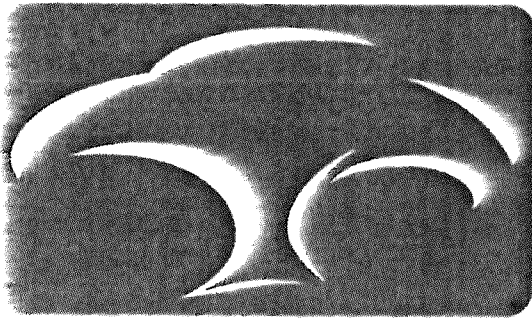


DEVELOPMENT OF WATER & SEWER UTILITIES
IN
HARNETT COUNTY WATER AND SEWER DISTRICTS



Harnett
C O U N T Y
NORTH CAROLINA

PUBLIC WATER SYSTEM PLANS AND SPECIFICATIONS	
APPROVED BY DEPARTMENT OF ENVIRONMENT & NATURAL RESOURCES DIVISION OF WATER RESOURCES PUBLIC WATER SUPPLY SECTION	
Serial No.	13-00652
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By	RJ DICKIE



HARNETT COUNTY
DEPARTMENT OF PUBLIC UTILITIES

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DEPARTMENT OF ENVIRONMENT
& NATURAL RESOURCES
DIVISION OF WATER RESOURCES
GROUND WATER SUPPLY SECTION

APPROVED BY

STATE OF CALIFORNIA
DEPARTMENT OF WATER RESOURCES

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CHAPTER 1
DEFINITIONS AND TERMS

Chapter 1 DEFINITIONS AND TERMS

Section 1.1 Interpretation of Certain Terms or Words

Except as specifically defined herein, all words used in this Regulation have their customary dictionary definitions. For the purposes of this Policy, certain words or terms used herein are defined as follows:

1.1.1 Words used in the present tense include the future tense. Words used in the singular include the plural and words used in the plural include the singular.

1.1.2 The word "shall" is always mandatory.

1.1.3 The word "may" is permissive.

1.1.4 The word "lot" includes the word "plat" or parcel.

1.1.5 The word "person" includes a firm, association, organization, partnership, trust company, or corporation as well as an individual.

Section 1.2 Definitions

1.2.1 Density

Unless otherwise stated, density requirements in this regulation are to be expressed in gallons per residential equivalent per day. Table No. 1 in the Appendix shall be used to calculate gallons per residential equivalent per day. Refer to Table No. 1 in the Appendix. Other values for the determination of gallons per residential equivalent will be considered, if justified, on the basis of extensive documentation.

1.2.2 Developer

Any person, firm, corporation, or other legal entity improving property for commercial, industrial, or residential purposes.

1.2.3 Easement

A grant by the property owner to any person, firm, corporation or public entity for the use of a strip or parcel of land for a specified purpose.

1.2.4 Engineer

See: Registered Professional Engineer

1.2.5 Governing Authority

The Board-of-Commissioners of Harnett County acting through the County's Department of Public Utilities (HCDPU).

1.2.6 Land Surveyor

See: Registered Professional Engineer

1.2.7 Lot

A piece, parcel, tract, or plat of land intended as a unit for the transfer of ownership for development.

1.2.8 Planning Commission

The Harnett County Planning Board and the Harnett County Development Review Board.

1.2.9 Plat

A map or drawing upon which the development plan is presented for approval.

1.2.10 Recognized Standards, Codes and Statutes

The following list of standards, codes and statutes outlined more specifically below are common principles for the design, construction, testing, inspection, operation and/or maintenance adopted by the reference for the Harnett County Water Distribution System & Wastewater Collection System. Any extension, connection, service, tap, lateral, point of discharge or any use of the Harnett County Water and Wastewater Systems shall agree to adopt and conform to the minimum requirements of all standard engineering design practices; construction, fabrication and installation methods; standard operating procedures and best maintenance practices for the systems in accordance with these recognized standards of the following professional societies, federal and state government agencies. Where conflicts may arise between these recognized standards, HCDPU shall make the determination for resolution.

A. American National Standards Institute - ANSI

The latest edition of Standards published by the American National Standards Institute.

ANSI [<http://www.ansi.org/>]

B. American Society of Civil Engineers - ASCE MOP

The latest edition of Manual of Practice published by the American Society of Civil Engineers.

ASCE [<http://www.asce.org/>]

C. American Society of Mechanical Engineers - ASME

The latest edition of the American Society of Mechanical Engineers Code

ASME [<http://www.asme.org/>]

D. American Society of Testing and Materials - ASTM

The latest edition of Standards published by the American Society of Testing and Materials

ASTM [<http://www.astm.org/>]

E. American Society of Sanitary Engineering - ASSE

The latest edition of Plumbing Standards published by the American Society of Sanitary Engineering is the voice of the ASSE Seal and Standards Programs.

ASSE [<http://www.asse-plumbing.org/>]

F. American Water Works Association - AWWA

The latest edition of Standards published by the American Water Works Association.

AWWA [<http://www.awwa.org/>]

G. HCDPU

Harnett County Department of Public Utilities or its appointed representative over the project unless otherwise noted.

H. Institute of Electrical and Electronics Engineers, Inc. - IEEE

The IEEE name was originally an acronym for the Institute of Electrical and Electronics Engineers, Inc. Today, the organization's scope of interest has expanded into so many related fields, that it is simply referred to by the letters I-E-E-E. A non-profit organization, IEEE is the world's leading professional association for the advancement of technology.

IEEE [<http://www.ieee.org/portal/site/iportals/>]

I. National Electrical Code - NEC

The latest edition of the National Electrical Code.

NEC [<http://www.nfpa.org/aboutthecodes/AboutTheCodes.asp?DocNum=70>]

J. National Electrical Manufacturers Association - NEMA

The National Electrical Manufacturers Association

NEMA [<http://www.nema.org/>]

K. National Rural Water Association – NRWA

The National Rural Water Association (NRWA) is a non-profit federation of State Rural Water Associations. NRWA's mission is to provide support services to our State Associations who have more than 25,735 water and wastewater systems as members.

NRWA [<http://www.nrwa.org/>]

L. North Carolina Board of Examiners for Engineers and Land Surveyors

The North Carolina Board of Examiners for Engineers and Land Surveyors is responsible for the administration and regulation of the professions of engineering and land surveying in North Carolina.

NCBELS [<http://www.ncbels.org/>]

M. North Carolina Department of Environment and Natural Resources - NCDENR

The North Carolina Department of Environment and Natural Resources (NCDENR) is the lead stewardship agency for the preservation and protection of North Carolina's outstanding natural resources. The organization, which has offices from the mountains to the coast, administers regulatory programs designed to protect air quality, water quality, land quality, wildlife and the public's health. NCDENR also offers technical assistance to businesses, farmers, local governments, and the public and encourages responsible behavior with respect to the environment through education programs.

NCDENR [<http://www.enr.state.nc.us/>]

N. North Carolina Department of Transportation - NCDOT

The North Carolina Department of Transportation (NCDOT) provides and supports a safe and integrated transportation system that enhances the state. NCDOT standards must be followed by HCDPU, developers, utility contractors, surveyors and engineers. Developers must acquire a three party NCDOT Encroachment Agreement before scheduling work inside the established NCDOT right-of-way of each highway, street, or road maintained by NCDOT.

NCDOT [<http://www.ncdot.gov/>]

O. United States Army Corps of Engineers - USACE

The United States Army Corps of Engineers (USACE) provides quality, responsive engineering services to the nation relating to planning, designing, construction, operation and maintenance support for civil projects.

All development that disturbs more than one (1) acre of wetlands must follow the Nationwide 12 Permit requirements set forth by the USACE and reporting requirements of the NCDENR – Division of Water Quality

USACE [<http://www.usace.army.mil/Pages/Default.aspx>]

P. United States Department of Labor (USDOL)
Occupational Safety and Health Administration (OSHA)

Under the Occupational Safety and Health Act of 1970, OSHA's role is to assure safe and healthful working conditions for working men and women; by authorizing enforcement of the standards developed under the Act; by assisting and encouraging the States in their efforts to assure safe and healthful working conditions; by providing for research, information, education, and training in the field of occupational safety and health.

OSHA [<http://www.osha.gov/>]

Q. Mine Safety & Health Administration (MSHA) of the United States Department of Labor - NEC

The latest edition of the Federal Mine Safety & Health Act of 1977.

MSHA [<http://www.msha.gov/>]

R. Water Environment Federation

The Water Environment Federation® is the not-for-profit association that provides technical education and training for the world's water quality professionals and also supports like-minded organizations such as Water for People and Engineers Without Borders. Formed in 1928, the Water Environment Federation® (WEF®) is a not-for-profit technical and educational organization with 35,000 individual members and 75 affiliated Member Associations representing water quality professionals around the world. WEF and its Member Associations proudly work to achieve our mission of preserving and enhancing the global water environment. Water Environment Research (WER) publishes peer-reviewed research papers, research notes, state-of-the-art and critical reviews on original, fundamental and applied research in all scientific and technical areas related to water quality, pollution control, and management.

WEF [<http://www.wef.org/Home>]

WER [<http://www.wef.org/ScienceTechnologyResources/Publications/WER/>]

The Manual of Practice (MOP) published by the Water Pollution Control Federation is a technical guide of references written for and by the water quality community.

1.2.11 Registered Professional Engineer

A person registered as a Professional Engineer by the North Carolina Board of Examiners of Engineers and Land Surveyors and competent in the field of water and waste collection, transmission and treatment design. (See the North Carolina Board of Examiners for Engineers and Land Surveyors).

1.2.12 Registered Land Surveyor

A person registered as a Land Surveyor by the North Carolina Board of Examiners of Engineers and Land Surveyors and competent in the field of land surveying. (See the North Carolina Board of Examiners for Engineers and Land Surveyors).

Section 1.3 Additional Definitions

Throughout this specification document, the following terms shall have the meanings ascribed to them respectively:

Agreement: A agreement between the County, State or representatives of the Departments of the County or State with any private developer, contractor, engineer, surveyor, attorney, or designated representative of established organizations for profit and non-profit organizations to set forth terms of an understanding between said parties. As a rule the County requires all agreements to be in writing with the signatures of the proper representatives of County and State Department(s) and witnessed along with signatures of the all involved parties private or public.

Air-gap: The vertical distance through the atmosphere between the lowest opening from any pipe or faucet supplying water to a tank, plumbing fixture, or other device and the flood level rim of the receptacle. An approved air-gap vertical separation shall be at least double the diameter of the supply pipe. In no case shall the air-gap be less than two (2") inches.

Approved Equal: Certified in writing by the Engineering staff of the Harnett County Department of Public Utilities (HCDPU) as an acceptable device, appurtenance or methodology used within the Harnett County Department of Public Utilities System. The approved equal shall be consistent with the standard specified by name in design, material, service life, cost of ownership and ease of installation or removal for normal maintenance and repairs.

Auxiliary intake: Any piping connection or other device whereby water may be secured from a source other than public water supply.

Backflow: Any flow of water into the public water supply from any other source due to a cross-connection, auxiliary intake, interconnection, backpressure, backsiphonage, any combination thereof, or other cause.

Backpressure: Any pressure on any source of water other than the public water supply which may be greater than the pressure on the public water supply and may result in a backflow.

Backflow prevention device: An approved effective device or method used to prevent backflow from occurring in the potable water supply. The type of device required shall be based on degree of hazard, existing or potential.

Backsiphonage: Any circumstance in which the pressure on the public water supply may be reduced to the point that the elevation and atmospheric pressure on a source of water other than the public water supply may result in a pressure to be greater than the pressure on the public water supply and may result in a backflow.

Certified tester: A person who has proven his/her competency to test, repair, overhaul and make reports on backflow prevention devices as evidenced by certification of successful completion of a training program approved by the Director of Public Utilities.

Cleanout: An entry point to the sanitary sewer service lateral to flush or remove clogged lateral lines to the sewer mains to remove any blockages. Cleanouts should be located near the property line at the edge of the street right-of-way.

Confinement assembly or device: A backflow prevention device, as approved and required, installed within a private plumbing or distribution system to isolate a localized hazard from the remainder of said system.

Confined Space: Spaces that are considered "confined" because their configurations hinder the activities of employees who must enter, work in, and exit them. A confined space has limited or restricted means for entry or exit, it may contain hazardous fluids or gases and it is not designed for continuous employee occupancy. Confined spaces include, but are not limited to underground vaults, tanks, storage bins, manholes, pits, silos, process vessels, and pipelines. (See Permit-required confined space)

Containment device: A backflow prevention device, as approved and required, installed at the point of separation between the public water supply and a private service or private distribution system or at the point of metering.

Cross-connection: Any physical connection whereby the public water supply is connected with any other water supply system, whether public or private, either inside or outside of any building or buildings, in such a manner that a flow of water into the public water supply is possible either through the manipulation of valves or because of ineffective check or back-pressure valves, or because of any other arrangement.

Cross-connection Control & Backflow Coordinator: The official position established and authorized by the Harnett County Department of Public Utilities and designated by the Director of Public Utilities to administer and interpret the cross connection section of these specifications and who shall also be a certified tester.

Customer Connections: (WATER) A water line between ¾" and 2" that connects the end user's residential dwelling or business to the County's water system generally between the building and the water meter that carries or transports potable water to the end user or customer for consumption, cleaning or irrigation.
(SEWER) A wastewater line between 4" and 6" that connects the end user's residential dwelling or business to the County's sewer collection system generally between the building and the sanitary sewer cleanout that carries or transports wastewater to the County from the end user or customer's building or dwelling.

Developer/land Developer: An individual, partnership, co-partnership, firm, company, corporation, association, joint stock company, trust, estate, governmental entity or any other legal entity, or their legal representatives, agents or assigns that improve raw land with the installation of utilities with the purpose to subdivide the property to sell.

Distribution Line: A water line between 2" and 8" in diameter that carries or transports potable water to the end user or customer for consumption, irrigation, agriculture or other domestic purposes.

Double check valve backflow prevention device: An approved assembly composed of two (2) single, spring-loaded independently operating check valves, including tightly closing shut-off valves located at each end of the assembly, and having suitable connections for testing the water-tightness of each check valve.

Drought: An extended period of severe hot and extremely dry weather with no significant precipitation to increase local water supplies such as rivers, streams and lakes that negatively impact output capacity of water treatment plants. Severe drought must follow requirements established by federal, state and local laws and ordinances to protect existing water supplies. Recent changes in state laws require the County to ration water resources available during the drought and taking additional conservation measures to reduce water demands from irrigation while following established conservation measures to reduce system leaks, water losses and eliminate waste by consumers.

Dual check valve: An approved device containing two (2) independently acting check valves in series.

Emergency Management Plan: An established and approved emergency plan approved by the State and adopted by the County to respond to emergencies involving water supplies, treatment and distribution system.

Fire hydrant: A water distribution apparatus designed to be used by authorized fire-fighting personnel to supply bulk water in an emergency for extinguishing fire or filling pump trucks to transport water for fire-fighting.

Fire line: A system of pipes and equipment used to supply water in an emergency for extinguishing fire.

Food preparation facility or establishment: Any commercial or industrial facility that prepares or serves food, including a restaurant, cafe, cafeteria, snack bar, grill, deli, catering service, bakery, grocery store, butcher shop, or similar establishment.

Grease Interceptor/Grease Trap: An underground tank with baffles and pipes designed to trap or collect grease from food preparation facilities and food serving establishments in order to keep the County Sewer Collection System free of fat, oil and grease deposits and accumulations.

Indirect discharge or discharge: The discharge or the introduction from any non-domestic source regulated under §307(b), (c), or (d) of the Act (33 U.S.C. 1317), into the POTW (including holding tank waste discharged into the system).

Interconnection: Any system of piping or other arrangement whereby the public water supply is connected directly with a sewer, drain, conduit, pool, heat exchanger, storage reservoir, or other device which does or may contain sewage or other waste or substance which would be capable of imparting contamination to the public water supply.

Interference: The inhibition or disruption of the POTW treatment processes, operations, or its sludge process, use, or disposal, which causes or contributes to a violation of any requirement of the POTW's NPDES or Nondischarge Permit or prevents sewage sludge use or disposal in compliance with specified applicable state and Federal statutes, regulations or permits. The term includes prevention of sewage sludge use or disposal by the POTW in accordance with §405 of the Act (33 U.S.C. 1345) or any criteria, guidelines, or regulations developed pursuant to the Solid Waste Disposal Act (SWDA) (42 U.S.C. 6901, et seq.), the Clean Air Act, the Toxic Substances Control Act, the Marine Protection Research and Sanctuary Act (MPRSA) or more stringent state criteria (including those contained in any state sludge management plan prepared pursuant to Title IV of SWDA) applicable to the method of disposal or use employed by the POTW.

Meter: A device or system of devices used to accurately measure the amount of water consumed by the end user for the purpose of billing that end user for the water consumed or used by the water service line supplied by the County's water distribution system.

Permit-required Confine Space: OSHA uses the term "permit-required confined space" (permit space) to describe a confined space that has one or more of the following characteristics: contains or has the potential to contain a hazardous atmosphere; contains a material that has the potential to engulf an entrant; has walls that converge inward or floors that slope downward and taper into a smaller area which could trap or asphyxiate an entrant; or contains any other recognized safety or health hazard, such as unguarded machinery, exposed live wires, or heat stress.

Person: Any individual, partnership, co-partnership, firm, company, corporation, association, joint stock company, trust, estate, governmental entity or any other legal entity, or their legal representatives, agents or assigns. This definition includes all Federal, state, and local government entities.

Publicly-owned treatment works (POTW) or municipal waste water system: A treatment works as defined by §212 of the Act (33 U.S.C. 1292) which is owned in this instance by the County. This definition includes any devices or systems used in the collection, storage, treatment, recycling, and reclamation of municipal sewage or industrial wastes of a liquid nature. It also includes sewers, pipes, and other conveyances only if they convey waste water to the POTW treatment plant. For the purposes of this specification document, POTW shall also include any sewers that convey waste waters to the POTW from persons outside the County who are, by contract or agreement with the County, or in any other way, users of the County's POTW.

Pressure vacuum breaker: An approved assembly containing an independently operating spring loaded check valve and an independently operating loaded air inlet valve located on the discharge side of the check valve. The assembly must be equipped with suitable connections for testing the proper operation of the device and tightly closing shut-off valves located at each end of the assembly.

Pretreatment or treatment: The reduction of the amount of pollutants, the elimination of pollutants, or the alteration of the nature of pollutant properties in waste water prior to or in lieu of discharging or otherwise introducing such pollution into a POTW. The reduction or alteration can be obtained by physical, chemical or biological processes, or process changes or other means, except by diluting the concentration of the pollutants unless allowed by an applicable pretreatment standard.

Public water supply or system: The water and waterworks system of the Harnett County and its customers outside the corporate limits, for general use and which supply is recognized as the public water supply by the North Carolina Department of Environment and Natural Resources. The Cape Fear River is the primary water source for Harnett County water system but, other water sources are available to Harnett County through interconnections with other water systems from surrounding towns and counties.

Reduced pressure zone principle backflow prevention device (RPZ): An approved device containing within its structure two (2) spring loaded, independently operating check valves, together with an automatically operating pressure differential relief valve located between the two (2) check valves. The first check valve reduces the supply pressure a predetermined amount so that during normal flow and at cessation of normal flow the pressure between the checks shall be less than the supply pressure. In case of leakage of either check valve, the differential relief valve, by discharging to the atmosphere, shall operate to maintain the pressure between the check valves less than the supply pressure. This device shall have suitable connections for testing the proper operation of the device, including tightly closing shut-off valves located at each end of the device.

Reuse water: Wastewater that has been treated to water quality standards as defined by the applicable section of the North Carolina Administrative Code and is intended to be distributed for non potable uses such as irrigation and/or industrial processes.

Reuse water services/service lines: Those portions of the reuse water service pipes that connect to the County's reuse water mains and extend to the boundaries of public easements and rights-of-way.

Sewer Collection Lines: Gravity sewer mains between eight (8") inches and twelve (12") inches in diameter. Eight (8") inches in diameter is the minimum size of wastewater collection lines allowed by the HCDPU.

Sewer Interceptor: Gravity sewer mains larger than eighteen (18") inches in diameter.

Sewer Lift Station: Sewer Lift Stations are designed to lift the wastewater from the low point of one sub basin into another sub basin closer to the nearest wastewater treatment facility.

Sewer Outfall: Gravity sewer mains larger than twelve (12") inches and less than or equal to eighteen (18") inches in diameter.

Sewer Service Lateral: Those portions of the sewer collection system and building sewer pipes which connect to the County's sewer mains and extend to the boundaries of public easements and rights-of-way. The point of demarcation is generally established by the sanitary sewer cleanout located at the edge of the street right-of-way and extending to the sewer main. (See Customer Connections and Water Service Lines)

Storm Sewer: (See Storm Water)

Storm Water: Any flow occurring during or following any form of natural precipitation and resulting there from.

Superintendent: The person designated by the County to supervise the operation of the publicly-owned treatment works, water distribution or sanitary sewer collections systems; and who is charged with certain duties and responsibilities by the County Ordinances, State Laws and General Statutes, Federal Codes and Regulations, or his duly authorized representative.

Tampering: The act to disrupt normal operation of the Harnett County water distribution system, sewer collection system, water treatment plant(s) or wastewater treatment plants by removing parts or components, damaging system equipment, or interfering of the routine duties of Harnett County staff to create a system upset, abnormality, outage of other disruption to the processes of treatment and distribution of potable water and/or the sewer collection system and the wastewater treatment plant(s).

Tap size: The nominal diameter of the connection of a water or reuse line installed between a meter assembly and main connected to the water or reuse utility system of Harnett County, without regard to the configuration of that water or reuse assembly, or ownership of the water or reuse meter assembly, service, or water or reuse main. Water tap sizes will vary from ¾" to 1" for most residential services; from 1" to 6" for commercial property and over 6" for most industrial services. Sanitary sewer taps will be no less than 4" for residential sewer service and sized by a professional engineer to handle calculated flows from commercial and industrial accounts.

Testing: The established and industry recognized procedures of exercising or checking utility system equipment and components under simulation of real operating conditions as will lead to proof or disproof of acceptability or rejection of the new or existing system or component. For example, water lines and mains must be filled with water, purged of air and pressure tested to verify the pipe, associated appurtenances and fittings will withstand the normal operating pressures before being placed into service. Testing of systems, equipment and components is only one of many inspections requirements before a new system or component may be accepted and placed into service to prove the system or component is ready for operation. Other testing procedures may be outlined in these specifications such as gathering and submitting water samples to the certified laboratory for complete analysis to determine the presence of contaminants above allowable limits or that should not be in the water system; or vacuum testing and mandrel testing of sanitary sewer systems and components to verify the new or existing sanitary sewer line or main is installed to meet designed grades and diameters. Testing procedures shall be approved by HCDPU before any testing may be scheduled with HCDPU.

Transmission Line: A water line over 10" in diameter that carries or transports potable water from the Harnett County Regional Water Treatment Facility to the clear wells, elevated storage tanks and standpipes located in various water & sewer districts (Northwest, Metro, East Central, Riverside, Southeast, South Central, Southwest, and West Central) throughout the entire Harnett County Water System.

Utility system, utility lines: Water pipelines, reuse water pipelines, and sewer pipelines (any or all as determined by the context), and shall include all pipes, valves, valve boxes, hydrants, and other fixtures, equipment, and apparatus connected to and forming a part of the main water, main reuse water, or sewer pipelines and systems or all, and all appliances necessary and convenient thereto. The utility lines dedicated to the County shall include only main distribution lines, valves, hydrants and other apparatus, fixtures and equipment forming a part of the lines laid in public streets, roads, highways and alleys or across County utility or sanitary sewer easements on private property, and shall not include lines leading from mains to building connections on private property and shall not include the water, reuse water, or sewer lines within any residences or other privately-owned building. Utility lines built in accordance with County specifications by private developers are included as part of the County's utility system.

Vehicle maintenance facility: Any commercial or industrial facility where automobiles, trucks, or equipment are serviced or maintained, including garages, service stations, repair shops, oil and lubrication shops, or similar establishments.

Water System Management Plan: An established and approved management plan approved by the State and adopted by the County to describe the ownership, organization, management policies and established standard operating procedures (SOP's) of the water system including training of operators and staff and system monitoring, recordkeeping and public reporting. The WSMP also includes documentation of the 20 year replacement Cost plan and the 5 year operating budget projections to maintain and protect the County's water system assets and keep them in operation to serve the public with potable water service meeting all State requirements.

Wastewater: The liquid and water-carried industrial or domestic wastes from dwellings, commercial buildings, industrial facilities, mobile sources, treatment facilities and institutions, together with any groundwater, surface water, and storm water that may be present, whether treated or untreated, which are contributed into or permitted to enter the POTW.

Water services/ Service lines and (building sewer) sewer service stubs: Those portions of the water service and building sewer pipes which connect to the City's water and sewer mains and extend to the boundaries of public easements and rights-of-way.

CHAPTER 2
PLAN SUBMISSION

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Chapter 2 Plan Submission

Section 2.1 General

The following sections outline the procedures for obtaining approval of water and/or sewer system extension within the territorial jurisdiction of Harnett County and the Harnett County Department of Public Utilities (HCDPU). It is the intent of this review process to avoid duplication and unnecessary delays in project approval. Every effort will be taken by the HCDPU to closely coordinate this review process with those of the Harnett County Planning Board, the Harnett County Development Review Board and other towns and counties inside and outside of Harnett County as well as, other agencies having jurisdiction. The developer is cautioned to adhere to the standards and provisions of the Harnett County Planning Board. Whichever public agency ordinances, rules, resolutions, or regulations impose a higher standard shall prevail. Conflicts between the policies, rules, resolutions, and ordinances of the HCDPU and NCDEH&NR and the Harnett County Planning Board shall be resolved by mutual agreement between the respective public agencies.

2.1.1 Projects Required to Follow These Procedures are as follows:

1. Any non-residential building larger than 1,500 square feet.
2. Any business employing more than 16 employees.
3. Any building requiring internal sprinkler system or fire protection booster pump system.
4. Any building providing medical facilities, human or animal.
5. Any facility providing food service.
6. Any facility discharging any type of waste other than domestic.
7. Any facility of an unusual nature can be required by the HCDPU upon the Director's confirmation.
8. Any single family lot subdivision requiring the extension of water and/sewer utilities.
9. Any multifamily development.

Section 2.2 Determination of Zoning Designation:

Before proceeding with the development of property or consideration given to the extension of water and/or sewer utilities to developing properties, the developer or property owner is cautioned to ensure that the property in question is properly zoned for the type of development being contemplated. The Harnett County Board of Adjustment must review and approve rezoning of the subject property.

In the event that the property requires a rezoning designation to a Planned Unit Development (PUD) a "Conceptual Plan" meeting the standards and requirements of the Harnett County Planning Board and the Harnett County Development Review Board will be required. The Conceptual Quality of waste to be delivered to the District's system for treatment (domestic, industrial, commercial); and Plan should be submitted to the HCDPU staff not less than thirty (30) days, prior to the meeting date scheduled by the Harnett County Planning Board and/or the Harnett County Development Review Board to review and consider approval of the plan. The HCDPU must review, approve, or disapprove the "Conceptual Plan" and so advise the Harnett County Planning Board and/or the Harnett County Development Review Board of its decision prior to final decision being reached by the Planning Board and/or the Harnett County Development Review Board. The final approving Authority shall be the Board-of-Commissioners of Harnett County.

Section 2.3 Water/Sewer Utility Master Plan

Upon the Harnett County Planning Board and/or the Harnett County Development Review Board approving a Planned Unit Development (PUD) and the associated "Conceptual Plan" establishing development patterns, density, and phasing, the developer will be required to develop a Water and Sewer Utility Master Plan. In addition, all developments greater than twenty-five (25) acres in size, as well as all phased projects will be required to develop a Water/Sewer Utility Master Plan. The Water/Sewer Utility Master Plan shall conform to the latest requirements and standards of the NCDEH&NR. The final approving authority shall be the HCDPU and as permitted by NCDEH&NR.

Section 2.4 Determination of Ability to Serve

2.4.1 Letter of Intent

Upon determination of zoning designation and/or approval of the Conceptual Plan and completion of the Water/Sewer Utility Master Plan (as applicable) as herein above described, the next action required of a developer is a letter of intent or application for reservation of water and/or sewer capacity. No capacity shall be agreed upon until capacity fees are paid to HCDPU. This letter should include the following minimum information:

- A. Name, address and telephone number of developer or development firm;
- B. Name, address and telephone number of Registered Professional Engineer or Engineering Firm;
- C. Identify the name, address and telephone number of contact person;
- D. Date of filing letter of intent;
- E. Signature of authorized representative or agent;
- F. Location of property to be developed which should include: tax map and tax lot number; Subdivision name and lot number; general plat of property; and/or highway number of adjacent streets and highways; and adjacent property owners;
- G. Type of development contemplated and proposed number of residential equivalent units;
- H. Nature of services requested from the HCDPU (Water, Sewer, and Fire Protection)
- I. Quality of waste to be delivered to the District's collection system for treatment (Domestic, Industrial, Commercial, etc.) and:
- J. Proposed sales, construction and occupancy schedules in residential equivalent units.

2.4.2 Sketch Plan Review

For expediency of review, the developer should submit along with his letter of intent a simple "sketch plan" of the proposed development. The purpose of the "sketch plan" is to enable the HCDPU staff to assist the developer prior to extensive site planning and engineering work which will be necessary for the preparation of a "pre-design plan" and "construction plan" as required herein. The "sketch plan" may be a simple free hand drawing. The plan should include all information identified in Section 3.3 of this document.

2.4.3 Conference

Within ten (10) work days from the date of submission of the "letter of intent" and "sketch plan", the HCDPU will notify the developer of the date established for a conference between the developer (or his agent) and the District's staff. This conference shall be an informal, confidential review and discussion of the proposed project and the District's policies and procedures. The developer will be advised of the HCDPU ability to serve the proposed project.

Section 2.5 The Construction Plan

2.5.1 Development of the Construction Plan

Approval of the "sketch plan" is conditional approval and does not constitute final project approval for any project involving the extension of Harnett County's water and sewer lines. The "construction plan" should address only that phase or stage approved in the "pre-design plan" and only for the water/sewer capacity needs established or agreed upon. Documents submitted as a part of the "construction plan" for approval shall include, but not be limited to: general layout, detailed plans, specifications cost estimates, bid tabulation forms, conditions, completed highway North Carolina Department of Transportation (NCDOT) encroachment permit forms, and completed Permit Application Forms. The specifications accompanying the construction drawings shall include all construction information not shown on the drawings which are necessary to inform the utility contractor in detail of the design requirements, to identify the quality of materials to be used and to establish workmanship and fabrication techniques for the project. All comments and design modifications identified by the HCDPU staff during the review process should be incorporated into the "construction plan". The plan shall include all plan information identified in Section 3.4 of these specifications as documented herein.

2.5.2 Approval of the Construction Plan

No approval for construction can be issued until final, complete, and detailed plans and specifications have been submitted and found to be satisfactory. The HCDPU staff shall act on the approval of the "Construction Plan", in a timely manner. HCDPU shall notify the developer in writing if the "construction plans" are satisfactory or shall so notify the developer of the conditions under which approval will be granted.

Once the project and plans are found to be satisfactory by the HCDPU, the developer or representative shall submit the required documents to NCDEH&NR for state permitting. The applications will be signed by the Director of the HCDPU upon receipt of capacity fees for the development. When the appropriate state permits for construction water line extension(s), sanitary sewer collections system(s) and related appurtenances are received by the HCDPU from NCDEH&NR, then the utility contractor and professional engineer must schedule and attend a pre-construction meeting with the HCDPU Utility Construction Inspector. The HCDPU Utility Construction Inspector must be provided with no less than 48 hours' notice for scheduling of the pre-construction meeting. The utility contractor must provide material submittals for review and approval by the Engineer of Record prior to acceptance by HCDPU Utility Construction Inspector during the pre-construction meeting. Following the pre-construction meeting, the HCDPU will notify developer and/or the utility contractor that he may proceed upon review of all applicable shop drawings and specifications of the materials used in the proposed utility project. Upon review and acceptance of all shop drawings and material specifications, the HCDPU will authorize Notice to Proceed.

Section 2.6 Fees and Charges

2.6.1 Plan Review and Processing

To defray the cost of reviewing and processing the "Conceptual Plan" "Water/Sewer Utility Master Plan", "Letter of Intent" and "Construction Plan," the developer shall pay the following fees to the HCDPU at the time such documents are submitted to the HCDPU for review:

- A. Conceptual Plan Review
Twenty-five dollars (\$25.00) minimum or One dollar (\$1.00) per residential equivalent unit whichever is greater, not exceeding seventy-five dollars (\$75.00) for each plan review.
- B. Water/Sewer Utility Master Plan

Fifty dollars (\$50.00) minimum or one dollar (\$1.00) per-residential equivalent unit whichever is greater, not exceeding one hundred and twenty-five dollars (\$125.00) for each plan review.

- C. Letter of Intent/Pre-design Plan
Five dollars (\$5.00) minimum or one dollar (\$1.00) per residential equivalent unit whichever is greater, not exceeding thirty-five dollars (\$35.00) for each review.
- D. Construction Plan Approval
Fifty Dollars (\$50.00) minimum or One dollar (\$1.00) per residential equivalent unit whichever is greater, not exceeding Two Hundred-Fifty Dollars (\$250.00) each plan review; each change order in project scope. Thirty-five Dollars (\$35.00) minimum, where water and/or sewer system extensions are not required to serve a particular project (restaurants, commercial buildings), the maximum payment required herein may be reduced.

2.6.2 Construction Inspection, Final Review and Approval

To defray the cost of project inspection and processing (not currently required by HCDPU) approval documents, the developer shall pay the following fees to the HCDPU at the preconstruction conference:

A. Construction Inspection

Total	Actual	%Fee
<u>Construction Cost</u>		<u>(\$250.00 Minimum)</u>
	up to 100,000	2.00
	200,000	1.75
	300,000	1.50
	400,000	1.48
	500,000	1.30
	600,000	1.20
	700,000	1.10
	800,000	1.00
	900,000	0.90
	1,000,000 and above	0.80

2.6.3 Connection Fees and Charges

The developer will be required to make payment of the appropriate prevailing connection fees for the amount of capacity reserved by the HCDPU, in keeping with the "Water/Sewer Service Agreement", on the date established for the preconstruction conference. The applicable fees and charges to be paid are as follows:

<u>Fee or Charge</u>	<u>Basis of Charges</u>	<u>Time of Payment</u>
Water Impact Fee ⁽¹⁾	Per. Res. Equivalent	Preconstruction Conference
Water Capacity Use Fee	Per. Res. Equivalent	Upon Application for Service
Water Tap (3/4 Inch)	Per Connection	Upon Application for Service
Water Meter Fee	Per. Res. Equivalent	Upon Application for Service
Sewer Impact Fee ⁽¹⁾	Per. Res. Equivalent	Preconstruction Conference
Sewer Capacity Use Fee	Per. Res. Equivalent	Upon Application for Service

Sewer Tap (4 Inch)	Per Connection	Upon Application for Service
Sewer and/or Water Deposit	Per. Res. Equivalent	Upon Application for Service
Customer Service	Per Account	Upon Application for Service 21
Administrative Fee ⁽¹⁾	Size/Complexity	Preconstruction Conference
Construction Inspection ⁽¹⁾	Size/Complexity	Preconstruction Conference

⁽¹⁾ not currently required by HCDPU

SINGLE FAMILY LOT DEVELOPMENTS

<u>Fee or Charge</u>	<u>Basis of Charges</u>	<u>Time of Payment</u>
Water Impact Fee ⁽¹⁾	Per. Res. Equivalent	Preconstruction Conference
Water Capacity Use Fee	Per. Res. Equivalent	Upon Application for Service
Water Tap (3/4 Inch)	Per Connection	Upon Application for Service
Water Meter Fee	Per. Res. Equivalent	Upon Application for Service
Sewer Impact Fee ⁽¹⁾	Per. Res. Equivalent	Preconstruction Conference
Sewer Capacity Use Fee	Per. Res. Equivalent	Upon Application for Service
Sewer Tap (4 Inch)	Per Connection	Upon Application for Service
Sewer and/or Water Deposit	Per. Res. Equivalent	Upon Application for Service
Customer Service	Per Account	Upon Application for Service 21
Administrative Fee ⁽¹⁾	Size/Complexity	Preconstruction Conference
Construction Inspection ⁽¹⁾	Size/Complexity	Preconstruction Conference

⁽¹⁾ not currently required by HCDPU

Note: The above fees are in addition to any other fees that may be charged by the Harnett County Central Permitting Office (such as Inspections Fees) and the Harnett County Planning Department. HCDPU will establish capacity fees for commercial and industrial accounts in direct correlation to the anticipated demands and residential equivalency.

2.6.4 Operation and Maintenance Fees/Availability Charges

Operation and Maintenance Fees/Availability Charges are not used by HCDPU at this time. These charges may be adopted in the future and HCDPU will invoice these fees should they be adopted by the County. 22

Section 2.7 Water/Sewer Capacity Use Fees

The HCDPU has heretofore duly adopted resolutions, determined that the recovery of a portion of the construction costs of water treatment, water distribution, sewer collections and sewer treatment facilities will be derived by the levy of a water/sewer capacity use fee upon the lots and parcels to which water service lines and sewer service laterals constructed therein in accordance with the requirements of North Carolina General Statutes. The applicable

North Carolina Code provides that any and all abutting properties later converted to commercial or residential purposes or later platted or otherwise developed are, at such time, subject to the assessment. These are subject to alternative method.

The purpose of the capacity use fee is to partially recover directly from new customers the costs of capacity of the utility system to serve them. It is hereby declared that such charges are reasonable and necessary and result in a more equitable and economically efficient method of recovery of such costs to handle new growth and to serve new customers without placing an additional financial burden on existing customers solely through inordinate enhancement of water and sewer rates. A Water System Capacity Use Fee of \$900.00 and a Sewer System Capacity Use Fee of \$1,000.00 per connection, lot and/or unit will be charged for all new water and/or sewer services connecting to any water supply or distribution system and/or sewer collection system owned and/or operated by HCDPU. Determination of water and sewer capacity fees for commercial development will be accomplished through the method of equivalent residential unit using the estimated water and sewer capacity needed for the development. These capacity use fees shall be paid in the manner set forth below: The full balance of the fees shall be payable upon the application for a water and/or sewer service to any water supply or distribution system and/or sewer collection system owned or operated by HCDPU. In instances of a new residential and/or commercial development where a water supply or distribution system and/or sewer collection system is conveyed to either HCDPU or a HCDPU Water and Sewer District the full balance of these fees shall be due prior to HCDPU concurrence on applications to NCDENR for water and/or sewer permits. These payments will be accepted on a per phase basis for residential developments in which a phase constitutes a minimum of 50 lots for planned developments consisting of a greater cumulative total of lots than the minimum of 50. For planned residential developments of less than 50 lots, all capacity fees will be due prior to application for permitting. For planned residential developments that will utilize one or more sewer lift stations, all capacity use fees for lots and future lots that can be served by the lift station(s) will need to be paid prior to application for permitting as stated above. The formula for determining the allocated capacity of a lift station will be to divide the pumping capacity of the total sewer lift station as measured by gallons per day by three hundred and sixty gallons per day. This will determine the number of lots or units that can be served by the station.

CHAPTER 3
PLAN REQUIREMENTS

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CHAPTER 3 PLAN REQUIREMENTS

Section 3.1 General

3.1.1 Conceptual Plan or the Preliminary Plat Plan

The Conceptual Plan or the Preliminary Plat Plan shall conform to the latest requirements and standards established by the Harnett County Planning Board, the Harnett County Development Review Board and Harnett County Department of Public Utilities.

The Harnett County Development Review Board (HCDRB) is an administrative board that reviews development applications. All major subdivisions and multifamily developments, as well as commercial site plans in the Highway Corridor Overlay District are reviewed by this board. The DRB is made up of five (5) member departments: Fire Marshal, E911/Addressing, Planning, Public Utilities, and Environmental Health.

The Harnett County Development Review Board (DRB) strives to streamline the approval processes by bringing all appropriate county departments together in one location at regular intervals for the convenience of land developers, land surveyors, engineers and architects to seek and gain approval of their developments and projects. Advisory members of the HCDRB include the North Carolina Department of Environment and Natural Resources (NCDENR) and the North Carolina Department of Transportation (NCDOT). Advisory members are not required to be present at the regularly scheduled HCDRB Meetings.

Section 3.2 Water/Sewer Utility Master Plan

The Water and Sewer Utility Master Development Plan shall conform to the latest requirements and standards of NCDENR and shall at a minimum, include a hydraulic analysis of the water distribution system. The Master Development Plan should include a proposed street and lot layout with a total lot count at complete build out. The Master Development Plan should identify all existing wetlands, streams, and rivers. The Master Development Plan should provide the name, address and contact telephone number for the Owner/Developer, the Professional Engineer (P.E.) and the Registered land Surveyor (R.L.S.). The Master Development Plan should provide the proposed phases lines between multiple phases and shows all planned improvements such as: streets, parks, natural features (rivers, stream, ponds, lakes, etc.), buffers or areas that shall remain undisturbed, sporting amenities (swimming pools, tennis courts, basketball courts, etc.), restaurants, and public areas to be maintained by the homeowner's associations or other organizations. If the proposed development will include sanitary sewer improvements that will be connected the county's existing sanitary sewer system then the master development Plan must conform to the county's Master Sewer Plan., latest edition.

Section 3.3 Sketch Plan

The sketch plan of a proposed development shall contain or be accompanied by the following information:

- A. All maps or drawings should show north arrow and estimated written or graphic scales;
- B. Provide a vicinity or location map for the purpose of locating the property being developed;
- C. Identify tract boundaries and provide total acreages; and
- D. Identify by-name and/or number all abutting NC Department of Transportation and/or municipal road rights-of-way.
- E. Closest available existing water & sewer utilities.
- F. Distance to the nearest existing manhole of the Harnett County sewer system.

Section 3.4 Construction Plan

3.4.1 General

The construction plan of the water and sanitary sewer improvements to serve a proposed subdivision or any other project shall be clearly and legibly drawn to a minimum scale of one (1) inch equal to one hundred (100) feet and on a sheet measuring twenty-four inches by thirty-six inches (24 x 36). If the construction plan requires more than one sheet, a key diagram showing relative location of the several sections shall be drawn on each sheet with appropriate match lines between each sheet.

3.4.2 Content

The construction plan shall contain or be accompanied by the following information as well as all information as-required herein for the preliminary plan:

A. General Information

1. Name, mailing address, email address (if applicable) and telephone number and of owner of record and the name of the developer of record.
2. Name of subdivision, date, north arrow, vicinity map and graphic scale.
3. The North Carolina One Call Center (NCOCC) telephone number 811 or (800) 632-4949 along with a note to the utility contractor to call the NCOCC at least 48 hours before digging or excavating begins on any project in order to identify the location of all existing underground utilities near the project site.
4. Name, registration number, signature and seal of the registered land surveyor and the professional engineer.
5. Sufficient data to determine readily and reproduce accurately on the ground the location, bearing and length of every street, alley line, lot line, easement and boundary line whether curved or straight. This shall include the radius, point of tangent, and other data for curved property lines and curved streets, to an appropriate accuracy and in conformance with surveying practice.
6. Names of owners of record of all adjoining land and all property boundaries, water courses, streets, easements, utilities and other such improvements, which cross or form any boundary line of tile tract being developed.
7. Exact boundaries of the tract of land being developed shown with bearing, distances and current adjacent property owners.
8. Streets and alleys, rights-of-way, percent of grades and street names.
9. Rights-of-way or easement; location, widths, and purposes.
10. All dimensions shall be to the nearest one hundredth of a foot and angles to the nearest minute.
11. Accurate description of the location of all monuments and markers.
12. Proposed utility easements, showing the accurate dimension in feet and hundredths including notation of any limitations on such easements.
13. Calculated Water and Sewer Daily usages.

Easements for the following utilities installed outside the planned right-of-way must be recorded:

- (a) Water;
- (b) Gas;
- (c) Sanitary sewer;
- (d) Storm drainage;
- (e) Electrical lines;
- (f) Telephone lines; and
- (g) Existing and proposed irrigation lines.

14. Sewer profile sheets shall indicate manhole number, the top or rim elevation, the manhole inlet/outlet invert elevations, all pipe crossings, manhole casting elevation, grade, length and type of pipe and material. Plan views shall number lines and manholes. Station numbers shall be noted and profiled to a minimum interval of 100 feet.

B. Platting information

The subdivision plat shall be submitted to HCDPU prior to recording to verify that all previously negotiated well sites, tank sites, pump station sites, or utility right-of-ways have been properly represented.

The professional engineer must submit 24" x 36" copies of the As-Built Record Drawings with all required information in bond (paper), mylar and digital formats along with the final plat from the Registered Land Surveyor so that HCDPU can compare them for accuracy prior to the final plat or project approval. Digital copies shall be submitted to HCDPU in AutoCAD (dwg) or (dxf) files. The As-Built Record Drawings shall match the final plat and may be submitted after the project has been completed, if the developer provides Harnett County with an adequate bond to cover the utility improvements that will serve the proposed development to be subdivided and recorded with the Harnett County Register of Deeds.

C. Additional information for Construction

Additional Information may be requested by HCDPU such as: Detailed report identifying necessary construction specifications and procedures along with the required construction documents, contractors bid tabulation sheets, performance payment bonds, general and special conditions, etc.

1. Tentative profiles along the center line of pavement of each proposed sheet shown on the construction plan. Such profiles shall show natural and finished pavement grade with typical road right-of-way section shown. Profiles of water line(s) over culvert crossings and through pass arounds.
2. Three (3) complete copies of the NC Department of Environment and Natural Resources, Division of Environmental Health – Public Water Supply Section (NCDENR, DEH-PWSS) completed permit application forms ready for submittal to obtain a permit for the construction and operation of the water system improvements. No permit applications shall be submitted without the concurrence and signature of the appropriate reviewing official.
3. Three (3) complete copies of the NC Department of Environment and Natural Resources, Division of Water Quality (NCDENR, DWQ) completed permit application forms ready for submittal to obtain a permit for the construction and operation of the sanitary sewer system improvements. No permit applications shall be submitted without the concurrence and signature of the appropriate reviewing official.
4. An Engineer's Report shall accompany all water applications that cover all requirements

established by NCDENR, DEH-PWSS under North Carolina Administrative Code Title 15A Department of Environment and Natural Resources, Subchapter 18C Water Supplies, Section .0307 to accurately describe the current existing system conditions and future projections on system demands.

5. Any other information considered by either the developer or HCDPU to be pertinent to the review of the plan.

6. Five copies of completed NCDOT Encroachment Permit Application Form if applicable. 27 The NCDENR permit applications and NCDOT encroachments agreements will be signed and returned to the developer's engineer of record for submittal to the State review agencies. When the erosion control permit is obtained, the developer shall submit a copy to the HCDPU prior to beginning construction.

Section 3.5 Construction and Inspections

3.5.1 Pre-Construction Conference

Once all permits have been issued by the State, the utility contractor may schedule a pre-construction conference with HCDPU. The Utility Contractor shall notify Harnett County Department of Public Utilities (HCDPU) and the Professional Engineer (PE) at least two days prior to construction commencing. The Utility Contractor must schedule and attend a pre-construction conference with HCDPU prior to the start of construction clearing and grubbing on site.

At that time, HCDPU will release the approved plan drawings stamped "Released For Construction," signed and dated by HCDPU Engineering staff. The utility contractor is required to provide HCDPU the material submittal package with all shop drawings at the pre-construction conference. The developer's Engineer of Record will review all shop drawings for conformance with HCDPU specifications prior to submittal to HCDPU. The shop drawing submittal to HCDPU shall include a cover letter by the developer's Engineer of Record certifying conformance with HCDPU specifications and summarizing any exceptions or concerns relative to approved drawings an/or HCDPU standards. The submittal and approval of all shop drawings for materials used in project must be approved prior to HCDPU necessary to proceed. Any materials not approved for use in Harnett County's water and sewer system shall be removed from the submittal package and suitable materials approved by the developer's Engineer of Record and HCDPU shall be submitted to replace the materials not approved by the developer's Engineer of Record and HCDPU. Once the material submittal package and shop drawings have been approved then the materials may be ordered and delivered to the project site.

3.5.2 Construction of Utility Improvements

- A. The utility contractor must notify the HCDPU Utility Construction Inspector at least two (2) days before any construction will begin and the utility contractor must coordinate with HCDPU for regular inspection visitations and acceptance of the water and sewer system(s). Construction work shall be performed only during the normal working hours of HCDPU which is 8:00 am – 5:00 pm Monday through Friday. Holiday and weekend work is not permitted by HCDPU. All State permits must be maintained on site throughout the entire construction process of the proposed water and sewer lines that will serve this project. The Utility Contractor will coordinate with HCDPU Utility Construction Inspector for regular inspection visitations and acceptance of the system.
- B. The Harnett County Fire Marshal shall approve all hydrant types and locations in new subdivisions. The Contractor shall contact the Harnett County Fire Marshal at (910) 893-7580 to schedule a final inspection for each fire hydrant installation in Harnett County. The fire hydrants are installed at certain elevations. Any grade change in the vicinity of any fire hydrant which impedes its operation shall become the responsibility of the Utility Contractor for correction. Corrections will be monitored by the HCDPU Utility Construction Inspector and the Harnett County Fire Marshal. If the project is located

outside of Harnett County, then the Contractor shall contact the Fire Marshal having jurisdiction over the project.

- C. Prior to the commencement of any digging or excavation work within established utility easements or NCDOT right-of-ways, the utility contractor is required to have a signed NCDOT encroachment agreement posted on site and notify all concerned utility companies in accordance with North Carolina General Statute 87-102. The utility contractor must call the North Carolina One Call Center at 811 or (800) 632-4949 to verify the location of existing utilities prior to the beginning of construction. Existing utilities shown in the plans are taken from maps furnished by various utility companies and have not been physically located or verified by the Professional Engineer (P.E.) (i.e. TELEPHONE, CABLE, WATER, SEWER, ELECTRICAL POWER, FIBER OPTIC, NATURAL GAS, ETC.). The utility contractor will be responsible to repair any and all damages to the satisfaction of the related utility company. The utility contractor shall spot dig to expose each existing utility pipe or line which may conflict with the construction of any proposed water or sanitary sewer line extensions well in advance to verify locations of the existing utilities. The Utility Contractor shall provide both horizontal and vertical clearances to the Professional Engineer (P.E.) to allow the P.E. to adjust the water or sanitary sewer line design in order to avoid conflicts with existing underground utilities. The Utility Contractor shall coordinate with the utility owner and be responsible for temporary relocation and/or securing existing utility poles, pipes, wires, cables, signs and/or utilities including services in accordance with the utility owner requirements during water line installation, grading and street construction.
- D. Construction Observation shall be performed by the Professional Engineer (P.E.) and surveying shall be performed by the Registered Land Surveyor (R.L.S.). The Professional Engineer (PE) shall make regular site visits during the construction process to observe the quantities and quality of the construction to verify the utility contractor follows the State approved plans and permit requirements. Before the construction of the water and sanitary sewer improvements shall begin, the Professional Engineer (P.E.), the Registered Land Surveyor (R.L.S.) or their designees shall make a site visit at the beginning of construction to set grade stakes to establish the proposed finish grade of the streets and underground water and sanitary sewer utilities for the utility contractor to follow. The Registered Land Surveyor (RLS) should stake out all lot corners and utility easements or right-of-ways. The Registered Land Surveyor (R.L.S.) or their designees shall make a final survey of all utility improvements by recording all above ground locations for the valve boxes, meter boxes, blow off assemblies, concrete valve markers, manholes, sanitary sewer clean outs, sanitary sewer valve boxes, sewer lift stations, sanitary sewer force main(s) and associated air release valves. The above ground utility improvements shall be placed into a map with real time coordinates tied to the state coordinate plane using the 1983 North American Datum (NAD) and provided to the Professional Engineer (PE) for the As-Built Record Drawings.
- E. Improvements shall be installed in accordance with the established specifications, and other applicable policies of HCDPU. Contractor shall conform to all applicable local, state and federal regulations. No field changes to the plans are allowed without prior written approval from HCDPU. The Developer shall, at his expense, retain the services of the Engineer of Record for the purposes of providing necessary inspections and supervision of the construction work, record drawings and Engineer certifications. The engineer is responsible to insure that construction is, at all times, in compliance with accepted sanitary engineering practices and the approved plans and specifications. A copy of each Engineer's field report is to be submitted to HCDPU as each such inspection is made. Water and sewer infrastructure must pass all tests as required by HCDPU specifications and those of all applicable regulatory agencies. These tests include, but are not limited to, air test, vacuum test, mandrel test, visual test, pressure test, bacteriological test, etc. A HCDPU inspector must be present during testing. All test results must be submitted to HCDPU. All tests must be satisfied prior to Final Inspection. Following completion of construction of all water and sewer infrastructure delineated in the approved water and sewer plans a Final Inspection must be requested in writing by the Developer or Developer's engineer. The Developer's engineer and HCDPU inspector shall prepare a written punch list of any defects or deficiencies noted during this inspection, should any exist. Upon completion of

the punch list, the Developer's engineer will schedule another inspection. In the event the number of inspections performed by HCDPU exceeds two, additional fees may be assessed to the Developer.

3.5.3 Documentation of Utility Improvements

A. Red Line Field Drawings by Contractor

The Utility Contractor shall provide the Professional Engineer (PE) and HCDPU Utility Construction Inspector with a set of red line drawings identifying the complete water and sanitary sewer system installed for each project. The red line drawings should identify the materials, pipe sizes and approximate depths of the water lines as well as the location of all gate valves, fire hydrants, meter setters, blowoff assemblies and all associated appurtenances for all water line(s) constructed in Harnett County. The red line drawings should clearly identify any deviations from the NCDENR approved plans. All change orders must be approved by the HCDPU and the Professional Engineer (PE) in writing and properly documented in the red line field drawings by the Contractor.

B. As-Built Record Drawings and P.E. Certification.

Upon completion of the utility construction, inspections testing and acceptance of the system, the Professional Engineer (P.E.) shall submit asbuilt drawings to HCDPU to conduct a final inspection and walkthrough. The P.E. will file a letter of certification that the project has been built in accordance with plans and specifications as approved by the North Carolina Department of Environment and Natural Resources, Division of Environmental Health - Public Water Supply Section for all water system improvements with a copy to HCDPU. The Professional Engineer (P.E.) will file a DWQ permit certification that the project has been built in accordance with plans and specifications as approved by the North Carolina Department of Environment and Natural Resources, Division of Water Quality for all sanitary sewer system improvements with a copy to HCDPU. In addition a Cost Statement shall be submitted to HCDPU for all utility improvements added to Harnett County's existing water and sewer systems.

These Engineering Certifications shall be provided as indicated above along with the Project As-Built Record Drawings as indicated below in substantially the same form where applicable and as stipulated by the HCDPU staff. One (1) complete set of mylar sepia drawings that accurately depict the "as-built" locations and condition of the project shall be submitted after the HCDPU has approved the As-Built Record Drawings. The plans shall be noted "As-built Record Drawings" or similar, dated and signed by the design engineer. All major system components such as: valves, manholes (including final depth), water service connections, meter boxes, meter setters, sanitary sewer service laterals, sanitary sewer cleanouts and other system appurtenances shall be located by either distance along the line or by distance from at least two permanent above ground structures that are readily visible near the appurtenance.

The Professional Engineer (P.E.) must file with HCDPU, two (2) 24" x 36" blue prints or bond copies of the "As-Built Record" drawings for all utility construction in place. These drawings must be sealed by the Registered Professional Engineer with his signature and marked "Record Drawings." Any and all field change orders that were made during construction shall be properly documented in the "As-Built Record" drawings. The "As-Built Record" drawings shall include all lot numbers, water valves, valve markers, water meter setters, fire hydrants, blow off assemblies, manholes, sewer clean outs, air release valves, profiles and sewer lift stations as installed by the contractor. A digital copy (CD) of the "Record" drawings must be submitted to HCDPU. Preferably, the digital copy of the "Record" drawings should be produced in AutoCAD (.dwg) or (.dxf) format and one copy in PDF.

The As-Built Record Drawings shall be labeled that the coordinates have been tied to the state coordinate plane using the 1983 North American Datum (NAD) and the As-Built Record Drawings shall be provided to the HCDPU Engineer upon completion of the utility improvement project. The As-Built Record Drawings that include gravity sewer line extensions, sewer lift station(s) and/or sewer

force mains as well as new water mains and service lines shall contain the following detailed information:

1. Lot numbers that will be served by the sewer system will be clearly identified on each page of the As-Built Record Drawings and match the final plat.
2. The distance for each sewer service lateral shall be measured from the down grade manhole along the sewer main to the connecting wye and along each sanitary sewer service lateral to the associated sewer cleanout for each lot. These dimensions should be included on the applicable sheets with each sanitary sewer main in a chart format showing these two dimensions as measured from each associated downstream manhole.
3. The direction for each sanitary sewer service lateral shall be marked as left or right facing up-grade from the nearest down grade manhole.
4. Directional arrows shall be placed on each sewer line (gravity and force main) on the overall layout sheet for each phase or section of the sewer system.
5. The location and size of all newly established utility easements which shall be provided with water or sewer improvements not installed within the established NCDOT right-of-way.
6. All pipe sizes and material shall be noted on the Record Drawings.
7. All manhole inverts must be labeled on the Record Drawings.

C. Developer's Cost Statement and P.E. Certification.

Upon completion of the utility construction, inspections testing and acceptance of the system improvements, the developer shall provide a statement of all costs associated with the construction, inspection, testing and approval of water and sanitary sewer system improvements to the Professional Engineer (P.E.). The P.E. will file a letter of certification to the HCDPU verifying the cost statement for the utility improvements that the developer will convey to the County.

3.5.4 Approval of Utility Improvements

A. Certification of the Approval of Water and/or Sewer Systems

A letter of approval from the NCDENR, DEH-PWSS will satisfy this certification requirement for water improvements. A letter of approval from the NCDENR, DWQ will satisfy this certification requirement for sanitary sewer improvements.

B. One year warranty letter shall be provided to HCDPU from the developer or the developer's utility contractor.

3.5.5 Certification by the HCDPU and the Harnett County Development Review Board

A. Final Plat Approval

The signature, seal and date of the developer's Registered Land Surveyor (R.L.S.) shall be affixed to the final plat submitted to the Harnett County Development Review Board (HCDRB) for review and approval to be recorded with the Harnett County Register of Deeds Office. Once the final plat has been approved then the HCDRB Officer shall sign and date the final plat to be recorded. If all utility improvements have been satisfactorily designed and installed in accordance with the State requirements and the HCDPU Standard Specifications and Details, then HCDPU representative on the HCDRB will vote to approve the final plat. Otherwise, the final plat will be held until all conditions for

approval have been satisfied by the developer, the contractor and the P.E.

B. Transfer of Title.

The Developer shall transfer to HCDPU, title to all water distribution and sewage collection systems installed by Developer's contractor. Such conveyance is to take effect without further action upon the acceptance of HCDPU of said installation. As further evidence of said transfer of title, upon completion of the said installation and prior to the rendering of service by HCDPU, the Developer shall, without cost to HCDPU:

1. Convey at no cost to HCDPU, its successors or assigns by good and sufficient easement deed or dedication in right-of-way in a form satisfactory to HCDPU a perpetual right, easement and privilege to operate, maintain and repair or replace all water and wastewater mains, pipes, connections, pumps and meters within granted easements upon Developer's property in connection with supplying water and wastewater service to the inhabitants, occupants and customers in Developer's property and secure from each mortgagee and lien or a release of mortgages' and lienors' interest in the easement and fixtures thereon for so long as the easement is used for the operation, maintenance, repair replacement of water and wastewater mains, pipes, connections, pumps and meters within the easements.
2. Transfer at no cost to HCDPU all Developer's right, title and interest in and to all of the water and wastewater supply lines, mains, connections pipes, valves, meters and equipment installed up to and within granted easements and right-of-way for the purpose of supplying water service and wastewater collection for the inhabitants, occupants and customers in Developer's property.
3. Furnish HCDPU with an AFFIDAVIT that all persons, firms or corporations who furnished labor or materials used directly or indirectly in the prosecution of the work required to be performed by the Agreement have been paid. Said AFFIDAVIT shall be written in such a form as approved and accepted by HCDPU.
4. Furnish HCDPU with a RELEASE OF LIEN from all contractors and suppliers of materials and/or labor who might have acquired interest into the installations by the supply of materials and/or labor otherwise.
5. Furnish HCDPU with all Manufacturers' warranties which Developer might have received or is due to receive on any part of the installations.
6. Pay to HCDPU any and all applicable charges which shall be due and payable prior to connection to HCDPU water and/or wastewater system.
7. Furnish HCDPU with a satisfactory warranty on guaranteeing all equipment and infrastructure installed pursuant to this Agreement against defect in materials, equipment of construction for a period of not less than one (1) year from date of acceptance of same by HCDPU. Said warranty shall be in such a form as approved and accepted by HCDPU.

C. Recording Notations and Fees

Appropriate notations for transfer and recording by the County Clerk of Court, indicating the date and time of recording, the plat book and location thereof, and instrument number. All applicable recording fees shall be paid by the developer or the developer's Registered Land Surveyor (R.L.S.). All utility easements required by HCDPU to access the new improvements shall be accurately documented in the final plat and conveyed to the District/County as deemed necessary by the HCDPU staff and outlined herein.

3.5.6 County Acceptance of System Improvements

The HCDPU Engineering Representative shall invoice the developer/owner for the tap fees, capacity use fees, meter fees, account set up fees and account deposits as applicable once the State has issued approval of the system improvements. The HCDPU shall approve the new system improvements and thereby release meters to the developer/owner or builder once all applicable fees have been paid by the developer/owner and the State approval letter(s) is/are on file with the HCDPU.

CHAPTER 4

GENERAL CONSTRUCTION REQUIREMENTS

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CHAPTER 4 GENERAL CONSTRUCTION REQUIREMENTS

Section 4.1 General

4.1.1 Phase Development

Subdivisions may be developed by sections or phases in accordance with an approved time table. Each section shall be submitted as separate, independent projects in accordance with the regulations and procedures herein.

4.1.2 Conformance

Improvements shall be installed in accordance with the requirements and standards, set forth in this document and other specifications, and policies adopted from time to time by the HCDPU. The source supply and/or manufacturer of the materials shall be approved by the Engineer of Record and HCDPU before delivery is started. Representative preliminary samples and certifications of independent testing laboratories relevant to the character and quality herein described shall be submitted by the contractor/developer for all materials furnished prior to obtaining any materials from the respective sources of supply if required. Only approved materials conforming to the requirements of approved specifications shall be used in the work. All materials proposed may be inspected, at any time during the progress of their preparation and they shall be stored so as to insure the preservation of their quality and fitness for incorporation into the work.

4.1.3 Commencement

No construction or installation of improvements shall begin in a proposed subdivision until the construction plan has been approved by the appropriate authorities and unless applicable permits have been issued and filed with the HCDPU. Upon receipt of all regulatory approvals, shop drawings approvals, and any required bonds, HCDPU shall notify developer to begin work.

A. Commencing Work

The developer/contractor shall notify the HCDPU in writing, at least 48 hours prior to beginning any work. Failure to comply with this requirement shall affect the acceptance of any work performed prior to notification. If the work does not commence on the date specified in the written notice, then a new notice will be required of sufficient lead time to allow the rescheduling of inspection forces.

B. Prosecution of Work

The work shall be prosecuted from as many different points in such part or parts as may be requested by the developer/contractor. All construction activities shall be carried out during the HCDPU normal working hours and days. Certain construction activities may be authorized such as site clean-up, etc.; however, such activities shall not be initiated without prior approval of the HCDPU. Normal working hours and days for the Department of Public Utilities shall be defined as 8:00 a.m. - 5:00 p.m., Monday - Friday.

4.1.4 Access

All public agencies shall have access to the premises and structures of a development from this document during reasonable hours to make those inspections as deemed necessary by them to ensure compliance with the provisions of this regulation.

4.1.5 Selection of Contractor

Upon approval of the construction plan by the HCDPU and issuance of the appropriate approvals and permits by the various local, state and federal agencies, a contractor should be selected to perform the necessary improvements. In certain instances the HCDPU may, at its discretion, offer to the developer the option of either securing a contractor or utilizing the HCDPU's labor and equipment to install the necessary improvements. In the event the HCDPU

elects to perform such service, the developer will be charged at or below prevailing construction prices inclusive of equipment costs, parts, materials, labor and overhead. In certain instances, involving minor extensions, the HCDPU may reserve the right to install all improvements in accordance with this Policy. 33

4.1.6 Licensed Contractors

All contractors must be licensed by the Contractor's Licensing Board of the State of North Carolina. The HCDPU reserves the right to accept or reject, based upon past performances and experiences, contractors selected to perform work on systems to be conveyed to the HCDPU. The developer shall submit the name and license number of the contractor to perform the work to the HCDPU for approval prior to commencing work.

All federal, state, and local laws, regulations, rules, general statutes and ordinances including but not limited to those established by: Environmental Protection Agency (EPA), Occupational Safety and Health Administration (OSHA), the North Carolina Department of Environment and Natural Resources (NCDENR), The North Carolina Department of Labor (NCDOL) and the North Carolina Department of Transportation (NCDOT) must be followed by each utility contractor and sub-contractor working within the NCDOT right-of-way. All requirements of approved NCDOT encroachment agreements must be strictly adhered to by all personnel on site during the course of utility construction within the NCDOT right-of-way including the strict adherence to all required NCDOT traffic control and erosion control measures. The utility contractor is responsible to assure that all staff, sub-contractors and temporary labor working on the project site meet all work zone safety requirements established by OSHA and/or the NCDOT. All personnel working on the construction site must be certified by a NCDOT approved training program with respect to the NCDOT work zone safety training certification requirements for the Flagger, Crew and Supervisory positions as deemed necessary by the NCDOT. The utility contractor as well as any and all sub-contractors and temporary labor or staff working on a project for the utility contractor must adhere to the latest and most current OSHA requirements and NCDOT standards for work zone safety when working within and near the NCDOT right-of-way.

4.1.7 Projects Offered to Bid

All contract work administered by the HCDPU must be either offered for bid or negotiated among a minimum of three (3) qualified contractors. Harnett County prefers that local utility contractors be provided the opportunity to bid on all projects that Harnett County funds. Performance and payment bonds will be required. Projects administered by the HCDPU are those which, by delegation of the developer, the HCDPU assumes responsibility for securing a contractor and construction management.

4.1.8 Preconstruction Conference

Upon the selection of a contractor a preconstruction conference shall be conducted. The developer shall make arrangements with those public agencies charged with the enforcement of the provisions of this document to conduct the preconstruction conference. Those in attendance must include representatives of the following: contractor, developer, engineer, and HCDPU. This requirement may be waived in writing by the HCDPU depending upon the project complexity.

Others that may wish to attend include NC Department of Environment and Natural Resources (NCDNR), Harnett County Planning Board, and North Carolina Department of Transportation (NCDOT). The purpose of this meeting is to outline construction, inspection, payment (to the HCDPU) and acceptance procedures. Adequate prior notice not less than five (5) working days shall be required.

4.1.9 Fees and Charges

All prevailing applicable County fees and charges must be paid to the County prior to the initiation of construction. The County will accept payment of the associated fees prior to commencement of the project. Payment before all approvals are obtained will not be accepted. The fees and charges in effect on the date of the preconstruction conference shall be the prevailing rates charged. Upon payment to the County and concurrence by the County's staff, construction authorization will be issued. The construction authorization should be submitted to the County Building Department for the issuance of any applicable building structure such as booster pump station permits. The County does not authorize the issuance of a building permit without official construction authorization from the Harnett County Department of Public Utilities.

A 10% forfeiture of fees shall be levied upon the un-built portion of the project should the developer choose not to build all portions as specified under the Water/Sewer Agreement within the time frame specified.

4.1.10 Developer's Guarantee of Work

The developer shall guarantee all facilities installed for a period of one (1) year after completion and the completion and inspection of sections of the facilities does not constitute acceptance of those sections. The guarantee by the developer shall begin on the date of formal dedication and acceptance by the HCDPU

4.1.11 Interpretation of Plans

The approved plans will show the locations, details, and dimensions of the work contemplated, which shall be performed in strict accordance therewith and in accordance with the approved specifications. Any deviations from the plans, specifications, etc., as may be required by exigencies of construction, in all cases will be determined by the HCDPU. Only plans marked "APPROVED FOR CONSTRUCTION" by the regulatory agencies or conformed copies may be used and a copy of same (exhibiting said approved stamp) along with project specifications shall be kept at the job site as long as construction is in progress.

In all cases, the figured dimensions shall govern in the case of a discrepancy between the scales and the figures. The contractor shall take no advantage of any error or omission in the plans, or the discrepancy between the plans and the specifications, and the County's representative shall make small corrections and interpretations as may be deemed necessary for the fulfillment of the intent of the specifications and the plans as construed by him and his decision shall be final.

Contractors shall install all water system improvements and all sanitary sewer improvements per the engineer's design as approved by the HCDPU and permitted by the North Carolina Department of Environment and Natural Resources unless the existing site conditions preclude such installation or significantly impact the project or environment. The contractor shall inform HCDPU Utility Construction Inspector of such impeding conditions or adverse site concerns and request the HCDPU Engineering Representative to review these contractor's concerns with the design engineer. The construction on the project may be halted until the HCDPU staff consults with the design engineer to provide a satisfactory change order to adjust the plans around the adverse site conditions or other concerns of the contractor. If a satisfactory resolution cannot be made by an engineering design change order then the project will be cancelled and completely re-designed by the design engineer. The re-designed plans shall be submitted to HCDPU Engineer for review and approval before resuming any construction activity on site to determine if significant design revisions warrant the need for a new NCDENR permit. HCDPU reserves the right to halt the construction of any project that involves an extension of the County's water distribution system or the County's sanitary sewer collection system at the discretion of the HCDPU Utility Construction Inspector or HCDPU Engineering Representative where site conditions may be considered to be unsafe, unstable, hazardous or life threatening to the HCDPU staff or the general public. Should new permit (s) be required then all construction shall be stopped until the appropriate NCDENR permit(s) have been applied for and received by the HCDPU. Construction shall resume as directed by the HCDPU Utility Construction Inspector or the HCDPU Engineering Representative.

4.1.12 Construction Layout

The developer/contractor shall furnish all line and grade (staking and cut sheets) necessary to construct the project. The work, as completed, shall conform to the APPROVED FOR CONSTRUCTION PLANS stamped by the HCDPU Engineering Representative as "Released For Construction" except where grade and/or alignment are changed to avoid obstructions and such changes have been previously approved by the Professional Engineer and the HCDPU Engineering Representative. Changes shall be made only as directed by the Professional Engineer and the HCDPU Engineering Representative.

4.1.13 General Inspection

Improvements shall be installed in accordance with the established specifications, and other applicable policies of HCDPU. Contractor shall conform to all applicable local, state and federal regulations. No field changes to the plans are allowed without prior written approval from HCDPU. The Developer shall, at his expense, retain the services of the Engineer of Record for the purposes of providing necessary inspections and supervision of the construction work, record drawings and Engineer certifications. The engineer is responsible to insure that construction is, at all times, in compliance with accepted sanitary engineering practices and the approved plans and specifications. A copy of each Engineer's field report is to be submitted to HCDPU as each such inspection is made. Water and sewer infrastructure must pass all tests as required by HCDPU specifications and those of all applicable regulatory agencies. These tests include, but are not limited to, air test, vacuum test, mandrel test, visual test, pressure test, bacteriological test, etc. A HCDPU inspector must be present during testing. All test results must be submitted to HCDPU. All tests must be satisfied prior to Final Inspection.

Following completion of construction of all water and sewer infrastructure delineated in the approved water and sewer plans a Final Inspection must be requested in writing by the Developer or Developer's engineer. The Developer's engineer and HCDPU inspector shall prepare a written punch list of any defects or deficiencies noted during this inspection, should any exist. Upon completion of the punch list, the Developer's engineer will schedule another inspection. In the event the number of inspections performed by HCDPU exceeds two, additional fees may be assessed to the Developer.

HCDPU inspectors shall make periodic checks; during all phases of construction to ensure that the contractor is complying fully with project design and specifications, as well as the policies and procedures herein established. Any deviation or revision to the approved engineering plans shall be accomplished in writing by contract change order. No deviations or revisions will be initiated by the Contractor until the Contractor, the HCDPU Engineering Representative and the Professional Engineer have each approved the change in writing. The Harnett County Department of Public Utilities requires an onsite resident inspector during all critical phases of construction. The onsite resident inspector shall be provided at the developer's expense and shall first be approved by the Harnett County Department of Public Utilities management. The inspector's resume shall be submitted for review and approval prior to the Preconstruction Conference.

4.1.14 Preliminary Inspection

A preliminary inspection may be requested by the contractor for the purpose of preparing a "punch list" of items to be completed prior to final inspection. This inspection does not authorize the developer or contractor to discharge raw wastewater into the sewer system or to distribute potable water by means of the County's water system. It should be noted that it shall be the responsibility of the developer or contractor to pump dry and dispose of all effluent in an acceptable manner prior to requesting a final inspection. Not until finally accepted by the County and dedicated will the County be obligated to accept waste from or distribute potable water to the proposed development.

4.1.15 Final Inspection

Upon completion of the proposed improvements, the developer or contractor shall request a final inspection. Prior to the discharging of any wastewater into the County systems and distribution of potable water, the improvements shall comply with all the criteria specified by the policies herein stated and the associated plans and specifications. In the event that the construction is acceptable, the HCDPU will assume operational responsibility upon the completion of the following: presentation of As-built Record Drawings, the certification of non-litigation, and certification of no outstanding liens, and recording of acceptable easements and deeds to property, Engineers certification that construction is in accordance with plans and specifications, engineer's certification of final cost, letter of official warranty and anniversary inspection date.

- Release of NCDOT bond and/or acceptance.
- Erosion Control.

4.1.16 Warranty Inspection

Upon completion of the construction and upon acceptance by the HCDPU, the one (1) year warranty period will begin. During the eleventh (11th) month following acceptance by the HCDPU of any and all water/sewer utilities so constructed, the HCDPU, in conjunction with the developer's engineer, shall conduct a warranty inspection. It shall be the responsibility of the developer to ensure that the water/sewer utilities are in first class condition and shall remain in said condition, less normal wear, for a period of one (1) year from the date of acceptance. All remedial items noted in the inspection shall be the responsibility of the developer.

4.1.17 Authority of Inspectors, Inspection of Work

Inspectors employed by the HCDPU are authorized to inspect all work done and all materials furnished by the contractor and such inspection may extend to all or part of the work and to the preparation or manufacture of the materials to be used. An inspector shall be assigned to the work to report the progress of the work and the manner in which it is being performed. He shall report to the appropriate County official whenever it appears that the materials and/or work performed by the contractor/developer fail to fulfill the requirements of the specifications and the developer's contract for this extension, and to call to the attention of the Contractor/Developer such failure or other default. Such inspection, or any failure to provide such inspection, however, shall not relieve the contractor/developer from his obligations to perform all work strictly in accordance with the requirements of the "Approved for Construction" plans and specifications nor, shall it release the developer from any of the terms of the contract for the work. The inspector is not authorized to revoke, alter or waive any of the requirements of the developer's contract; to approve or accept any portion of the completed project; nor to give any instructions to the contractor/developer which are contrary to the "Approved for Construction" plans and specifications. He shall have the authority to reject materials and to suspend the work until any questions at issue can be referred to and decided by the County's Utility Manager or Engineering Supervisor. The inspector shall, in no case, act as foreman or perform any other duties for the contractor/developer, nor shall he interfere with the management of the work by either the contractor or the developer, except in the case of the work done in the road rights-of-way where it is apparent that the County may be liable for unsafe or defective action of the contractor. Any advice or instructions which the inspector may give the contractor shall not be construed as binding upon the County in any way, or as releasing the contractor/developer from fulfilling the terms of these specifications or the developer fulfilling all of the terms of his contract for the work.

Where there is disagreement between the contractor/developer or his representative and the inspector, such as; refusal by the contractor/developer to use properly approved materials; performing work not in compliance with the "Approved for Construction" plans and specifications; or refusing to suspend work until problems at issue can be referred to and decided upon by the County's Utility Manager. The inspector will immediately direct the Developer's Engineer to all issues at hand and the Developer's Engineer will prepare and deliver to the contractor/developer, by mail or otherwise, a written order suspending the work and explaining the reason for such shutdown. Subsequent inspections will not be made until such time as the issues at hand are resolved. Any work performed during the inspector's absence will not be accepted and may be required to be removed and disposed of at the contractor's/developer's expense. The contractor/developer shall remove, at his own expense, any work or materials condemned as unsatisfactory by the County's Utility Manager, and shall rebuild/replace same to the standard required by the specifications.

Failure of the contractor to comply with these specifications and determinations of the County and to remove condemned materials or work will jeopardize the acceptability on future work under the jurisdiction of the County. Failure of the developer to insure the required compliance by his contractor or to faithfully comply with all of the terms of his contract with the County for the work will prevent the issuance of service connections until the issues at hand are satisfactorily resolved and will be considered prior to the issuance of future extension contracts. If deemed necessary by the Director of the HCDPU, the Director may instruct his construction forces to physically disconnect the substandard construction from the County's system.

4.1.18 All Work Subject to the Control of the County

In the performance of the work, the developer/contractor shall abide by all orders, directions and requirements of the HCDPU, and at such times and places, by such methods and in such manner and sequences as he may require. The HCDPU shall determine the quality, acceptability, and fitness of all parts of the work, and shall interpret the

specifications and decide all other requests in connection with the work.

- A. Upon request, the HCDPU shall confirm in writing any oral order, direction, requirement or determination.
- B. The enumeration herein or elsewhere in the specifications of particular instances in which the opinion, judgment, discretion, or determination of the HCDPU Manager shall control, or in his approval or inspection, shall not imply that only matters similar to those enumerated shall be so governed and performed, but without exception all work shall be so governed and so performed.

4.1.19 Construction Approval, Conveyance and Dedication Requirements

Approval of the As-Built Plan shall not be given by the HCDPU unless the developer has installed all improvements as herein specified and required or has provided a financial guarantee therefore as specified herein.

The following procedures address the requirements of the Harnett County Department of Public Utilities (HCDPU), the North Carolina Department of Environment & Natural Resources (NCDENR) and the North Carolina Department of Transportation (NCDOT) necessary to convey water/sewer improvements and to place into service the water/sewer utilities constructed.

- A. The Project Engineer will make an inspection of the project to determine what items require attention and to determine that such items are subsequently completed by the contractor prior to notifying the County and NCDENR.
- B. A pre-final inspection will be conducted by the HCDPU at the Project Engineer's request in order to list all items that in the opinion of the HCDPU representative, still need attention.
- C. A final inspection will be coordinated by the Engineer & NCDENR where applicable with the HCDPU and any additional agency that may have interest in the project. A preliminary "As-Built" will be supplied by the Project Engineer at this time to field verify the accuracy of same and to make the necessary changes prior to final submittal.
- D. Only upon receipt of written approval of the system by HCDPU, will water and/or sewer service connections be permitted to the dwelling units. Service is also conditioned upon satisfaction of all HCDPU requirements related to the proper operation of the utilities.
- E. The HCDPU may, at times, issue a conditional temporary approval. This is not to be misinterpreted as final approval, but only an interim measure of limited operational obligation by the HCDPU to aid the developer in completing his construction commitments. The developer still must maintain ownership and is obligated to any excessive operational expenses associated with his project.
- F. The NCDOT will be notified by the Engineer to inspect all work completed by the contractor under the Encroachment Agreement between NCDOT, the Developer and the County. Final acceptance will be withheld until written approval by the North Carolina Department of Transportation (NCDOT) District Engineer is received for the project.
- G. Final approval by the HCDPU will be withheld until all construction is completed within each phase of a project or that portion which is approved by the regulatory agencies document. The construction, as mentioned, is limited to grading, pavement placement, landscaping, and any additional placement of any and all materials that would cause additional hardship to the HCDPU in servicing the utilities. This does not, however, include the construction of any structures or facilities that would utilize the system.
- H. Upon final approval by the HCDPU, the Director will sign the Applicant Certification" document, and then forward the executed copies to the NCDENR for recording. The date of operation,

maintenance, and acceptance of the project by the HCDPU, as well as the one year warranty by the developer, will coincide with the date of the Director's signature on the above document.

- I. The Engineer will supply to the HCDPU the following documents, prior to acceptance, with ample time for inspection and corrections:
 1. All Items Covered under Section 3.5 and associated documents deemed necessary by Harnett County or HCDPU.
 2. Four (4) copies of any deed along with four copies of any plat, if applicable, prepared by the developer's attorney for conveyance of property associated with a pump station site, well site, elevated storage tank site or facility site to be deeded to the County.
 3. One (1) copy of the "Cost Certification" document supplied and certified by the Project Engineer.
- J. After final acceptance and verification of the accuracy of the "As-Built" plans, one (1) record set of mylars, two sets of blue prints or bond copies, and one digital copy [AutoCAD .dwg file] of the As-Built Record Drawings all having the Professional Engineer's certification and seal will be supplied to the HCDPU, along with any original equipment manufacturers' (OEM) maintenance manuals or operational literature as may be required to operate and maintain the utilities being conveyed.

4.1.20 Acceptance of Construction and Connection to the Existing Public System

Preliminary acceptance and permission for lateral connections, as hereinafter outlined, may be granted by the HCDPU when all testing has been successfully completed and all deficiencies corrected. Final acceptance shall not be granted until such time as:

- A. All work is completed and a surface course is placed up to the finished grade (riding surface).
- B. If proposed storm drainage is not in place at the time of the construction, a determination shall be made by the HCDPU Engineering Representative that Ductile Iron Pipe has been placed in those areas to be crossed with storm drainage.
- C. A final inspection has been conducted by authorized representatives of the HCDPU and all deficiencies corrected.
- D. Work within State maintained road right-of-way has been approved by the North Carolina Department of Transportation (NCDOT) District Maintenance Engineer.
- E. As-Built construction plans have been submitted and approved and all right-of-way and easements in which water and sewer lines lie have been properly recorded. 38
- F. North Carolina Department of Environment & Natural Resources (NCDENR) approvals have been issued by the State and copies are on file in the HCDPU office.
- G. All Items outlined in Chapter 3 Section 3.5 have been completed.

4.1.21 Maintenance of Improvements

Completion of construction of any improvements shall not obligate the HCDPU or any public agency to maintain said improvements. The HCDPU will assume responsibility only when construction is accepted by the HCDPU and all dedication instruments duly recorded.

4.1.22 Observance of Laws

The developer/contractor shall at all times observe and comply with all Federal, State, and local laws, ordinances, regulations, and all such decrees as exist at present or as may be enacted during the period of construction, by bodies or tribunals having any jurisdiction or authority over the work, in any manner affecting the conduct of the work or those employed on the work. No plea of misunderstanding will be considered on account of their ignorance thereof.

4.1.23 Permits and Licenses

The developer/contractor shall procure all permits and licenses, shall pay all charges and fees, and shall give all notices necessary and incidental to the due and lawful prosecution of the work.

4.1.24 Indemnification of the County

The contractor/developer will indemnify, hold harmless the County and its agent and including attorney's fees arising out of or remitting from the loss or expense that is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property including the loss of use resulting there from; and is caused in whole or in part any negligent or willful act or omission of the developer, contractor, and subcontractor(s), or anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable.

In any and all claims against the County or any of its agents or employees, by any employee of the developer, contractor, and subcontractor(s), anyone directly or indirectly employed by any of them, or anyone for whose acts any of them may be liable, the indemnification obligation shall not be limited in any way by any limitation on the amount or type of damages, compensation or benefits payable by, or for the developer, contractor, and subcontractor(s) under Workman's Compensation Acts, Disability Benefit Acts or other employee benefit acts.

4.1.25 Public Convenience and Safety

The contractor shall, at all times, conduct the work in such a manner as to ensure the least obstruction to vehicular and pedestrian traffic. The convenience of the general public and of the residents along and adjacent to the work shall be satisfactorily provided for, including provisions for and maintenance of access to passageways and entrances into public and private property. Fire hydrants on or adjacent to street shall be kept accessible to fire apparatus at all times, and no material or equipment shall be placed within fifteen (15) feet of any such hydrant. The contractor/developer shall provide, erect, and maintain all necessary barricades, suitable and sufficient warning lights and danger signals, provide watchmen, and take all precautions necessary for the protection of the work and safety of the public. Any necessary signs shall be mounted on suitable and approved standards and shall be conspicuously placed adjacent to the work where traffic will be alerted.

The contractor/developer shall, at his own risk and expenses shore up and otherwise protect buildings, bridges, fences, walls, property monuments, pipes, and other structures and objects legally existing along the line or adjacent to the work; and in the event of any injury to such public or private property by reason of, or consequent upon any act, omission, neglect or misconduct in the execution of the work provided for herein, the developer/contractor shall, at his own cost and expense, make all such repairs as may be necessary to restore such property to its former condition. Failure on the part of the developer/contractor to make all necessary repairs, or to satisfy any legal demand or liability, shall confer upon the HCDPU the right to disallow the connection of the project to the County's system.

It is clearly understood that it is the responsibility of the developer/contractor to maintain reasonable cleanliness of all streets which are used in the construction of the project. When, in the opinion of the HCDPU representative, any street inside or outside of the project becomes excessively dusty or unclean due to its use by the contractor's equipment, the contractor shall, at his own expense, furnish men and equipment and clean (flush, etc.) said street to a degree acceptable. At the completion of the project, the contractor shall thoroughly clean the above mentioned streets to a degree acceptable to the HCDPU representative. The inspection of these streets will be a part of the inspection.

Section 4.2 Financial Guarantees

4.2.1 General

Financial guarantees covering all improvements required herein shall be a prerequisite to the HCDPU action on the application for the construction plan. Such Guarantees must follow the latest Unified Development Ordinance.

4.2.2 Performance Bond

Contractors performing work on State rights-of-way requiring an encroachment agreement signed by the County, will and the NCDENR permit will be required to post a bond to the HCDPU for the total dollar amount of improvements and possible damage in that rights-of-way prior to initiating construction. Since the County is ultimately held responsible for the actions of the contractor in the road rights-of-way, he will be required to sign an "Encroachment Agreement" which gives the County authority over this portion of construction. In addition, the developer or contractor must post a performance bond with the County guaranteeing the completion of all offsite improvements as determined by the Harnett County Department of Public Utilities or Planning Department staff.

4.2.3 Warranty Bond

Upon completion of construction and upon acceptance by the HCDPU, the developer/contractor shall post a warranty bond guaranteeing that the facilities, appurtenances, and lines are in first class condition and shall remain in said condition, less normal wear, for a period of one (1) year from the date of agreement by the HCDPU to accept said facilities. An extension of the performance bond for the warranty period in lieu of a separate warranty bond is acceptable.

Section 4.3 County/District Installed Water/Sewer Extensions

Where extensions are to be made to existing County owned utility lines which may serve abutting undeveloped properties, the HCDPU will consider providing the necessary equipment and labor to install the extension in accordance with the following conditions and latest Water and Sewer Use Ordinance:

- The extension to be made must be within existing public road right-of-ways.
- The extension to be made is in accordance with the County's overall Master Plan.
- The developer or property owner makes advance payment for all materials required to complete the project, as well as, all contracted work beyond the ability of the HCDPU to perform.
- The HCDPU has the proper equipment and labor available to conduct the work contemplated.
- The extensions to be made will be mutually beneficial to abutting properties and are not deemed by the HCDPU to be necessary for the exclusive future development use or needs of the developer or property owner.
- The developer understands that no portion of the funds given to the County for the extensions can be rebated in the event additional properties utilize this extension.
- The developer understands that the extension will be made by the HCDPU staff as time is available and the County will bear no development expense due to the delays in completion of said extensions.

In no event will the HCDPU provide equipment or labor to construct improvements within subdivisions or developing properties unless the conditions established in Sections 4.1.5, 4.1.6, 4.1.7, and 4.3.1. 40

4.3.1 Prepayment

In lieu of immediate construction by the developer of any or all required utility improvements, the developer may make payment to the County at the discretion of the County of the full amount of said improvements in compliance

with the requirements herein below.

- A. The County shall have the right to refuse prepayment for any and/or all required improvements and require construction and installation thereof by the developer.
- B. Where prepayment is accepted by the County, the construction and installation of all improvements covered thereby shall be performed by the HCDPU. After completion of said improvements, any unexpended amounts shall be refunded by the developer.
- C. In the event more than one property owner is involved in payment for a line extension, it will be the responsibility of the initiating property owner to negotiate payment by the additional property owners. The County will provide an estimate of materials cost. 41

Please see Chapter 12, General and Special Conditions, Special Construction Technical Specifications for additional information and requirements for construction.

CHAPTER 9

WATER SYSTEM STANDARDS AND SPECIFICATIONS

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CHAPTER 9 WATER SYSTEM STANDARDS AND SPECIFICATIONS

Section 9.1 Design of Water System Improvements

All line extensions and improvements to the Harnett County existing water distribution system shall be designed by a Professional Engineer (P.E.). The Engineer's plans and details shall be approved by HCDPU and permitted by the North Carolina Department of Environment and Natural Resources – Division of Water Resources, Public Water Supply Section (NCDENR-DWR, PWSS) before any construction may begin on proposed water system improvements. The Professional Engineer must follow the Plan and General Requirements described in Chapters 2-4. The Contractor shall notify the Engineer if site conditions prevent the construction of the water system improvements as planned by the Engineer, approved by the HCDPU and permitted by the NCDENR-DWR, PWSS. Should site conditions warrant plan revisions then follow the procedures outlined in Chapter 4 under Section 4. 1. 11 above for plan approval of all system improvements. All materials used in the water system improvements shall meet the requirements specified in the specifications unless otherwise approved by the HCDPU Engineering Representative or the HCDPU Director in writing.

Once each project has been approved and permitted by the state, the approved plans will be returned to the HCDPU and then copies will be made for the contractor and the HCDPU Utility Construction Inspector. Copies of the state approved plans will be stamped by the HCDPU Engineering Representative as "Released For Construction," signed and dated to verify all plan changes requested by the state and the HCDPU have been addressed by the design engineer. During the pre-construction conference, the HCDPU Engineering Representative will provide a copy of the state approved plans stamped as "Released For Construction" to the contractor/developer and the HCDPU Utility Construction Inspector. Only the HCDPU approved plans as permitted by the NCDENR-DWR, PWSS stamped by the HCDPU Engineering Representative as "Released For Construction" shall be used for construction of any water system improvements to the existing Harnett County water treatment plant or the water distribution system.

Section 9.2 Materials & Design Requirements

The Professional Engineer (P.E.) shall design the water system improvements using only materials approved under Rules Governing Public Water Systems NCAC Title 15A DENR Subchapter 18C Sections .0100 through .2200 or latest edition, Harnett County Public Utilities Standards and Specifications latest edition, and included herein. Unless otherwise noted, the materials listed below are acceptable to the HCDPU for use in the design of any line extension or system improvement of the County's water distribution system. Should the P.E. desire to use materials not listed in these specifications, written permission must be obtained from both the HCDPU Director and the HCDPU Engineering Representative or designated personnel as approved by the HCDPU Director.

All material shall be free from defects impairing strength and durability and be of the best commercial quality for the purposes specified. It shall have structural properties sufficient to safely sustain or withstand strains and stresses to which it is normally subjected and be true to detail. Connection to existing water mains as indicated under the direct supervision of the HCDPU Utility Construction Inspector or equivalent engineering representative of HCDPU. Provide water main pipe, fittings, accessories, resilient seat or resilient wedge type gate valves, rubber seated butterfly valves, fire hydrants, combination air valves, air/vacuum valves, altitude control valves, check valves, cast iron valve boxes, tapping saddles, service saddles, corporation stops, polyethylene (CTS) plastic tubing, soft "K" copper tubing, meter setters, meter boxes, concrete valve box protective rings (donuts) and concrete valve markers as specified and where indicated per project utility plans approved by the HCDPU and permitted by the

North Carolina Department of Environment and Natural Resources – Division of Water Resources, Public Water Supply Section.

Any engineer designing project(s) to improve the Harnett County water distribution system or to extend new water mains, water service lines or repair of the existing water distribution system shall abide the specifications herein and shall have a copy of these specifications. The specifications shall govern the design of any such system improvements and be submitted to the North Carolina Department of Environment and Natural Resources – Division of Water Resources, Public Water Supply Section (NCDENR-DWR, PWSS) along with the utility plans and an engineer’s report to obtain the appropriate “Authorization to Construct” (water) DWR permit issued by the NCDENR-DWR, PWSS for the proposed project. In addition, the P.E. shall obtain an Erosion and Sedimentation Control permit issued by the North Carolina Department of Environment and Natural Resources – Division of Land Quality (NCDENR-DLQ) for any land disturbing activity that disturbs more than one (1) acre of soil. In addition, the P.E. shall obtain Wetland permit issued by the state of North Carolina and/or United States Army Corps of Engineers (USACE) for any wetland disturbance that may be caused by the project construction. The P.E. shall complete the North Carolina Department of Transportation (NCDOT) encroachment agreement to cover all work proposed within the right-of-way of any state maintained street or road. All of these permits and agreements shall be obtained by the P.E. for the Contractor to post on the project job site for any authority having jurisdiction over the project to see the appropriate permits and agreements have been issued to the county or the developer as required by state law.

Section 9.3 Water Main Design

9.3.1 Pressure

All water mains, including those not designed to provide fire protection, shall be sized after a hydraulic analysis based on the flow demands and pressure requirements. The system shall be designed to maintain a minimum pressure of 20 psi at ground level at all points in the distribution system under all conditions of flow including domestic fire flow of 500 gpm in residential communities and 500 gpm in commercial areas. The normal working pressure in the distribution system should be approximately 60 psi and not less than 35 psi. All pipe to be selected for water system improvements shall be able to withstand system pressures up to 200 psi. Water distribution mains shall be sized to provide a minimum pressure at all points within the distribution system of not less than 20 pounds per square inch (gauge) during periods of peak demand (fire flow), but in any case water mains shall not be less than two-inch standard nominal diameter. Fire hydrants shall not be installed on water mains of less than six inches diameter or on water mains or water systems not designed to carry fire protection flows. All systems shall have the capacity to maintain a pressure of at least 30 pounds per square inch (gauge) throughout the system during periods of peak domestic flow.

9.3.2 Diameter

Pipe sizes acceptable to the HCDPU are based upon nominal diameters of 2 inch, 4 inch, 6 inch, 8 inch, 12 inch, 16 inch, 20 inch, 24 inch, 30 inch and 36 inch. Larger pipe diameters shall be designed by the Professional Engineer (P.E.). Pipe diameters less than 2 inches are not acceptable for water mains. The minimum size of water main for providing fire protection and serving fire hydrants shall be 6 inches diameter. Larger size mains shall be required if necessary to allow for the withdrawal of the required fire flow while maintaining the minimum residual pressure specified herein.

9.3.3 Fire Protection

When fire protection is provided, system design shall be such that fire flows and facilities are in accordance with the requirements of the UDO (Chapter 7 Section 6.4.4) or latest revision, or a minimum of 500 gpm delivery in

residential areas 500 gpm in commercial areas with 20 psi residual pressure. The local Fire Marshal having jurisdictional authority over the project may require greater flow than the minimum flows listed above.

9.3.4 Small Water Mains

Any departure from minimum requirements shall be justified by hydraulic analysis and future water use, and may be considered only in special circumstances. Generally, pipe diameters of less than 4 inches are not acceptable. However, a pipe 2 inches in diameter may be acceptable by the HCDPU on a case by case basis (short extensions, dead ends, cul-de-sacs). All pipe under 4 inches in diameter shall bear the NSF # 61 certification label.

9.3.5 Hydrants

Water mains less than six (6") inches diameter or water mains not designed to carry fire flows shall not have fire hydrants connected to them. Fire hydrants shall satisfy the requirements set forth in Section 7.4.5 below and shall be installed on water mains six (6") inches in diameter or greater. The Harnett County Fire Marshal requires that fire hydrants shall be placed at each intersection including the entrance to each new development. The fire hydrants shall be located on the right side of the street as firefighting apparatus would travel into the development. Fire hydrants should be spaced out evenly along each new street with the spacing in between each fire hydrant not to exceed 1,000 feet.

9.3.6 Dead Ends and Reductions in Size of Water Line Pipe

Dead ends shall be minimized by looping of all mains whenever practical. The construction drawings shall include a two (2") inch blow off assembly at the end of each dead end water line in accordance with Detail W-2 to allow the HCDPU staff to flush the dead-end water line on a regular basis. Since the Harnett County Fire Marshal requires that each and every residential lot be within 500 feet of the nearest fire hydrant, the HCDPU requires the design engineer to measure the 500 feet along the centerline of the street from the rear property line of the last lot on any cul-de-sac or dead-end street to determine the point where the last fire hydrant should be placed on the dead-end street. Then the water line should be reduced down to a smaller water line of at least two (2") inches in diameter to serve the lots at the end of the street not to exceed 12 lots. The water line design shall include an in-line gate valve at each location where the water line diameter is reduced and the gate valve shall be located on the smaller side of the reducer fitting. This will enable the HCDPU staff to determine where the water line has been reduced in diameter.

9.3.7 Flushing

Where dead end streets will be served by water mains, there shall be provided a fire hydrant if flow and pressure are sufficient or with an approved flushing hydrant. No flushing device shall be directly connected to any sewer. Post hydrants or flushing hydrants shall be Mueller 24058 or approved equal. If the water line cannot support a flushing hydrant then the engineer shall design a two (2") inch blow off assembly to be installed at the end of the water main. The blow off assembly shall be located on the opposite corner from the last meter setter on the end of the water main. The blow off assembly shall be located at least one (1 ft.) foot within the NCDOT right-of-way at the property corner. A temporary two (2") inch blow off assembly shall be required at the end of all temporary water line terminations and the design of the blow off assembly shall include a gate valve sized equal to the main water line.

9.3.8 Size of Mains

All water mains designed to be installed within public streets and NCDOT state maintained rights-of-ways shall be sized in accordance with the HCDPU Water Distribution System Master Plan. Generally, all water mains installed within public streets and NCDOT state maintained rights-of-ways shall be at least eight (8") inches in diameter

unless otherwise approved by the HCDPU Engineer. The Professional Engineer (P.E.) designing any project to extend water mains from Harnett County's existing water distribution system shall consult with the HCDPU Engineering Representative to assure the requirements of the HCDPU Water Distribution System Master Plan will be satisfied by the design of the new project. The HCDPU Water Distribution System Master Plan is subject to change at any time to meet the needs of the growing population of Harnett County and the surrounding areas.

9.3.9 Materials and Locations

The Professional Engineer must design the proposed water main extensions with the materials specified herein.

Section 9.4 Materials

9.4.1 Standards

All materials used in the construction of water line extensions to be added to the Harnett County's water distribution system shall comply with the requirements of the Safe Drinking Water Act and meet the requirements established by the American Society for Testing Materials (ASTM), the American Water Works Association (AWWA), the Ductile Iron Pipe Research Association (DIPRA), the American Association of State Highway and Transportation Officials (AASHTO) and the American National Standards Institute (ANSI), American Society of Sanitary Engineering (ASSE) and all other federal, state, county and local requirements. See Section 9.15.3 for Material Submittals and Shop Drawings.

9.4.2 Water Main Materials

A. PVC PIPE – THINWALL POLYVINYL CHLORIDE (PVC) PRESSURE PIPE

As a minimum, PVC 2 inch through 12 inch shall conform to pressure rated Class 200 PSI standard dimension ratio SDR 21 as required by AWWA Standard C-905 unless otherwise specified. All pipe less than four (4") inches in diameter shall bear the NSF # 61 certification label indicating approval for use in public water systems. All PVC pipe shall meet the requirements of ASTM Standard D-2241. Pipe supplied with gasketed joint shall meet the requirements of ASTM Standard D-3139 and the joint gasket shall conform to the requirements of ASTM Standard F-477. All PVC pipe shall meet the requirements of NSF Standard # 14, "Plastic Piping Components and Related Materials," and Standard # 61, "Drinking Water System Components-Health Effects." The PVC pipe shall display the "NSF-PW" listing mark signifying use in potable water applications. Pipe shall be installed and tested in accordance with these specifications and the manufacturers' suggested procedures. The PVC compound material for extruding shall meet ASTM Standard D1784. The rubber coupling rings shall meet ASTM standard D2672 or ASTM D3139.

Pipe shall be furnished in factory packaged units and each pipe shall be plainly marked with the manufacturer's name, size, material (PVC), type, grade or compound pressure rating and reference to appropriate product standards each pipe length shall bear the stamped seals of approval from Underwriters Laboratory (UL) and National Sanitation Foundation (NSF).

Harnett County Department of Public Utilities does not allow the use of glued pipe, joints or fittings to be installed in the Harnett County water distribution system. Pipe specimens shall be subjected to tests by an independent testing laboratory at such time as the HCDPU staff may direct or as specified herein. Pipe not meeting these specifications will be ordered remove from the project site by the HCDPU Utility Construction Inspector and such pipe shall be immediately

removed from the job site and not transported to any portion of the project being constructed or any other project to be extended from or integrally connected to the Harnett County water distribution system.

B. DUCTILE IRON PIPE

Ductile Iron Pipe, except flange pipe, shall conform to the ANSI/AWWA C151/A21.51-02. All Ductile Iron Pipe shall be NSF # 61 certified, Pressure Class 350 for pipe 12" diameter and smaller. All larger pipes shall be Pressure Class 250. Flanged pipe shall conform to ANSI/AWWA C115/A21.15-05. The ends of pipe and fittings shall be suitable for the specified joints. Pipe and fittings shall have cement-mortar lining per ANSI/AWWA C104/A21.4-03 standard thickness and all ductile iron shall conform to the requirements of ASTM A-536, latest revision, Grade 70-50-05.

9.4.3 Joints

A. Mechanical Joints

Packing and jointing materials used in the joints of all pressure pipe shall meet the current standards of the AWWA and the HCDPU. All joints on pressure pipe installed underground shall be mechanical joint ductile iron fittings with grip rings for reinforcement.

B. Slip-On or Push-On Joints

PVC pipe shall require slip on joints with rubber gaskets. Fittings for pipe 4" up to 12" shall be DI Push Joint IPS/PVC, Class 250, ASTM A-536 and F-477 or DI Mechanical Joint with Grip Rings, Class 350, AWWA C110. For pipe smaller than 4", fittings shall be PVC Push Joint 200 psi PR with elastomeric gaskets (synthetic type) must meet ASTM Standard D-1784, D-3139, and F-477.

C. Flanged Joints

The flanged joints shall be used in above ground connections or connection installed inside concrete vaults. Flanged joints cannot be approved for use in direct burial pipe. Flanged joints shall be manufactured by a domestic foundry in accordance with applicable ASME Code Section IX and ASNI B31.1 for pressure piping. The flanged fittings shall meet or exceed the requirements of AWWA C115/ANSI 21.15-05 for Flanged Ductile Iron Pipe with Ductile Iron or Gray Iron Threaded Flanges and AWWA C207-01 for Steel Pipe Flanges for waterworks Service – Size 4 Inches through 144 inches.

D. Locking Joints

The locking joints shall be used in instances where the Engineer deems appropriate for the reinforcement of the joint. The locking joints shall be Griffin Field-Lok or approved equal for use with direct burial pipe. Locking joints must be assembled in compliance with the manufacturer's standards and recommended guidelines.

9.4.4 Tapping Sleeves

All tapping sleeves installed in the Harnett County water distribution system shall be constructed with stainless steel material and meet the requirements established in AWWA Standard C223-02. Stainless steel fabricated tapping

sleeves shall be Romac model SST or approved equal made from stainless steel material that meets or exceeds the requirements of ANSI/AWWA C220. Cast Iron tapping sleeves are not permitted to be used in the Harnett County water distribution system. Tapping flanges for stainless steel fabricated tapping sleeves shall meet or exceed the requirements of ASTM A240, ASTM A743/A743M, or ASTM A744/A744M.

The tapping sleeve shall be installed per the manufacturer's installation instructions provided with the fabricated tapping sleeve. The manufacturer's instructions must be followed regarding support of the valve and the tapping machine during the tapping procedure. The contractor shall hydrostatically test the seal between the gasket of the tapping sleeve on the pipe of the existing water main and the gate valve before the tapping machine may be set up to perform the tap. The contractor may tap into the existing water main only after the hydrostatic pressure test has been completed with satisfactory results. For personal safety reasons, do not use a compressible fluid medium (such as air) to check for water tightness.

The HCDPU Utility Construction Inspector must witness the hydrostatic testing on the tapping sleeve and valve assembly as well as the tapping procedure on the existing water main. The coupon removed from the existing water main when the water line is tapped shall be given to the HCDPU Utility Construction Inspector. The HCDPU Utility Construction Inspector shall return the coupon to the HCDPU Engineering Representative for a visual analysis. Additional non-destructive analysis may be performed by the HCDPU Engineering Representative on the coupon to determine the condition of the existing water main. Coupons removed from AC pipe shall be sealed in a plastic bag to reduce the potential for fraying or dispersal of asbestos material. 135

9.4.5 Gaskets

Gaskets shall be molded or extruded natural or synthetic rubber free of porous areas and visible defects. Reclaimed rubber shall not be used. Unless otherwise specified, gaskets shall be suitable for water service to 150°F (65°C). Gaskets for the body of the tapping sleeve shall meet the requirements of ASTM D2000. Gaskets needed for the body of the tapping sleeve shall have a minimum diameter of 50 and minimum tensile strength of 800 psi. Gaskets for flanges shall conform to ANSI/AWWA C207.

9.4.6 Valves

A. Gate Valves (12 inches and smaller)

Gate valves installed in the Harnett County water distribution system shall be manufactured by Mueller, American Flow Control, M&H, Kennedy, Waterous or approved equal. Gate valves shall be cast iron conforming to AWWA standard C500 and rated for a working pressure of 200 psi for valves up to 12 inches in diameter and 150 psi for valves larger than 12 inches in diameter. Gate valves shall be mechanical joint, resilient seat type valves with non-rising stem, "O" ring seal, open left with 2-inch square operating nut. Gate valves shall be of one manufacturer. It is strongly recommended that instruction manuals supplied by the valve manufacturer be reviewed in detail before installing gate valves. The contractor should inspect the valve and accessories on the jobsite prior to installation.

Gate valves shall be resilient seated or resilient wedge type gate valves suitable for use with buried piping. All gate valves shall conform to AWWA standard C509-01 or latest version and/or AWWA standard C515-01 or latest version and they shall be NSF 61 certified. All valves smaller than 24 inches in diameter shall be configured and installed in a vertical position. Gate valve end connections shall be mechanical joint with grip rings for buried pipe or flanged joint for pipe installed above ground and for pipe installed inside an underground vault or enclosed structure as

indicated by the project drawings. Gate valves with flanged joints shall only specified for installation within an underground vault permitting personnel access and they must be equipped with hand wheels for operation. Gate valves shall have a non-rising valve stem with a 2-inch square operating nut. Gate valves shall open by counter-clockwise rotation of the operating nut. Stuffing boxes shall have "O" ring stem seals, except for those valves for which gearing is specified, in which case use conventional packing in place of the "O" ring stem seal. Stuffing boxes shall be bolted and constructed so as to permit easy removal of the parts for repair. The wedge shall be cast iron, completely encapsulated with resilient material. The resilient sealing material shall be permanently bonded to the cast iron wedge with rubber-tearing bond to meet ASTM standard D-429. The gate valve stem and stem nut shall be copper alloy. The body and bonnet shall be coated both interior and exterior with a fusion bonded heat cured thermo setting material meeting all application and performance requirements of the AWWA standard C550-05.

B. Check Valves

Check valves shall be manufactured by Mueller, American Flow Control, M&H, Kennedy or approved equal in accordance with AWWA standard C508-01 or latest version. Check valves shall be swing type check valves with iron or steel body and cover and flanged ends. Check valves shall have iron disc with bronze disc ring and seat ring. Valve to be lever and weight controlled with lever and weight on left side of valve when viewing valve in the direction of flow. All internal iron surfaces of the valve shall be coated with a minimum of 10 mils of fusion bonded or liquid epoxy, approved for potable water.

C. Butterfly Valves

Butterfly valves installed in the Harnett County water distribution system shall be manufactured by Mueller, Kennedy, Pratt, American Flow Control, Dezurik Water Controls, Keystone or approved equal. Butterfly valves shall conform to AWWA standard C504-06 or latest version for Class 150B service and shall be NSF 61 certified. Valve bodies shall be constructed of cast iron meeting the ASTM standard A-126 Class B and conform to AWWA standard C504-06 for laying lengths and minimum body shell thickness. Butterfly valves end connections shall be mechanical joint or flanged joint as indicated by the project drawings. Butterfly valves with flanged joints shall only specified for installation within an underground vault permitting personnel access and they must be equipped with hand wheels. 136

Valve discs shall also be made of cast iron meeting the ASTM standard A-126 Class B or ASTM standard A-48 Class 40 in sizes 24" and smaller. Disc shall be furnished with 316 stainless steel seating edge to mate with rubber seat on the body. Valve seat shall be Buna-N rubber located on the valve body. Valves 20 inches in diameter and smaller shall have bonded seats that meet test pressures outlined in the ASTM standard D-429 Method B. For valve sizes 24 inches in diameter and larger, the valve seats shall be retained in the valve body by mechanical means without the use of metal retainers or other devices located in the flow stream.

Butterfly valve shafts shall be manufactured of 18-8 type 304 stainless steel conforming to ASTM standard A-276. Shaft seals shall be standard self-adjusting split V packing and shaft seals shall be of a design allowing replacement without removing the shaft. Valve bearings shall be sleeve-type, corrosion resistant and self-lubricating. The valve shaft bearings shall be heavy duty bronze, properly fitted into thee hubs which are integrally cast into the valve body.

Valve actuators shall be fully grease packed and have stops in the open position. The actuator shall have a mechanical stop which will withstand an input torque of 450 ft.-lbs against the stop. The traveling nut shall engage alignment grooves in the housing. The actuator shall have a built in packing leak bypass to eliminate possible packing leakage into the actuator housing. All internal and external surfaces shall be covered with a polyamide cured epoxy coating applied over a sand blasted "new white metal surface" per SSPC-SP10 to a minimum of 6 mils in compliance with AWWA standard C-550-05 or latest version. External painting, hydrostatic testing, travel stop adjustments and crating for shipment shall be completed by the manufacturer in accordance with the AWWA standard C504-06 or latest version. It is strongly recommended that instruction manuals supplied by the valve manufacturer be reviewed in detail before installing butterfly valves. The contractor should inspect the valve and accessories on the jobsite prior to installation.

Valve actuators shall be fully grease packed and have stops in the open position. The actuator shall have a mechanical stop which will withstand an input torque of 450 ft.-lbs against the stop. The traveling nut shall engage alignment grooves in the housing. The actuator shall have a built in packing leak bypass to eliminate possible packing leakage into the actuator housing. All internal and external surfaces shall be covered with a polyamide cured epoxy coating applied over a sand blasted "new white metal surface" per SSPC-SP10 to a minimum of 6 mils in compliance with AWWA standard C-550-05 or latest version. External painting, hydrostatic testing, travel stop adjustments and crating for shipment shall be completed by the manufacturer in accordance with the AWWA standard C504-06 or latest version. It is strongly recommended that instruction manuals supplied by the valve manufacturer be reviewed in detail before installing butterfly valves. The contractor should inspect the valve and accessories on the jobsite prior to installation.

D. Surge Relief and Backpressure Valves

Surge relief and backpressure valves shall be flanged iron globe body; fully bronze mounted; external pilot operated with free floating piston; operated without springs, diaphragm, or levers; single seat with seat bore equal to size of valve. Valves shall be manufactured in accordance with AWWA standard C506. All surfaces of iron castings shall be coated with a minimum of two coats of a serviceable grade of asphaltic base metal paint. The valve design shall be such that repairs and internal dismantling of the main valve may be done without removing the valve from the water main. Valve working and surge pressures will be shown on the drawings or designated in the "Special Conditions." . It is strongly recommended that instruction manuals supplied by the valve manufacturer be reviewed in detail before installing surge relief and backpressure valves. The contractor should inspect the valve and accessories on the jobsite prior to installation.

E. Air Release/Air Relief Combination Valves for Water Lines

The air release/air relief valve shall include a vacuum check unit. The air release valve shall be installed at the highest point(s) on the water main as indicated by the project plans in order to release air in the main as the water main is filling and allow air to enter when the water main is being emptied to prevent pipe collapse when subject to negative pressure or vacuum. The air release valve shall be manufactured to meet or exceed the requirements of ANSI/AWWA C512-04 or latest edition and shall be NSF 61 certified. Valves shall be iron manufactured with screwed inlet connections and rated for a working pressure of 150 psi. The air release valves shall be Crispin Universal Air Valve model U20 with 1/4" orifice, Val-Matic, A.R.I. or approved equal. The valve shall be operated through a compound level system that will seal both the pressure orifice and the air vacuum orifice simultaneously. This lever system shall permit a 1/4" orifice to

release an accumulation of air from the valve body at a capacity of 98 cfm of air at 150 psig. The function lever of the valve shall permit a positive disengagement of the main valve from the large orifice. As the float drops the pressure decreases, the disengagement of the main valve from the large orifice shall be immediate and not limited to an initial draw of vacuum. The air release valve(s) shall be two (2") inches in diameter with national pipe threads (NPT) or ANSI Class 125 flanged inlet connection and shall be a cast iron body, top and inlet flange (where required), stainless steel float and trim with a BUNA-N rubber seat. Valves, which operate the pressure plunger via a single lever and fulcrum, will not be acceptable. A protect top shall be supplied to keep debris from entering the outlet of the valve. Air release valve(s) shall be two (2") inches in diameter include a two (2") inches in diameter, non-rising stem (NRS) solid disc, inside screw bonnet gate valve with a 200 WOG pressure rating and conforming to Federal Specifications MSS SP-80. Each air release valve shall be installed inside a manhole as shown in detail sheet of the project plans if included with the project. Air release valves are not required for most water line extensions.

F. Indicator Posts

Indicator Posts shall be supplied for gate valves and butterfly valves as specified in the project plans. Indicator Posts shall be FM approved and installed to meet the established requirements of the Harnett County Fire Marshal having jurisdiction over the project. Indicator posts shall have a means to lock the valve open or closed.

9.4.7 Fittings and Bends

Pipe manufacturers have a specified amount of deflection that the pipe can bend. If the design of any water line will exceed the manufacturer's tolerance for deflection then the design shall incorporate the use of bends and fittings to accomplish turns, offsets and other adjustments for water line alignment. All fittings and bends shall be installed with mechanical joints and grip rings for pipe sizes up to 12" diameter and be installed with appropriate concrete reaction blocking. All fittings and bends shall be installed with mechanical joints and Megalugs for pipe sizes over 12" diameter and be installed with appropriate concrete reaction blocking. The fittings shall conform to the following applicable AWWA standards:

C104/A21.4-03	Cement- Mortar Lining for Ductile Iron Pipe & Fittings for Water
C110/A21.10-03	Ductile Iron & Gray Iron Fittings for Water
C111/A21.11-00	Rubber Gasketed Joints for Ductile Iron Pressure Pipe &Fittings
C900-97	Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4" through 12"
C901-02	Polyethylene (PE) Pressure Pipe and Tubing, ½" through 3" for Water Service
C903-05	Polyethylene-Aluminum-Polyethylene & Crossed- Linked Polyethylene-Aluminum-Cross-Linked Polyethylene Composite Pressure Pipes, ½" through 2" for Water Service
C905-97	Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 14" through 48", For Water Transmission and Distribution
C906-99	Polyethylene (PE) Pressure Pipe and Fittings, 4" Through 63", For Water Transmission and Distribution
C907-04	Injection-Molded Polyvinyl Chloride (PVC) Pressure Fittings, 4" Through 12", For Water Distribution.

Section 9.5 Main Line Valves

9.5.1 Valve Location

Sufficient valves shall be provided on all new water mains so that inconvenience and sanitary hazards will be minimized during repairs. Valves shall be located at intervals not to exceed 700 feet in any commercial district and not more than 1,000 feet in residential districts. Two valves are required on each tee, one on the main line and one on the lateral line unless the water mains are looped. Three valves are required for all tees where the water mains are looped. Four valves are required for all crosses, two valves on the branches or laterals and two in-line valves. An in-line gate valve shall be included with each hydrant tee except at fire hydrants located at intersections. Each valve shall be provided with a concrete valve marker with brass insert stamped with distance and direction denoted. All valves shall require concrete valve location markers, except within interior subdivisions, where the Professional Engineer (P.E.) shall reference valves on the "As-built" Record Drawings to at least two permanent above ground structures. The concrete valve location markers should be included on the "As-built" Record Drawings.

9.5.2 Location of Bends in Water Mains

Bends and fittings shall be depicted in plans where the water mains shall turn more than the allowable deflection will be exceeded by the design. All bends greater than 22.5° degrees shall be marked in the field by setting two concrete markers at the edge of the right-of-way or easement in line with the bends. The top of the markers shall be stamped with the distance to each bend or fitting and the markers shall be turned backwards so the HCDPU staff will not confuse them for valve markers or blow off markers.

9.5.3 Valve Operation and Protection

All valves (gate valves, butterfly valves, plug valves, etc.) installed in the Harnett County Water Distribution System shall meet AWWA standards and be provided with an adjustable cast iron valve box with an 18" x 18" x 6" concrete collar in accordance with the HCDPU Standard Details. The valves that are installed more than eight (8 ft.) feet below finished grade shall be provided with extensions on the operating nuts to raise them up to be within six (6 ft.) feet of the finished grade.

Section 9.6 Fire Hydrants

9.6.1 Location and Spacing

Hydrants shall be provided at each street intersection and at intermediate points between intersections as recommended by the Harnett County Fire Marshal. Generally, hydrant spacing may range from 500 to 1,000 feet depending on the area being served. Larger spacing increments may be allowed in very rural areas upon approval of the HCDPU. The fire hydrants installed to serve new residential subdivisions shall be installed on the right side of the street in which fire and rescue vehicles travel when entering the subdivision and the water main shall be installed on the same side of the street to avoid having hydrant legs installed under the paved streets. The location of the fire hydrant shall be approved by the Fire Marshal having jurisdiction over the project site.

9.6.2 Valves and Nozzles

Fire hydrants shall have a bottom valve size of at least 5-1/4 inches, one 4 1/2 inch pumper nozzle and two 2 1/2 inch hose nozzles.

9.6.3 Hydrant Leads

The hydrant lead shall be a minimum of six inches in diameter. Auxiliary valves shall be installed in all hydrant leads and bolted firmly to the hydrant tee with threaded rod. The threaded rod shall be coated to prevent corrosion.

9.6.4 Drainage

Hydrant drains shall have a gravel pocket or dry well provided unless the natural soil will provide adequate drainage. Hydrant drains shall not be connected to or located within 10 feet of sanitary sewers or storm drains.

9.6.5 Type

Fire hydrants shall conform to the latest edition of AWWA C502-05 for Dry Barrel Fire Hydrants. Fire hydrants must have main opening valves of 5¼" diameter. All fire hydrants must be installed in accordance with the requirements established by the HCDPU standard details and the Harnett County Fire Marshal. In order to reduce the number of different brands and models that HCDPU must stock parts and repair kits for and for standardization and maintenance reasons, HCDPU only the following fire hydrants are permitted to be installed in Harnett County:

- A. Mueller - Super Centurion 250 A-423 model with a 5¼" main valve opening three way (two hose nozzles and one pumper nozzle);
- B. American Darling - Mark B-84-B model with a 5¼" main valve opening three way (two hose nozzles and one pumper nozzle);
- C. Waterous - Pacer B-67-250 model with a 5¼" main valve opening three way (two hose nozzles and one pumper nozzle).

Fire hydrants shall meet or exceed the AWWA C502, latest edition and have a rated working pressure of at least 250 psig. All fire hydrants shall be dry-barrel type with two – 2 ½" hose nozzles and one – 4 ½" pumper nozzle all having standard NPT threads. All fire hydrants shall carry a 10 year warranty from the date stamped on the fire hydrant. Fire hydrant(s) shall be listed by Underwriters Laboratories, Inc., as meeting their standard UL 246, latest edition and approved by the Factory Mutual Research Corporation (FMRC) and installed to meet the established requirements of the Fire Marshal having jurisdiction over the project.

9.6.6 Fire Hydrant Testing, Painting and Color Coding

Fire hydrants shall be painted solid red before installation by the manufacturer. Once the fire hydrant has been inspected, pressure tested and accepted for service by HCDPU, and then the utility contractor shall paint another coat of red paint on all fire hydrants and then notify the Harnett County Fire Marshal or the Fire Marshal having jurisdiction over the project to request an inspection of each fire hydrant installation. Any deficiencies noted by the Fire Marshal shall be corrected before the fire hydrant will be accepted by the HCDPU and allowed to be placed into operation.

The contractor shall provide the HCDPU with one fire hydrant wrench for each fire hydrant installed in the Harnett County water distribution system up to a maximum of two wrenches per project. The local fire department shall be responsible to conduct any additional pressure testing and/or fire flow testing annually on the fire hydrants following acceptance by the HCDPU. Each fire hydrant shall be provided with chains for each nozzle cap. The fire hydrants shall be installed with a four (4 ft.) feet bury depth with three feet of cover to allow the base of the hydrant to be slightly above finished grade. Should the hydrant tee be installed at depths greater than four (4 ft.) feet then the contractor shall provide all bends, fittings, pipe and joints to raise the fire hydrant to the proper elevation so the base of the fire hydrant shall be no more than twelve (12") inches above the finished grade.

Each fire hydrant may be Color Coded as necessary by the local fire department. The top cap may be repainted by the local fire department which will designate the specific pressure and flow characteristics of each fire hydrant. The National Fire Protection Association (NFPA) standard calls for bonnets and caps to be color-coded to indicate the hydrant's available flow at 20 psi. Standard color codes stipulated by the National Fire Protection Association (NFPA) are as follows:

NFPA 291, Chap. 3

Class C	Less than 500 GPM	Red
Class B	500-999 GPM	Orange
Class A	1000-1499 GPM	Green
Class AA	1500 GPM & above	Light Blue

Section 9.7 Air Relief Valves

9.7.1 Air Relief Valves

At high points in water mains where air can accumulate, provisions shall be made to remove the air by means of hydrants or air relief valves. Automatic air relief valves shall not be used in situations where flooding of the manhole or chamber may occur.

9.7.2 Air Relief Valve Piping

The open end of an air relief pipe from automatic valves shall be extended to at least one foot above finished grade and provided with a stainless steel screened, downward facing elbow. The pipe from a manually operated valve shall be extended to the top of the pit.

9.7.3 Chamber Drainage

Chambers, pits or manholes containing valves, blow offs, meters, or other such appurtenances to a distribution system, shall not be connected directly to any storm drain or sanitary sewer, nor shall blow offs or air relief valves be connected directly to any sewer. Such chambers or pits shall be drained to the surface or the ground where they are not subject to flooding by surface water or to absorption pits underground. If gravity drainage is impractical, a small sump pump with float control shall be included in the design along with the electrical service connection to provide power for the sump pump. Generally, the HCDPU prefers to avoid the use of sump pumps unless absolutely necessary for the proper operation of the system.

Section 9.8 Bore and Jack Method for Water Lines to Cross NCDOT Right-of-Ways

9.8.1 Bore and Jack Method

All water lines that will cross an established NCDOT maintained street shall be permitted by the North Carolina Department of Transportation (NCDOT) District Engineer in a three party NCDOT Encroachment Agreement. Any bore and jack work shall be accurately described in the three party NCDOT Encroachment Agreement between the

developer, the HCDPU and the NCDOT. All water lines that will cross an established NCDOT maintained street shall be designed to be installed by the bore and jack method to avoid open cuts in the existing pavement. Open cuts on established streets and roads are not allowed by the HCDPU unless approved by NCDOT in writing in the three-party NCDOT Encroachment Agreement.

9.8.2 Carrier Pipe

The carrier pipe for any road crossing should be sized equal to or larger than the water line being extended to accommodate future development when practical. The carrier pipe shall be the same material as the water line unless conditions will prevent the installation of the water line using the same material. Generally, the HCDPU prefers that all carrier pipe shall be ductile iron pipe installed inside a steel casing pipe. The use of PVC pipe material should be avoided under the paved street inside the NCDOT right-of-ways. The carrier pipe shall include a valve on each side of the street to afford the HCDPU staff a means to isolate the water line on both sides of the street. The valves may not be required if the water line is greater than 20 inches in diameter.

9.8.3 Casing Pipe

Where indicated on the plans and/or as required by the NCDOT, water lines shall be installed under highways by bore and jack method with the carrier pipe (water line) installed inside a spiral wound steel casing. The contractor shall be required to notify NCDOT's District Engineer and Harnett County Department of Public Utilities at least five (5) days prior to work starting. Casing shall have a minimum cover of three (3) feet of cover and extend a minimum of two (2) feet either side of pavement but preferably from ditch line to ditch line where practical as stipulated in the approved project plans. The utility contractor must verify all grades and alignment prior to set up. Contractor shall install casing in a manner not to create drainage beneath the highway. Casing shall be welded steel to conform to ASTM A-53 Grade "B", ASTM A-139 Grade "B" or better. Although the casing is not considered a pressure vessel, the welding on the casing shall be performed by a qualified welder in accordance with Section IX of the ASME Boiler and Pressure Vessel Code. The minimum inside diameter of the casing as compared to the largest diameter outside diameter of the carrier pipe, joints or couplings shall be as follows:

Casing Pipe	Casing Pipe Diameter Amount
<u>Nominal Size Diameter O.D.</u>	<u>Greater than Carrier Pipe</u>
Less than 6 inches	Not less than 4 inches
6 inches and larger	Not less than 6 inches

<u>Casing Pipe Diameter</u>	<u>Minimum Wall Thickness</u>
6"-14"	1/4"
16"-18"	5/16"
20"-22"	3/8"
24"-26"	7/16"
28"-32"	1/2"
34"-42"	9/16"

Section 9.9 Separations

9.9.1 General

The following factors shall be considered in providing adequate separation:

- A. Materials and type of joints for water and other non-potable water lines,

- B. Soil conditions,
- C. Service and branch connections into the water main and other non-potable water lines,
- D. Compensating variations in the horizontal and vertical separations,
- E. Space for repair and alterations of water and sewer pipes, and
- F. Offsetting of pipes around manholes.

9.9.2 Vertical Separations

The following minimum vertical separations shall be provided for any water line extension of Harnett County’s existing water distribution system:

<u>Utilities or Structures</u>	<u>Vertical Separation Distance</u>
A. Storm sewers and other utilities not listed below;	2 feet
B. Water mains (potable water over potable water)	2 feet
C. Reclaimed water lines (potable water over reclaimed water);	2 feet
D. Final earth grade (finished grade);	3 feet
<ul style="list-style-type: none"> i. Crossing a Water Main Over a Sewer. Whenever it is necessary for a water main to cross over a sewer, the water main shall be laid at such an elevation that the bottom of the water main is at least 24 inches above the top of the sewer, unless local conditions or barriers prevent an 24 inch vertical separation--in which case both the water main and sewer shall be constructed of ferrous materials and with joints that are equivalent to water main standards for a distance of 10 feet on each side of the point of crossing. ii. Crossing a Water Main Under a Sewer. Whenever it is necessary for a water main to cross under a sewer, both the water main and the sewer shall be constructed of ferrous materials and with joints equivalent to water main standards for a distance of 10 feet on each side of the point of crossing. A section of water main pipe shall be centered at the point of crossing. The design shall maintain vertical separations to satisfy state minimum requirements where the ductile iron pipe is used to satisfy the HCDPU requirements above. 	

Ductile iron pipe shall be used for any line extension of County’s existing water distribution system where the above minimum vertical separations cannot be maintained, except for the edge of pavement (EOP). The design shall maintain horizontal separations to satisfy state minimum requirements where the ductile iron pipe is used to satisfy the HCDPU requirements above.

9.9.3 Horizontal Separations

The following minimum horizontal separations shall be provided for any water line extension of Harnett County’s existing water distribution system:

Utilities or Structures	Horizontal Separation Distance
-------------------------	--------------------------------

- | | | |
|----|--|----------|
| A. | Edge of Pavement (EOP); | 3-5 feet |
| B. | Storm sewers, power poles and other utilities not listed below; | 5 feet |
| C. | Sanitary sewers and reclaimed water mains or associated lines; | 10 feet |
| D. | Any non-permanent structures or improvements (fencing, landscape material, etc.) ; | 10 feet |
| E. | Any building foundation, basement or subsurface structure; | 25 feet |
| F. | Any swimming pool | 30 feet |
-
- i. Lateral Separation of Sewers and Water Mains. Water mains shall be laid at least 10 feet laterally from existing or proposed sewers, unless local conditions or barriers prevent a 10-foot lateral separation--in which case:
 - ii. The water main is laid in a separate trench, with the elevation of the bottom of the water main at least 24 inches above the top of the sewer; or
 - iii. The water main is laid in the same trench as the sewer with the water main located at one side on a bench of undisturbed earth, and with the elevation of the bottom of the water main at least 24 inches above the top of the sewer.

Ductile iron pipe shall be used for any line extension of County’s existing water distribution system where the above minimum horizontal separations cannot be maintained, except for the edge of pavement (EOP). The design shall maintain horizontal separations to satisfy state minimum requirements where the ductile iron pipe is used to satisfy the HCDPU requirements above.

9.9.4 Sewer Manholes/Storm Drainage

No water pipe shall pass through or come in contact with any part of a sewer manhole or storm drain.

9.9.5 Exception

The HCDPU and the North Carolina Department of Environment & Natural Resources, Division of Environmental Health – Public Water Supply Section must specifically approve any variance from the separation requirements of Sections 9.10.2, 9.10.3 and 9.10.4 when it is impossible to obtain the specified separation distances.

Section 9.10 Surface Water Crossings

Surface water crossings or under water crossings present special problems. The HCDPU shall be consulted before final plans are prepared. Generally, the HCDPU will design and build the water lines in these areas with specific approval of the Harnett County Board of Commissioners as permitted by the state, unless a developer or land owner desires to fund the project engineering and construction costs. These water crossings will be designed and constructed in accordance with all federal, state and local requirements. An Engineer working on a project design that will include the crossing of a lake, river or stream must consult with the HCDPU Engineer before submitting plans to the HCDPU for review or approval.

9.10.1 Above Water Crossing

The pipe shall be adequately supported and anchored, protected from damage and freezing and accessible for repair or replacement.

9.10.2 Under Water Crossing

A minimum cover of five (5 ft.) feet shall be provided over the pipe. When crossing water courses which are greater than 15 feet in width, the following shall be provided.

- A. The pipe shall be of special construction, having flexible watertight joints;
- B. Valves shall be provided at both ends of water crossings so that the section can be isolated for testing or repair. The valves shall be easily accessible and not subject to flooding; and
- C. A blow off shall be provided on the side opposite the supply of service.

Section 9.11 Easements

In all cases when it is necessary to construct water mains abutting private property, an easement designated specifically for construction, operation and maintenance of water/sewer improvements shall be dedicated exclusively to the Harnett County Department of Public Utilities. In no event shall the easement be allowed to be upon privately held single family lots. Dimensions of the easement shall be in keeping with the herein stated separation requirements. A minimum permanent easement width of 20' shall be provided where it is necessary to install water mains outside of public highway right-of-ways, such as planned unit developments, private road right-of-ways and commercial areas, etc. or a combination of 15' common property easement and 15" building setback for lines installed between adjacent parcels.

Section 9.12 Cross Connections and Interconnections

9.12.1 Cross Connections

There shall be no connection between the distribution system and any pipe, pumps, hydrants, or tanks whereby unsafe water or other contaminating materials may be discharged or drawn into the system. Connections between private individual's wells shall not be allowed. This procedure is not acceptable by the North Carolina Department of Environment & Natural Resources (NCDENR) No fire protection water line, irrigation water system, commercial or industrial water system shall be allowed to connect to the Harnett County water distribution system without the proper backflow protection. At a minimum, these connections shall have a dual check valve assembly (DCVA) or reduced pressure zone (RPZ) assembly installed between their water system and the Harnett County water distribution system to provide adequate backflow protection. Each service connection shall be evaluated by the HCDPU Backflow and Cross Connection Operator in Charge (ORC) for proper compliance to this requirement. Each business owner shall be responsible to satisfy all current and future requirements with respect to the backflow and cross connection regulations as set forth in all federal, state, county, and local regulations. All connections to the Harnett County water distribution system shall be tied into the potable water system without prior approval and in keeping with the County's Water Conservation Resolution, as amended. Whenever there is a question of cross connection the engineer shall provide reduce pressure zone backflow prevention.

9.12.2 Cooling Water

Neither steam condensation nor cooling water from engine jackets, cooling towers, heat exchangers or any other heat transfer devices shall be returned to the sanitary sewer collection system. Potable water supply shall not be connected without proper back flow prevention. 145

9.12.3 Interconnections

The approval of the HCDPU shall be obtained for interconnections between potable water supplies and non-potable water sources (i. e. irrigation systems). in the event the interconnections are allowed by the HCDPU, such connections shall be designed in keeping with the Ten States Standards, the State Primary Drinking Water Regulations and the HCDPU Water Conservation Resolution.

Section 9.13 Water Services and Plumbing

9.13.1 Water Services

The County will be responsible for the initial installation of a water service connection for all single family lots, including a main line tap, water service from the main line to the user's property line (or within the defined public or private road right-of-way), a meter box, a meter, a check valve or backflow prevention device, and a cut off valve. It shall be the property owner's responsibility to maintain and/or install all pertinent lines, connection fittings beyond the check valve/back flow prevention device and/or gate valve to the premises or building units being served.

9.13.2 Service Lines

All 3/4", 1" and 2" water service lines shall be copper tubing size (CTS) Cross-linked PEX SDR 9 or approved equal conforming with ASTM F876 with a NSF marking and PEX1006 coding polyethylene plastic tubing.

When service mains are installed under roadways or sidewalks the must be installed inside a casing. Copper water service lines shall be at „K“ copper. The 3/4" water service lines shall be installed inside a schedule 40 PVC or steel casing of at least two (2") inches in diameter. The and 1" water service lines shall be installed inside a schedule 40 PVC or steel casing of at least three (3") inches in diameter. The 2" water service lines shall be installed inside a schedule 40 PVC or steel casing of at least four (4") inches in diameter. Each casing shall be installed by an open cut for new streets or by the bore and jack method for all existing paved streets. The casing shall be at a minimum of three (3 ft.) feet below surface of street and each ditch line on either side of the street.

9.13.3 Plumbing

Water services and plumbing shall conform to relevant local and/or state plumbing codes, or to the National Plumbing Code. All water service lines beyond the meter shall be inspected by the building code inspector having jurisdiction over the project. The HCDPU will require the plumber to install a valve (gate valve or ball valve) on the customer's side of the meter setter within 12 to 18 inches of the meter box. The HCDPU meter readers will not release a meter to be installed in the meter setter unless the valve has been installed by the plumber.

9.13.4 Booster Pumps

Individual home booster pumps shall not be considered or required for any individual service from the public water supply mains.

9.13.5 Fire Protection

Connections to the HCDPU system for the purpose of individual sprinkler systems in commercial buildings, shall provide a remote double detector check valve (double check) assembly located outside of the structure being served that can be readily accessible by HCDPU staff at all times for inspection. Fire lines entering private property shall be the full responsibility of the owner and must be supplied with a shut-off valve at or before the property line to delineate the responsibility of the HCDPU. Sprinkler systems in commercial and industrial projects must meet all requirements established by the state and local fire codes as well as the standards established by the National Fire Protection Association (NFPA). The Harnett County Fire Marshal shall review plans for all sprinkler systems and be present for a system test before the sprinkler system can be accepted and placed into operation.

Section 9.14 Service Meters

Each service connection shall be individually metered and conform to the latest AWWA standards. All brass meters shall be required. ABB, Kent, Dewey Brothers C700 meters shall be used for service connections between three-fourths (¾") inch and 1" shall be required. ABB, Kent, Dewey Brothers C3000 shall be used for service connections greater than or equal to two (2") inches shall be required. Meter boxes for the services two (2") inches or smaller shall be constructed with ABS plastic. Solid cast iron lids shall be installed for service connections of three-fourths (¾") inch. Solid ABS plastic lids with cast iron reader windows in the center shall be installed for service connections of one (1") inch up to two (2") inches. 146

All metered services greater than two (2") inches shall be installed inside a prefabricated, pre-stressed concrete vault in accordance with Harnett County's standard details. Meters two (2") inches and under shall be installed by the HCDPU. Metered services over two (2") inches shall be installed by the contractor and the contractor shall provide the meter for the project; however, the meter should be purchased through the HCDPU supplier and only released once the project has been approved by the NCDENR – DWQ, PWSS and the HCDPU. Concrete meter vaults shall house the bypass line, the gate valves, the meter, the strainer, flanges, couplings and have positive head for drainage or be equipped with a sump pump and a 120 volt GFCI receptacle for a light and a sump pump. The GFCI receptacle shall be installed in accordance with the NEC requirements. If the power is supplied for the sump pump then the vault shall be equipped with a fluorescent light having a zero (0°) degree ballast. 147

Please see Chapter 12, General and Special Conditions, Special Construction Technical Specifications for additional information and requirements for construction.

Section 9.15 Construction of Approved Final Drawings and Plans

9.15.1 Design Plans and Construction of Water System Improvements

Contractors shall install all water system improvements per the Professional Engineer's design as approved by HCDPU and permitted by the North Carolina Department of Environment and Natural Resources – Division of Water Resources, Public Water Supply Section (NCDENR-DWQ, PWSS) unless the existing site conditions preclude such installation or site conditions significantly impact the project construction. Should site conditions warrant plan revisions then the contractor shall follow the procedures outlined in Section 4. 1. 11 above. All materials used in the construction of any water system improvements to the existing Harnett County water distribution system shall meet the requirements specified in the sections below unless otherwise approved by the HCDPU Engineering staff.

Once each project has been approved and permitted by the state, the approved plans will be returned to the HCDPU and then copies will be made for the contractor and the HCDPU Utility Construction Inspector. Copies of the state approved plans will be stamped by the HCDPU Engineering Representative as "Released For Construction," signed and dated to verify all plan changes requested by the state and the HCDPU have been addressed by the design engineer of record. During the pre-construction conference, the HCDPU Engineer or designated staff shall provide a copy of the NCDENR-DWR, PWSS (state) approved plans, marked as Final drawings by the Professional Engineer (P.E.) and stamped by the HCDPU as "Released For Construction" to the contractor/developer and the HCDPU Utility Construction Inspector. Only the state approved plans stamped by the HCDPU Engineer as "Released For Construction" shall be used for construction of any water system improvements to Harnett County's existing water distribution system.

9.15.2 Materials & Design Requirements

The utility contractor shall furnish all types of pipe and other incidentals required for the construction of a complete water system as shown on the plan drawings and as specified herein. Unless otherwise noted, the materials listed below are acceptable to the HCDPU for use in the construction of any extension of Harnett County's water distribution system. Should the contractor desire to use materials not listed in these specifications, written permission must be obtained from both the Professional Engineer (P.E.) of record and the HCDPU Engineering Representative or designated personnel as approved by the HCDPU Director. The developer's Engineer of Record will review all shop drawings for conformance with HCDPU specifications prior to submittal to HCDPU. The shop drawing submittal to HCDPU shall include a cover letter by the developer's Engineer of Record certifying conformance with HCDPU specifications and summarizing any exceptions or concerns relative to approved drawings and/or HCDPU standards.

9.15.3 Material Submittals and Shop Drawings

All materials to be used in the extension of or connection to the existing Harnett County water distribution system must be approved by the Developers Engineer and HCDPU Engineering Representative prior to purchase and delivery to any project site. Submit three (3) copies of the material specification sheets and all associated shop drawings including a cover letter summarizing all material to be used in the in the proposed project to the Developers Engineer and HCDPU Engineering Representative prior to the Pre-Construction conference to demonstrate compliance with the stipulated requirements as set forth herein these specifications under the "General Conditions." The developer's Engineer of Record will review all shop drawings for conformance with HCDPU specifications prior to submittal to HCDPU. The shop drawing submittal to HCDPU shall include a cover letter by the developer's Engineer of Record certifying conformance with HCDPU specifications and summarizing any exceptions or concerns relative to approved drawings and/or HCDPU standards.

9.15.4 Project Specifications, Encroachments and Permits

Any utility contractor performing work to the Harnett County water distribution system to extend new water mains, water service lines or repair of the existing water distribution system shall abide the specifications herein and shall have a copy of these specifications on the job site along with the appropriate "Authorization to Construct" (water) permit issued by the North Carolina Department of Environment and Natural Resources – Division of Water Resources, Public Water Supply Section (NCDENR-DWR, PWSS) for the proposed project. The contractor shall have a copy of the Erosion and Sedimentation Control permit issued by the North Carolina Department of Environment and Natural Resources – Division of Land Quality (NCDENR-DLQ) for any land disturbing activity that disturbs more than one (1) acre of soil. The contractor shall have a copy of any Wetland permit issued by the state of North Carolina and/or United States Army Corps of Engineers (USACE) for any wetland disturbance that may be caused by the project construction. The contractor shall have a valid copy of the North Carolina Department

of Transportation (NCDOT) encroachment agreement to cover all work proposed within the right-of-way of any state maintained street or road. Connection of new streets or driveways to the existing streets and roads shall be made by only with the approved Driveway Permits issued by the NCDOT. All of these permits, agreements, etc. shall be posted on the project site during the construction for any authority having jurisdiction over the project to see the appropriate permits and agreements have been issued to the county and/or the developer as required by state law. Contractors shall provide the HCDPU Engineer with copies of any permits, encroachment agreements or other documents obtained by the Professional Engineer during the Pre-Construction Conference.

9.15.5 Material Transportation, Storage and Protection

The Contractor shall receive at least one (1) of the three (3) copies stamped as reviewed by the Engineer and HCDPU Utility Construction Inspector prior to ordering any material. All materials shall be transported by the supplier to the contractor at the project site and handled by both parties in a manner to avoid damage. All items damaged in transit shall be returned to the supplier for full credit and similar materials in new condition shall be provided to replace any damaged materials. The contractor shall store and protect all materials that will not be installed immediately. PVC pipe shall be provided protection against sunlight exposure. All materials shall be kept clean and free of contamination. Contaminated materials shall be removed from the project site and replaced with similar material in new condition.

Section 9.16 Site Work

9.16.1 Site Clearing

- A. General: The Contractor shall furnish all labor, materials, tools, equipment, and perform all work and services necessary for or incidental to the performance and completion of all site clearing, tree protection, and demolition as shown on drawings and as specified in accordance with provisions of the contract documents and completely coordinated with that of all other trades.

Work included within the project consists of but is not limited to the following:

- Clearing for Booster Pump Stations as needed.
- Clearing for Elevated Tank as needed.
- Clearing for all water line installation as needed.

Although such work is not specifically shown or specified, all supplementary or miscellaneous items, appurtenances, and devices incidental to or necessary for a sound, secure, and complete installation shall be furnished and installed as part of this work.

- B. Quality Standards: Perform all work in accordance with OSHA requirements and requirements of Environmental Protection Agency in addition to State and Local requirements.
- C. Protection of Work Area: Provide barricades, coverings, or other types of protection necessary to prevent damage to existing improvements indicated to remain in place. Protect improvements on adjoining properties as well as those on Owner's property. Restore any improvements damaged by this work to their original condition, as acceptable to Owner or other parties or authorities having jurisdiction. Protect existing trees and other vegetation indicated to remain against unnecessary cutting, breaking or skinning of roots, skinning and bruising of bark, smothering of trees by stockpiling construction materials or excavated materials within drip line, excess foot or vehicular

traffic, or parking of vehicles within drip line. Provide temporary fences, barricades or guards as required to protect trees and vegetation to be left standing.

- D. Improvements on Adjoining Property: Authority for performing removal and alteration work on property adjoining owner's property will be obtained by Owner prior to award of contract.
- E. Site Clearing: Remove trees, shrubs, grass, weeds, and other vegetation, improvements, or obstructions that interfere with new construction. Also remove such items elsewhere on site or premises as specifically indicated. Removal includes new and old stumps of trees and their roots. Carefully and cleanly cut roots and branches of trees indicated to be left standing where such roots and branches obstruct new construction.
- F. Clearing and Grubbing: Clear project site of trees, shrubs, and other vegetation, except for those indicated to be left standing. Completely remove stumps, roots, and other debris protruding through ground surface. Use only hand methods for grubbing inside drip line of trees indicated to be left standing. Fill depressions caused by clearing and grubbing operations with satisfactory soil material, unless further excavation or earthwork is indicated. Place fill material in horizontal layers not exceeding 6 inches loose depth and thoroughly compact to a density equal to adjacent original ground.
- G. Removal of Improvements: Remove surfacing and pavements, including bases for pavements. Remove wood headers, posts, poles, fences, and other work as specifically indicated. Removal of abandoned underground pipe(s) or conduit(s) which interferes with construction is included under this section.
- H. Disposal of Waste Materials: Burning of combustible cleared and grubbed materials is permitted providing the Contractor obtains such permits and approvals required by state, county, and local authorities. Remove all waste materials and unsuitable and excess topsoil from Owner's property, and legally dispose of it.

9.16.2 Site Excavation and Grading

- A. General: The Contractor shall furnish all labor, materials, tools, equipment, and perform all work and services necessary for or incidental to the furnishing and installation complete of all operations in connection with excavation, construction of fills, borrow, rough grading, finish site grading and disposal of excess material as shown on the drawings and as specified in accordance with provisions of the contract drawings and completely coordinate with that of all other trades.

Work included within the project consists of but is not limited to the following:

- Excavations for Booster Pump Stations.
- Excavations for Elevated Tank Foundation System.
- Excavations for water main installation.

Although such work is not specifically shown or specified, all supplementary or miscellaneous items, appurtenances, and devices incidental to or necessary for a sound, secure, complete, and compatible installation shall be furnished and installed as part of this work.

Unclassified Excavation: Remove and dispose of rock excavation, clay, silt, gravel, hard pan, loose shale, and loose stone as directed by the Engineer. All excavation on this project shall be considered as unclassified.

- B. Site Grading: Plans indicate both existing grade and finished grade required for construction of project. The Contractor shall stake out all units, structures, piping, roads, parking areas and walks and establish their elevations and perform all other layout work required. Replace property corner markers to original location if disturbed or destroyed.

It shall be the Contractor's responsibility to maintain existing utility lines (either overhead or underground), sidewalks, and pavement designated on drawings, shown or mentioned in specifications free of damage. For any item unknown or not properly located inadvertently damaged shall be repaired to original condition. Notify the Engineer and Owner of said utility at once so that emergency repair may be made.

During construction, shape and drain embankment and excavations. Maintain ditches and excavations to provide drainage at all times. Protect graded areas against action of elements prior to acceptance of work. Reestablish elevations and slopes where settlement or washing may have occurred.

- C. Construction of Embankments and Fills: Construct embankments and fills at locations shown on plans to lines of grade indicated on drawings. Completed fill shall correspond to shape of typical cross section or contour shown on plans whichever method is used to show shape, size, and extent of line and grade of completed work.

Provide only fill material which is free from roots, organic matter, trash, frozen material, and stones having a maximum dimension greater than six (6) inches. Insure that stones larger than four (4) inches, maximum dimensions, are not placed in upper six (6) inches of fill or embankment. Do not place materials in layers greater than eight (8) inches of loose thickness. Place layers in horizontally and compact each layer prior to placing additional fill.

Compact by sheep foot rollers, pneumatic rollers, vibrators or other equipment approved by Engineer. Add moisture to or dry by aeration each layer as necessary to meet requirements of compaction. Do not place materials in embankments or fills which exceed optimum moisture content by 5 percent or are 3 percent below optimum moisture content for the material.

Under structures & roadways compact to density not less than 95 percent maximum dry density as measured by AASHTO Method T99.

Under other embankments and fills, compact to not less than 90 percent of maximum dry density as measured by AASHTO Method T99. (ASTM D698)

In place moisture-density tests will be ordered to insure that all work complies with these specifications. Tests will be taken at locations determined by the Engineer. Compaction will be tested by the standard cone method, nuclear density test, or drive shoe method as required or approved by the Engineer. Tests shall be performed through recognized testing laboratory or by the Engineer and all costs to be paid by the Owner. Copies of test results will be furnished to Contractor and Engineer.

Materials not meeting specified moisture-density test requirements shall be re-compacted and re-tested at Contractor's expense.

Provide, at no extra cost, the necessary amount of approved borrow material compacted to a density equal to that obtained in the laboratory by vibration and inundation. Compact to 100 percent maximum density measured by AASHTO T99. Borrow or fill cannot be obtained on site except when specifically permitted by Engineer.

9.16.3 Trenching, Backfilling and Compacting

- A. General: The Contractor shall furnish all labor, materials, tools, equipment, and perform all work and services necessary for or incidental to the furnishing and installation complete of all operations in connection with excavation, trenching, and backfilling of underground utilities as shown on drawings and as specified in accordance with provisions of the contract documents and completely coordinated with that of all other trades. 152

Work included in the project consists of but is not limited to the following utility items:

- Installation of water distribution system.
- Installation of buried appurtenances.

Although such work is not specifically shown or specified, all supplementary or miscellaneous items, appurtenances, and devices incidental to or necessary for a sound, secure, complete, and compatible installation shall be furnished and installed as part of this work.

- B. Protection of Existing Utilities: Verify location and existence of all underground utilities. Omission from or inclusion of located utility items does not constitute non-existence or definite location. Secure and examine local utility records for available location data.

Take necessary precautions to protect existing utilities from damage due to any construction activity. Repair all damages to utility items at sole expense. Assess no cost to Owner, Engineer, or auxiliary party for any damages.

Avoid surcharging ditch banks by placing excavated material a sufficient distance back from edge of excavation to prevent slides or caving. Maintain and trim excavated materials in such a manner to be as little inconvenience as possible to public and adjoining property owners.

Provide full access to public and private premises, to fire hydrants, at street crossings, sidewalks and other points as may be designated by the Engineer to prevent serious interruption of travel.

- C. Unclassified Excavation: Remove and dispose of rock excavation, clay, silt, gravel, hard pan, loose shale, and loose stone as directed by the Engineer. All excavation on this project shall be considered as unclassified.
- D. Trench Excavation: Unless given permission to do otherwise, excavate trenches by open cut method to depth shown on plans and necessary to accommodate the work. Permission may be granted for tunnel work for crossing under crosswalks, driveways or existing utility lines; however, such tunnels are limited to ten (10) feet in length.

Open only the length of trench at one time allowed by the Engineer. Do not open more than 400 lineal feet trench at one time. Failure to comply may necessitate shutdown of entire project until backfilling is performed.

Observe the following trenching criteria:

1. Trench size: Excavate only sufficient width to accommodate free working space. In no case shall trench width at the top of pipe or conduit exceed outside diameter of utility service by following dimensions:

<u>Outside Diameter of Utility Service</u>	<u>Excess Dimension</u>
33 inches and less	18 inches
more than 33 inches	24 inches

Cut trench walls vertically from bottom of trench to one (1) foot above the top of pipe, conduit, or utility service.

2. Dewatering: Keep trenches free of water. Include cost of dewatering in original bid. No additional remuneration for this item is permitted.

3. Sheeting and Bracing: Brace and sheet trenches as soil conditions dictate and in full observation of OSHA requirements. Do not remove sheeting until backfilling has progressed to a stage that no damage to piping, utility service, or conduit will result due to removal. 153

E. Preparation of Foundation For Pipe Laying: Exercise care to avoid excavations below established grade where firm earth conditions exist. If over-excavation occurs, backfill in 6-inch lifts and thoroughly compact with pneumatic tampers. In case of rock excavation, carry excavation a minimum of 12 inches below established grade and backfill to grade with suitable earth or sand. Material used shall be free of rocks, roots, sod or organic matter and shall be firmly compacted. Form bell holes in trench such that only the barrel of pipe is firmly supported by bedding material.

F. Backfilling: Use only backfill material for trenches which are free from boulders, large roots, sod, other vegetative or organic matter, and frozen material. Hand or pneumatic tamp backfill under and around pipe up to 24 inches above top of pipe in lifts not exceeding 8 inches loose thickness. Backfill and compact remainder of trench in 8-inch lifts to density specified.

Perform mechanical tamping evenly on both sides of pipe to top of excavation or to a depth such that pipe will not be injured by subsequent method of compaction used to achieve required density. Exercise extreme care in backfilling operations to avoid displacing pipe joints either horizontally or vertically and avoid breaking the pipe. Water ponding for backfill consolidation is not permitted.

G. Compaction: Compact all trench backfill in areas under roads, parking areas and sidewalks as directed by Engineer to a density of 95 percent of maximum dry density (STANDARD PROCTOR) as determined by AASHTO Method T99 (ASTM D-698). In locations where trench will not be under paved areas or roads but is inside, Department of Transportation rights-of-way, compact trench backfill to a density equal to its density before disturbance or 95 percent maximum dry density (STANDARD PROCTOR), whichever is less. In all locations not covered above,

compact trench backfill to a density equal to its density before disturbance or minimum 90 percent of maximum dry density (STANDARD PROCTOR), as determined by AASHTO Method T99 (ASTM D-698) whichever is less.

- H. Testing: Perform in-place moisture-density tests as ordered by Engineer to insure trench backfill complies with requirements. Tests shall be performed through recognized testing laboratory and all costs to be paid by the Owner. Copies of test results will be furnished to Contractor and Engineer. Where backfill compaction does not pass moisture-density test requirements and after backfill has been removed as directed by Engineer and situation corrected, additional tests will be directed until compaction meets or exceeds requirements. The Contractor shall pay the cost of any additional testing required as a result of his failure to meet minimum compaction requirements.
- I. Pavement Cuts: All pavement cuts shall be made to true line by a method acceptable to the Engineer and the pavement removed just prior to the trenching operation. The Contractor will be allowed to excavate no more trench width than the pipe outside diameter plus 18 inches for pipe up to 33 inches in diameter and 24 inches for pipe over 33 inches in diameter, in all paved areas. The pavement will be trimmed an additional twelve inches (12") beyond the trench edge to give firm bearing for the patching operations.

The Contractor shall backfill all trenches to a point ten inches (10") below the existing pavement and then backfill with crushed stone flush with the existing pavement. It shall be the Contractor's responsibility to maintain all pavement cuts in good order until asphaltic patching is completed. At the time of patching, all broken down, ragged edges shall be trimmed to true line.

It shall be the contractor's responsibility to provide drag boxes, ditch jacks, sheeting, etc., as required to maintain the trench width as specified. The Owner will pay only for the width of pavement removal as specified above.

It is intended that no section of streets or road (3,000 linear feet of line) shall be left in an incomplete condition for a period in excess of thirty days. This completion shall include all phases of work on the lines to be constructed in the area of the section, including trenching, placing pipe, backfilling, setting valves, hydrants, and fittings, installing house services as required preparation for paving repair, repair of paving, grassing and clean-up for delivery of the completed section to the Owners. This requirement shall be adhered to in its entirety unless waived in writing by the Owners through the Engineers. Flushing, testing and disinfection maybe delayed until a sufficient amount of line is ready. Failure to comply with this condition for more than 30 days will result in reduction of payment to the contractor.

9.16.4 Pipe Laying – Pressure Pipe

- A. General: The Contractor shall furnish all labor, materials, tools, equipment, and perform all work and services necessary for or incidental to the furnishing and installation complete of all pressure pipe construction as shown on drawings and as specified in accordance with provisions of the contract documents and completely coordinated with that of all other trades.

Although such work is not specifically shown or specified, all supplementary or miscellaneous items, appurtenances, and devices incidental to or necessary for a sound, secure, and complete installation shall be furnished and installed as part of this work.

- B. Quality Standards: Procedures for handling, laying, protection, and use of pipe shall be in accordance with the pipe manufacturer's recommendations and these specifications.
- C. Submittals: The Contractor is to submit to the Engineer the manufacturer's name and type of material for all materials used on this project. Such materials shall meet with the approval of the Engineer. If the materials submitted do not meet with the approval of the Engineer, the Contractor is to submit other types and makes that may be approved.
- D. Product Delivery, Storage, and Handling: Units shall be delivered, handled, and maintained in a manner to avoid damage to the pipe.
- E. Materials: Refer to the approved plans and the material specifications in Chapter 9 for the materials specified.
- F. Clearing Rights-of-Ways: When piping system to be constructed under this project is outside of the streets rights-of-way, the rights-of-way are to be cleared by the Contractor to a width satisfactory for the installation and the cost of same is to be included in the price bid for the line in place. No extra allowance will be made for rights-of-way clearing.
- G. Installation: The work included under this article consists of but is not limited to furnishing and installing piping systems used for the purposes of carrying fluids under pressure and shall include pressure testing. Disinfection shall be included for potable water lines.
- H. Tapping Sleeves: All tapping sleeves installed in Harnett County's existing water distribution system shall be constructed with stainless steel material and meet the requirements established in AWWA Standard C223-02. Stainless steel fabricated tapping sleeves shall be Romac model SST or approved equal made from stainless steel material that meets or exceeds the requirements of ANSI/AWWA C220. Cast Iron tapping sleeves are not permitted to be used in the Harnett County water distribution system. Tapping flanges for stainless steel fabricated tapping sleeves shall meet or exceed the requirements of ASTM A240, ASTM A743/A743M, or ASTM A744/A744M.

The tapping sleeve shall be installed per the manufacturer's installation instructions provided with the fabricated tapping sleeve. The manufacturer's instructions must be followed regarding support of the valve and the tapping machine during the tapping procedure. The contractor shall hydrostatically test the seal between the gasket of the tapping sleeve on the pipe of the existing water main and the gate valve before the tapping machine may be set up to perform the tap. The contractor may tap into the existing water main only after the hydrostatic pressure test has been completed with satisfactory results. For personal safety reasons, do not use a compressible fluid medium (such as air) to check for water tightness.

The HCDPU Utility Construction Inspector must witness the hydrostatic testing on the tapping sleeve and valve assembly as well as the tapping procedure on the existing water main. The coupon removed from the existing water main when the water line is tapped shall be given to the HCDPU Utility Construction Inspector. The HCDPU Utility Construction Inspector shall return the coupon to the HCDPU Engineer for a visual analysis. Additional non-destructive analysis may be performed by the HCDPU Engineer on the coupon to determine the condition of the existing water main. Coupons removed from AC pipe shall be sealed in a plastic bag to reduce the potential for fraying or dispersal of asbestos material.

- I. Pipe & Fittings: Materials at all times shall be handled in such a manner as to protect them from damage. Pipe and fittings should be handled with mechanical equipment at all times that the work site will permit. At no time shall pipe and fittings be dropped or pushed into ditches. Pipe and fitting interiors shall be protected from foreign matter and shall be inspected for damage and defects prior to installation. In the event foreign matter is present in pipe and fittings, it shall be removed before installation.

All pipe shall be in manufacturer's full nominal lengths and shall have a minimum of (36") thirty-inches of cover. Pipe shall be laid on true lines as directed by the Engineer. Ditches are to be dug of sufficient width to adjust the alignment. Bell holes shall be dug at each joint to permit proper making of the joints. The pipe shall be laid and adjusted so that the alignment with the next succeeding joint will be centered in the joint and the entire pipeline will be in continuous alignment both horizontally and vertically. Pipe joints shall be fitted so that a thoroughly watertight joint will result. All joints will be made in conformance with the manufacturer's recommendations for the type of joint selected. In no case shall two types of pipe be used in this project, except where ductile or cast iron pipe is required. All transition joints between different types of pipe shall be made with transition couplings approved on shop drawings showing the complete assembly to scale.

- J. Existing Utilities: Prior to beginning construction, the Contractor will contact local utility companies and verify the location of utilities. When existing utilities are in conflict with construction, they shall be exposed prior to beginning construction to prevent injury to the utilities.

- K. Trenching Along Roadways and Unpaved Areas:

In paved areas, the Contractor shall compact the backfill as specified to a point 10" below the pavement surface and will then backfill with crushed stone, as shown on the plans.

All pavement cuts will be patched no later than two (2) days after backfilling. The unpaved areas of the rights-of-way shall be grassed as described in a later article of these specifications when disturbed by this work.

For work along highways, no more than 3,000 feet of disturbed shoulder shall be unseeded at any time. Ditches shall be maintained by the Contractor in good condition until the project is accepted by the Owners.

Any unpaved side road, dwelling entrance road, commercial entrance, or any other area presently stabilized by use of rock material shall be protected from erosion during construction and shall be stabilized by use of crusher run stone after backfilling. This stone stabilization shall be approximately four (4) inches thick unless otherwise directed by the Engineer. The Contractor shall submit his price for this stone placed as described under "Stone for Shoulder Stabilization" in the Proposal. Stone used in the repair of paved roads and streets shall be paid for separately and shall be included in the proposal under "Stone for Pavement Repairs."

The Contractor shall schedule his work to cause the least inconvenience to the public and will maintain traffic at all times. If the work shall require the existing water mains to be temporarily closed or shut off, then the contractor shall coordinate the work activity with the HCDPU staff and provide at least 48 hours to all existing water customers that will be affected by the outage. The

contractor will be responsible for properly safeguarding the public against accidents and shall save harmless the County or developer/owner and shall assume responsibility for any suits or actions for damages of other law suits, which may be instituted against the County or developer/owner because of any incident arising from the construction. The contractor shall follow all traffic control measures using NCDOT work Zone methods in accordance with all NCDOT requirements.

Excavated materials shall be placed on one side of the trench; and when backfilling is completed, all excess materials will be hauled off and the work shall be left in an acceptable manner. Excavated materials will never be piled beyond the centerline of the road or street. Attention is called to the fact that under no condition shall the work be accepted until completed and finished in a workmanlike manner. Barriers shall be placed and lights furnished by the Contractor as directed by the Engineers and as covered elsewhere in these specifications.

The contractor shall leave no block of streets (3,000 linear feet of line) in an incomplete condition for a period in excess of thirty days. This completion shall include all phases of work on the lines to be constructed, including trenching, placing pipe, backfilling, setting valves, hydrants and fittings, installing house services as required, testing, preparation for paving repair, repair of paving and clean-up for delivery of the completed section to the Owners. This requirement shall be adhered to in its entirety unless waived in writing by the Owners through the Engineers. The intent shall be to place the section of line into service as soon as possible. It shall be required to begin construction at the connection to the existing water system in order that water for testing, flushing and placing the line into service can be brought along with the construction. Failure to construct the project in this matter (unless otherwise impossible) will result in reduction in the amount of partial pay requests that the contractor may submit on the line section in question.

- L. Pressure Testing: After installation and backfilling of the pressure mains, each section (as required by the Engineers) of the pipeline system shall be subject to a hydrostatic pressure test equal to 200 psig. Before applying the specified test pressure, all piping shall be thoroughly flushed and all air shall be expelled from the pipe. If outlets are not available at high places, the Contractor shall make the necessary taps at points of highest elevations before the test is made. The test pressure shall be maintained in the section tested for a period of three (3) hours. Allowable leakage in the three (3) hour period shall not exceed the allowable leakage using the following formula:

$$L = [S \times D \times (P)^{0.5}] / 148,000$$

Where:

L = testing allowance (makeup water), in gallons per hour

S = length of pipe tested, in feet

D = nominal diameter of the pipe, in inches

P = average test pressure during the hydrostatic test, in pounds per square inch (gauge)

Tests may be made of isolated portions of such piping as will facilitate general progress of the installation. Any revisions made in the piping systems will subsequently necessitate retesting of such affected portions of the piping systems.

When water service is available from the Owner, reasonable amounts of water will be provided the Contractor for line flushing and testing at no cost. The availability of water for this purpose is subject to the Owner's own needs or requirements. Water loss, as the result of line breakage,

blocking movement, blow outs, or other reasons directly attributable to the Contractor's work, shall be paid for by the Contractor at the Owner's prevailing rates.

The hydrostatic test shall be conducted by the Contractor under the direct observation HCDPU Utility Construction Inspector and the Professional Engineer. Any defective material causing excessive leakage shall be repaired or replaced and the test repeated until satisfactory results are achieved by the pipe or pipe section holding the pressure for at least two (2) hours.

M. Disinfection:

After pressure testing, the new water lines are to be disinfected in accordance with AWWA All new, cleaned or repaired water mains shall be disinfected in accordance with AWWA C651 "section 4.4.3" and as specified herein. The water lines are to be flushed thoroughly to remove all dirt and debris which may have collected in the line. After flushing has been completed, the pipelines shall be tapped on top at a point furthest from the point that the lines are to be filled with water. The valve at the end of the line shall then be closed, and the valve between the new water line and the Municipal Water System closed.

Chlorine is then to be applied under pressure by an ejector pump (or equal) to the water entering the new pipeline. Chlorine will be added in sufficient quantities to give an overall chlorine residual to the water of at least fifty (50) parts per million. The pipeline is to be completely isolated from the system by closed valve(s) and the chlorinated water allowed to remain in the line for at least twenty-four hours. At the end of this period, the pipeline is to be thoroughly flushed until no evidence of chlorine exists as determined by the Ortho-Tolidine Test.

These specifications still include detailed procedures for the adequate flushing, disinfection, and microbiological testing of all water mains. In accordance with T15A NCAC 18C .1003 or latest NCDENR PWS version, the waterline shall be disinfected by continuous feed disinfection method.

1. Initial Flushing

All new water lines extended from Harnett County's existing water distribution system shall be thoroughly flushed to remove foreign matter, dirt and debris that may have entered the pipe during the construction process. Preliminary flushing removes light particulates from the main but not from the pipe-joint spaces. The initial flushing of any water line shall be conducted to maintain a flushing velocity of at least 2.5 feet per second. Once the initial flushing procedures have been completed and the pipe is clear of foreign matter, dirt and debris, then the contractor shall sterilize the pipe using the continuous feed method for water lines.

Flushing and cleaning shall be the responsibility of the contractor. The contractor shall pump dry and dispose of all extraneous ground water and other sand gravel and foreign objects within the water main. Such material shall not be flushed into the existing operating sewer mains, pump stations or pertinent facilities. Flushing of water main lines under construction into sewer main lines of the HCDPU is prohibited. Water for flushing and cleaning shall be provided by the HCDPU upon payment of the appropriate fees for a fire hydrant meter in keeping with HCDPU established standards rates and regulations. The water mains shall be flushed at the end of the blow off.

2. Chlorination Methods

Water main chlorination must be completed in accordance with AWWA C651 "section 4.4.3" for the Continuous Feed Method. The continuous-feed method consists of placing calcium hypochlorite granules in the main during construction (optional), completely filling the main to remove air pockets, flushing the completed main to remove particulates, and filling the main with potable water. The potable water shall be chlorinated so that after a 24-hr holding period in the main there will be a free chlorine residual of not less than 10 mg/L.

At the option of the contractor, calcium hypochlorite granules shall be placed in pipe sections to provide a strong chlorine concentration in the first flow of flushing water that flows down the main. In particular, this procedure is recommended when the type of pipe is such that this first flow of water will flow into annular spaces at pipe joints. Before the main is chlorinated, it shall be filled to eliminate air pockets and flushed to remove particulates. The flushing velocity in the main shall not be less than 2.5 ft/sec (0.76 m/sec) unless the purchaser determines that conditions do not permit the required flow to be discharged to waste. Note that flushing is no substitute for preventive measures during construction. Certain contaminants, such as caked deposits, resist flushing at any feasible velocity and pigging of the main may be required.

In accordance with T15A NCAC 18C .1003 or latest NCDENR PWS version, the waterline shall be disinfected by continuous feed disinfection method.

3. Final Flushing

After the applicable retention period, heavily chlorinated water should not remain in prolonged contact with pipe. In order to prevent damage to the pipe lining or to prevent corrosion damage to the pipe itself, the heavily chlorinated water shall be flushed from the main fittings, valves, and branches until chlorine measurements show that the concentration in the water leaving the main is no higher than that generally prevailing in the distribution system or that is acceptable for domestic use. The environment to which the chlorinated water is to be discharged shall be inspected. If there is any possibility that the chlorinated discharge will cause damage to the environment, a neutralizing chemical shall be applied to the water to be wasted to thoroughly neutralize the residual chlorine. Where necessary, federal, state, local, or provincial regulatory agencies should be contacted to determine special provisions for the disposal of heavily chlorinated water. Thorough consideration should be given to the impact of highly chlorinated water flushed into the waste environment. If there is any question that damage may be caused by chlorinated-waste discharge (to fish life, plant life, physical installations, or other downstream water uses of any type), then an adequate amount of reducing agent should be applied to water being disposed of in order to thoroughly neutralize the chlorine residual remaining in the water.

4. Bacteria Testing of Water Samples

The purpose of chlorination is to clean and disinfect water lines, resulting in an absence of coliforms as confirmed by laboratory analysis. All water samples collected for testing must be analyzed in a state certified laboratory and for this reason all water samples will be tested by the HCDPU laboratory.

Water samples for bacteriological analysis shall be collected in sterile bottles treated with sodium thiosulfate and they shall be tested for bacteriological (chemical and physical) quality in accordance with *Standard Methods for the Examination of Water and Wastewater*; and shall show the absence of coliform organisms; and, if required, the presence of a chlorine residual. Turbidity, pH, and a standard heterotrophic plate count (HPC) test may be required at the option of the

county because new material does not typically contain coliforms but does typically contain HPC bacteria.

After flushing the line, the Contractor shall be responsible to furnish sample points at various points along the line under the direct observation HCDPU Utility Construction Inspector and the Professional Engineer. While the Contractor is responsible to furnish sterilized bottles and take water samples for testing the HCDPU Utility Construction Inspector will generally furnish sterilized bottles and take water samples to the HCDPU laboratory for testing and bacteria analysis. The HCDPU laboratory is a state certified laboratory and this service is free of charge at this time, but subject to change if lab fees become necessary to maintain the state certified laboratory.

A minimum of three samples shall be taken in any instance. The Contractor may send additional samples to an approved laboratory for bacteriological analysis at the contractor's expense. If the analysis reveals that no bacteria is present, the line or lines may be approved to be placed into service upon notification of the Engineer, and Final Approval by the North Carolina Department of Environment and Natural Resources – Division of Water Resources, Public Water Supply Section (NCDENR-DWR, PWSS).

At least one set of water samples shall be collected from every 1,200 ft (366 m) of the new water main, plus one set from the end of the line and at least one set from each branch. The sampling pipe must be dedicated and clean and disinfected and flushed prior to sampling. A corporation cock may be installed in the main with a copper-tube gooseneck assembly. After samples have been collected, the gooseneck assembly may be removed and retained for future use. The gooseneck assembly shall be stored in a clean, dry area between uses to avoid potential contamination from the assembly entering the water samples. Water samples shall have no coliforms present and the HPC is less than 500 cfu/mL.

5. Repeat Disinfection Procedures Until All Water Samples Test Negative For Coliform

If test results from the lab indicate a measured HPC greater than 500 colony-forming units (cfu) per mL for any water sample then, flushing and disinfection procedures should be resumed and continued for another 24 hour contact period. Following the second final flushing procedure, another set of water samples shall be collected and analyzed for the presence of coliform and HPC and the disinfection process shall be repeated until a set of water samples have no coliforms present and the HPC is less than 500 cfu/mL. The record of compliance shall be the bacteriological test results certifying that the water sampled from the new water main is free of coliform bacteria contamination and is equal to or better than the bacteriologic water quality in the distribution system. The HCDPU laboratory will forward all test results to the HCDPU Engineer to verify the disinfection process is complete and the results are satisfactory.

- N. Protecting Open Pipelines: All water mains installed under this contract shall be thoroughly blocked against access to the pipe of any water from extraneous sources, any vermin, animals, mud, silt or other deleterious materials by installation of plugs designed for the purpose at every pipe end at all times when the pipe ending is not attended by contractor personnel.
- O. Relation of Water Mains to Sewers: The Contractor shall adhere to the location of the water and sewer lines as shown on the plans (if applicable). If conditions change in the field that require relocation of either water or sewer mains, the Contractor shall insure that the water main is laid at least 10 feet laterally from existing or proposed sewers. If the 10 foot lateral separation is not

possible then the water main shall be laid in a separate trench with the bottom of the water main at least 24 inches above the top of the sewer. If neither the 10 foot lateral or 24 inch vertical separation is possible then the water and sewer lines shall both be constructed of ductile iron pipe (class 50 w/pressure tight joints) for a distance of 10 feet on each side of the point of crossing and the state minimum 18 inch vertical separation shall be maintained.

9.16.5 Boring and Jacking Under Highways

- A. **General:** The Contractor shall furnish all labor, materials, tools, equipment, and perform all work and services necessary for or incidental to the furnishing and installation to complete all boring and jacking under highways as shown on drawings and as specified in accordance with provisions of the contract documents and completely coordinated with that of all other trades. The contractor shall be responsible for the work performed by a subcontractor to meet all NCDOT requirements and satisfy all requirements outlined herein these specifications. The contractor shall be responsible to repair any and all damage to existing street pavement or the right-of-way caused by the boring the jacking procedure. The areas where the contractor shall dig the bore pits shall be restored to the same condition before the bore and jacking operation started leaving the right-of-way in as good or better condition once the work is complete.

Although such work is not specifically shown or specified, all supplementary or miscellaneous items, appurtenances, and devices incidental to or necessary for a sound, secure, and complete and compatible installation shall be furnished and installed as part of this work.

- B. **Quality Standards:** Procedures for boring and jacking shall be in accordance with the best accepted practice of the industry and these specifications.
- C. **Submittals:** The Contractor shall submit to the Engineer the manufacturer's name for all materials to be used in this project, along with such other information the Engineer may request.
- D. **Product Delivery, Storage, and Handling:** Units shall be delivered, stored and handled in such a manner to avoid damage to the material.
- E. **Job Conditions:** Verify all grade and alignment prior to setting up boring rig. Installation assumes responsibility for performance.
- F. **General Requirements:** Lines installed under major highways shall be performed by boring under the highway or tunneling as may be required by the North Carolina Department of Transportation. Where boring under pavement is required by the Department of Transportation, the Contractor will be paid the unit price bid in the Proposal for each linear foot of pipe so placed of the type bid upon in the proposal.

In placing the pipe, any annular space exceeding one-quarter inch in width between casing and tunnel shall be fitted with 1:2 Portland cement mortar grout, pumped into the space to form a tight fit between casing and tunnel walls. Cost of grouting shall be an integral part of the price submitted in the Proposal for the type and size pipe, "Boring Under Highways" required by the installation.

The Engineer may require "Boring and Jacking" under objects or pavement not indicated on the plans but required in the best interest of the Owners, in which case the payment for each linear foot required will be made at the unit price given in the Proposal for "Boring Under Highways".

Where North Carolina Department of Transportation (NCDOT) requires casings to be installed at primary highway crossings, the Contractor shall install the casings in accordance with the following requirements:

The Contractor shall be required to notify the Department of Transportation on the contemplated construction and secure the necessary permit for performing the work.

- G. Installation: All work on boring and/or casing under highways shall be under the supervision of the District Engineer of the Department of Transportation or his authorized representative who shall be notified at least five (5) days before actual work or installation begins. Pipelines shall be installed under highways by boring and jacking where shown on the plans.
- H. Carrier Pipe: Carrier line pipe and joints under primary highways shall be of approved material and construction satisfactory to the District Engineer of the Department of Transportation. Pipelines operating under pressure must be of a material and type capable of withstanding the internal stresses generated in the lines. Joints may be welded, screwed or mechanical type. Pipe must be supported by a minimum of (2) two pipe carrier spacers per length of pipe.
- I. Casing Pipe for Primary Highways: The inside diameter of casing pipe for carrier pipe less than 6 inches in diameter shall be not less than 2 inches greater than the largest outside diameter of the carrier pipe, joints or couplings and not less than 4 inches greater for carrier pipe 6 inches and larger in diameter. It shall, in all cases, be great enough to afford easy removal of the carrier pipe without disturbing the casing pipe or roadbed.

The casing pipe must be capable of withstanding highway loadings and must be so constructed as to prevent leakage of any matter throughout its length, except in cases where the ends are not sealed. Casing shall be installed in a manner to prevent the formation of a waterway under the highway. It must have an even bearing throughout its length, except in cases where the ends are not sealed. Casing shall be installed in a manner to prevent the formation of a waterway under the highway. It must have an even bearing throughout its length and slope to one end.

If installed by the open trench method ductile iron pipe with restrained joints may be used with approval by the NCDOT, the Professional Engineer and the HCDPU Engineer. Sizes 12 inches and under shall be not less than Class 50. Sizes 14 inches through 48 inches shall be not less than Class 51 or as shown on plans or directed by the Engineer.

Standard weight (Schedule 40) wrought steel or wrought iron pipe having wall thickness as listed below may be used as casing pipe in sizes 8 inches and smaller.

WROUGHT STEEL DIAMETER OF PIPE	WROUGHT IRON	
	WALL THICKNESS	WALL THICKNESS
	(Inches)	(Inches)
2-1/2	.203	.208
3	.216	.221
3-1/2	.226	.231

4	.237	.242
5	.258	.263
6	.280	.286
8	.322	.329

Steel pipe in sizes 8 inches and larger manufactured from steel having minimum yield strength of 35,000 psi and having minimum permissible wall thickness as listed below may be used as casing pipe. Adjust the thickness for other grades of pipe, except that the wall thickness shall be not less than .3125 (5/16") inch:

<u>DIAMETER OF PIPE (Inches)</u>	<u>MINIMUM WALL THICKNESS (Inches)</u>
12	.188
16	.250
18	.250
<u>DIAMETER OF PIPE (Inches)</u>	<u>MINIMUM WALL THICKNESS (Inches)</u>
20	.250
24	.250
30	.312
36	.375

- J. Depth of Casing Pipe: The depth from surface of roadway to top of pipe at its closest point shall be not less than 3 feet.
- K. Protection at Ends of Casing Pipe: Where ends of casing are below ground, they shall be suitably sealed to protect against the entrance of foreign material.
- L. Shoring of Ditches: Shoring shall be done in a neat, safe and workmanlike manner so as to prevent any cave-ins or settlement of the roadway and so as not to endanger any personnel working in the ditch. Contractor shall be required to provide shoring of pits, trenches and other excavation in accordance with the latest requirements of the North Carolina Department of Transportation and the Federal Occupational Health and Safety Act.
- M. Length of Casing Pipe: Casing pipe shall be of a length as determined to be necessary by the Department of Transportation District Engineer and the Project Engineer.
- N. Removal of Casing Pipe: In the event that an obstruction is encountered during the dry boring operation, the auger and spiral welded steel pipe encasement are to be withdrawn and the void is to be completely filled with grout at 25 psi pressure before moving to another boring site.
- O. Payments: The Contractor shall be paid the unit price bid in the proposal for the size of casing in place complete under the primary highways, including the furnishing of all labor, tools, equipment, and materials required for the various installations. Water mains through casing will be paid for at the unit price bid in addition to the price paid for casings under the highways.

9.16.6 Horizontal Directional Boring

- A. General:
Directional boring is a method of trenchless construction using a surface launched steerable drilling tool controlled from a mobile drilling frame, and includes a field power unit, mud mixing system and mobile spoils extraction system. The drilling frame is sited and aligned to bore a pilot

borehole that conforms to the planned installation of the main. The drilling frame is set back from an access pit that has been dug (typically at the location of a proposed manhole or other appurtenance) and a high-pressure fluid jet tool head that uses a mixture of bentonite clay and water is launched. Pits are normally dug at the start point and endpoint of the proposed pipe installation and are used to align the tool head, attach other equipment, and to collect and remove excess spoils. Using an electronic guidance system, the tool head is guided through the soil to create a pilot borehole. Upon reaching the endpoint joint, the tool head is removed and a reamer with the product pipe attached is joined to the drill string and pulled back through the borehole. In large diameter installations, pre-reaming of the borehole will usually be done prior to attaching the product pipe for the final pullback. A vacuum spoils extraction system removes any excess spoils generated during the installation. The connections, manholes or other appurtenances are then completed at both the start point and endpoint locations and the surface restored to its original condition. **The Contractor must follow HDPE pipe installation guidelines per AWWA Manual M55 and to provide anchorage to offset the Poisson Effect contraction.**

- B. **Site Conditions for Directional Borings**
Drilling operations must not interfere with, interrupt or endanger surface and activity upon the surface. Contractor must comply with all applicable jurisdictional codes and OSHA requirements. When rock stratum, boulders, underground obstructions, or other soil conditions that impede the progress of drilling operations are encountered, the Contractor and Engineer shall review the situation and jointly determine the feasibility of continuing drilling operations.
- C. **Qualifications for Directional Boring Contractors**
Directional boring Contractors will have actively engaged in the installation of pipe using directional boring techniques for a minimum of three years. Field supervisory personnel employed by the Directional Boring Contractor will have at least three years' experience in the performance of the work and tasks. Submit documentation indicating experience. Information must include, but not be limited to, date and duration of work, location, pipe information (i.e., length, diameter, depth of installation, pipe material, etc.), project owner information, (i.e., name, address, telephone number, contact person), and the contents handled by the pipeline (water, wastewater, etc.). Submit a list of field supervisory personnel and their experience with directional boring operations. At least one of the field supervisors listed must be at the site and be responsible for all work at all times when directional boring operations are in progress. Directional boring operations will not proceed until the resume(s) of the Contractor's field supervisory personnel have been received and reviewed by the Engineer.
- D. **Submittal Drawings for Directional Boring**
The Directional Boring Contractor shall provide working drawings and written procedure describing in detail the proposed method of installation. This will include, but not be limited to, size, capacity and setup requirements of equipment; location of drilling and receiving pits; dewatering if applicable; method of fusion and type of equipment for joining pipe; type of cutting tool head; and method of monitoring and controlling line and depth. If the Contractor determines that modifications to the method and equipment as stated in the submittal are necessary during construction, the contractor will submit a plan describing such modifications, including the reasons for the modification.
- E. **Drilling Fluid:**
Drilling Fluid for Directional Bores will be an inert fluid mixture of water and bentonite clay.

- F. Conformance:
Directional Boring shall conform to ASTM F1962. The Contractor will furnish all labor, components, materials, tools and appurtenances necessary or proper for the performance and completion of the contract. The Engineer shall be notified immediately if any obstruction is encountered that stops the forward progress of drilling operations.
- G. Preparation:
Excavate required pits in accordance with the working drawings. The drilling procedures and equipment shall provide protection of workers, particularly against electrical shock. As a minimum, grounding mats, grounded equipment, hot boots, hot gloves, safety glasses and hard hats shall be used by crewmembers. The drilling equipment shall have an audible alarm system capable of detecting electrical current. Removal of trees, landscaping, pavement or concrete shall be performed as specified.
- H. Equipment:
The drilling equipment must be capable of placing the pipe within the limits indicated on the contract plans. Directional boring equipment shall consist of a surface launched steerable drilling tool controlled from a mobile drilling frame, and include a field power unit, mud mixing system and mobile spoils extraction system. The number of access pits shall be kept to a minimum and the equipment must be capable of boring the following lengths in a single bore.
- I. Safety Equipment:
During drilling operations all equipment shall be effectively grounded and incorporate a system that protects operating personnel from electrical hazards. The system shall be equipped with an audible alarm that can sense if contact is made with an energized electric cable. Proper operation of the alarm system will be confirmed prior to the drilling of each tunnel. All equipment will be connected to ground with a copper conductor capable of handling the maximum anticipated fault current. Crew members operating drilling equipment and handling rods will do so while standing on grounded wire mesh mats, ensuring that all equipment is grounded, and wearing hot boots, hot gloves, safety glasses and hard hats. Crewmembers operating handheld locating equipment will wear hot boots.
- J. Pilot Hole Boring / Adjustments / Restarts
The entry angle of the pilot hole and the boring process will maintain a curvature that does not exceed the allowable bending radii of the product pipe. The Contractor shall follow the pipeline alignment as shown on the Drawings, within the specifications stated. If adjustments are required, the Contractor shall notify the Engineer for approval prior to making the adjustments.
- K. Product Pipe Installation:
After the pilot hole is completed, the Contractor shall install a swivel to the reamer and commence pullback operations. Pre-reaming of the tunnel may be necessary and is at the option of the Contractor.
1. Reaming diameter will not exceed 1.5 times the diameter of the product pipe being installed.
 2. The product pipe being pulled into the tunnel will be protected and supported so that it moves freely and is not damaged by stones and debris on the ground during installation. The drilling fluid should remain in the tunnel to ensure the stability of the tunnel, reduce drag on the pulled pipe, and provide backfill with the annulus of the pipe and tunnel.

Pullback forces will not exceed the allowable pulling forces for the product pipe.

The Contractor shall allow sufficient lengths of product pipe to extend past the termination point to allow connections to the diffuser assembly. Pulled pipe will be allowed 24 hours of stabilization prior to making tie-ins. The length of extra product pipe will be at the Contractor's discretion.

The contractor shall allow at a minimum of 20 linear feet of directional-drilled pipe on each end of the installation. The additional pipe lengths shall be on a parallel plane with the existing grade at the point of connection to the Ductile Iron or PVC main.

L. Cleanup and Disposal of Drilling Fluid:

The Contractor shall maintain the work site in a neat and orderly condition throughout the period of work and after completing the work at each site, remove debris, surplus material and temporary structures erected by the Contractor. The site shall be restored to a condition equal to the existing condition prior to being disturbed. Disposal of excess drilling fluid and spoils will be the responsibility of the Contractor who must comply with all relevant regulations, right-of-way, work space, permits and encroachment agreements. Excess drilling fluid and spoils will be disposed at an approved location. The Contractor is responsible for transporting all excess drilling fluid and spoils to the disposal site and paying any disposal costs. Excess drilling fluid and spoils will be transported in a manner that prevents accidental spillage onto roadways. Excess drilling fluid and spoils will not be discharged into sanitary or storm drain systems, ditches or waterways.

Drilling fluid returns (caused by fracturing of formations) at locations other than the entry and exit points will be minimized. The Contractor will immediately clean up any drilling fluid that surfaces through fracturing. Cleanup of excess drilling fluid shall be accomplished by the means of mobile spoils removal equipment.

Mobile spoils removal equipment capable of quickly removing spoils from entry or exit pits and areas with returns caused by fracturing will be present during drilling operations to fulfill the requirements of paragraph "a" above. The Contractor shall not commence drilling operations without the presence of drilling fluid removal equipment. All excess drilling fluid shall be removed from the site(s) and disposed of properly.

The Contractor will be responsible for making provisions for a clean water supply for the mixing of drilling fluid. Water purchased from the HCDPU water distribution system must be metered through fire hydrant meters and paid for by the Contractor. The Contractor shall contact the HCDPU Administrative Office to obtain a fire hydrant meter and return the same to the HCDPU Administrative Office along with payment for the water used on site.

The contractor shall contain all drilling fluids from the site until such time that the excess fluid may be removed from the site by mobile spoils removal equipment. At no time shall the contractor allow excess drilling fluids to drain into water bodies such as streams, rivers, lakes, wetlands etc.

M. As-Builts

The Contractor shall provide to the Engineer a bore plan (boring log) to provide the as-built condition of the bore. This information shall include the pipe depth at intervals of 50 lf, which shall indicate the horizontal alignment with respect to a horizontal baseline.

9.16.7 Work Along Highways

- A. General: The Contractor shall furnish all labor, materials, tools, equipment, and perform all work and services necessary for or incidental to the furnishing and installation to complete all work along highways construction as shown on drawings and as specified in accordance with provisions of the contract documents and completely coordinated with that of all other trades. 165

Although such work is not specifically shown or specified, all supplementary or miscellaneous items, appurtenances, and devices incidental to or necessary for a sound, secure, and complete installation shall be furnished and installed as part of this work.

- B. Quality Standards: All work within the rights-of-way of the Department of Transportation shall be governed by DOT Standard Specifications.
- C. Job Conditions: The Contractor shall verify all existing conditions prior to beginning work with the rights-of-way of DOT. Any unusual conditions should be brought to the attention of the Engineer.
- D. Work Along Highways: The Contractor shall be responsible for notifying the North Carolina Department of Transportation of the proposed construction, shall secure necessary permits, and shall be responsible for any damage to existing roadways by reason of his work. The Contractor will be required to replace paving cut on account of this work. The Contractor shall also be entirely responsible for backfilling and maintaining the ditches cut along and across highways in accordance with the permits received from the North Carolina Department of Transportation and as is required by these specifications.

It will be absolutely necessary for the Contractor to schedule on-the-site inspection prior to beginning work at highway bridges and/or box culverts by contacting the Head of Bridge Maintenance.

Lines installed under major highways shall be performed by boring under highway or tunneling as may be required by the North Carolina Department of Transportation.

Where lines to be installed by the open-cut method pass under culverts on the Department of Transportation right-of-way, the Contractor shall fill the void from the bottom of the line to the bottom of the culvert with pea gravel (DOT No. 78M). When the Contractor tunnels under culverts, any voids shall be filled with pea gravel (DOT No. 78M) or concrete as directed by the Engineer. The Contractor shall include the cost for placing this item in the appropriate lump sum or unit price item.

The Contractor shall conduct his work in accordance with the requirements of the Department of Transportation; and in particular, he shall be required to control traffic in the vicinity of the work as required by the latest revision of the North Carolina Construction and Maintenance Operations Supplement to the Manual of Uniform Traffic Control Devices (MUTCD) for Streets and Highways. This publication may be obtained from the Traffic Engineering Branch, Division of Highways, Department of Transportation, and Highway Safety. Contractor will be required to obtain and have in his possession one copy of the above-referenced publication and to comply with the requirements therein.

The use of this supplement manual does not preclude the use of the MUTCD, and it is recommended that Part VI of the MUTCD be read before attempting any construction or maintenance signing. Any conflicts found to occur between the Supplement Manual and the MUTCD shall be resolved in favor of the MUTCD.

- E. Unpaved Roadways: Any unpaved road, side road, dwelling entrance road, commercial entrance, road shoulder, or any other area presently stabilized by use of rock material shall be protected from erosion during construction and shall be stabilized by use of #57 (crusher run) stone after backfilling. This stone stabilization shall not be less than approximately four inches (4") thick unless otherwise directed by the Engineer.
- F. Pavement Cuts: In pavement cuts, the Contractor shall compact the backfill as hereinbefore specified and then remove compacted earth to a point ten inches (10") below the pavement surface and will then backfill with crushed stone as shown on the plans.

The Contractor shall maintain in good condition the ditch line in pavement cuts until paving is authorized to be replaced. The Contractor, upon notification from the Engineer, shall replace any and all paving cut on this project by placing a paving of similar nature to that cut to the specifications of the North Carolina Department of Transportation. 166

The Contractor will not be reimbursed for pavement damaged on the opposite side of the roadway from the construction. The Contractor shall repair and replace such damaged pavement at his own expense.

- G. Service Lines: All service lines crossing highways shall be installed by boring under highway unless special permission for open cutting is obtained by the Contractor from the Division Engineer of the Department of Transportation.

9.16.8 Asphalt Paving

- A. General: The Contractor shall furnish all labor, materials, tools, equipment, and perform all work and services necessary for or incidental to the furnishing and installation complete of all asphalt paving construction as shown on drawings and as specified in accordance with provisions of the contract documents and completely coordinated with that of all other trades.

Although such work is not specifically shown or specified, all supplementary or miscellaneous items, appurtenances, and devices incidental to or necessary for a sound, secure, and complete installation shall be furnished and installed as part of this work.

- B. Quality Standards: Contractors shall perform all work in accordance with the North Carolina Department of Transportation Standard Specifications for asphalt paving and these specifications.
- C. Submittals: The Contractor shall submit the names of the suppliers of all materials to be used in this project.
- D. Job Conditions: The Contractor shall verify suitability of sub grade prior to placing the stone base or asphaltic paving. Installation assumes responsibility for performance.

- E. **Materials:** All suppliers and sources of materials shall be approved for use by the Department of Transportation of the State of North Carolina.
- F. **Stone Base Course:** All work on this project will have six-inch minimum compacted thickness, except as is otherwise designated on the plans or as given in written instruction by the Engineer. CABC shall consist of one or more natural materials proportioned and blended on the area to be paved and shall meet the requirements of the N. C. Department of Transportation Standard Specifications for roads and pavements.

The contractor shall utilize the stone placed in the trench after backfilling of the line in so far as possible. Additional stone may be required to bring the minimum stone thickness up to the required depth.

Prior to placing asphalt, the surface shall be thoroughly rolled for its full length and width with a power roller or vibrating tamp to thoroughly compact the stone base. Rolling and and/or tamping shall be continued alternately until the surface is smooth and the entire base is compacted.

Irregularities or depressions developed by rolling shall be corrected by loosening the material and compacting to form a uniform surface. Along curbs, headers and walls and at places not accessible to the roller the base shall be compacted thoroughly with mechanical tampers or with hand tampers. Mechanical tamping shall be done with an approved rapid hitting mechanical tamper capable for delivering 185 pounds per square foot of tamping area per blow. Hand tampers shall weigh not less than 50 pounds with a face area of not more than 100 square inches.

- G. **Asphaltic Concrete:** The Contractor will be required to place a surface course consisting of a mixture of aggregate and liquid asphalt mixed in an approved type batch plant. Asphaltic concrete shall be placed and compacted on a prepared base course to the lines, grades, and compacted thickness called for on the plans or shown in the Bid Form.

The asphaltic wearing surface shall be N. C. Department of Transportation Asphaltic Concrete Mix Type I-2. The mix shall be prepared in a N. C. Department of Transportation approved plant and shall meet N. C. Department of Transportation Specifications Section 645 in every respect.

- H. **Placing:** No asphaltic concrete shall be placed when temperature is less than 40° degrees F in the shade away from artificial heat.

The Contractor shall be equipped to place the mixture with approved spreading and finishing equipment, which shall spread the material to uniform density and strike a smooth finish true to cross-section and free from inequalities. Asphaltic concrete shall be placed in one course unless otherwise instructed by the Engineer.

While still hot, the mixture shall be rolled or tamped in places inaccessible to the rollers to give the required stability and density. Rolling shall be with 8- or 10-ton tandem rollers, weighing not less than 250 pounds per inch of width of roller tread. In rolling, care shall be taken not to damage structures of any type against which the mixture abuts.

Placing of the mixture shall be as nearly continuous as practicable; rollers shall not pass over unprotected end of the mixture except when laying of the course is discontinued for a length of

time that will allow the mixture to become chilled, in which case the joint shall be cut back to expose an unsealed or granular surface for the full depth and width of the joint so a bond will be formed with the fresh mixture. When laying is resumed, the exposed edge of the joint shall be painted with a thin coat of hot asphalt cement or asphalt thinned with naphtha and the fresh mixture raked against the joint thoroughly tamped with hot tamps and rolled. At the beginning of each day's work, joints shall be formed as above described and at all other times when laying of the course is interrupted for a sufficient time to allow the material to chill. Longitudinal joints shall be formed in a similar manner as that described above when longitudinal joints are required.

Newly compacted surface shall be protected from traffic until it has become properly hardened by cooling.

9.16.9 Erosion Control and Grassing

- A. General: The Contractor shall furnish all labor, materials, tools, equipment, and perform all work and services necessary for or incidental to the furnishing and installation, complete, of all Erosion Control and Grassing construction as shown on drawings and as specified, in accordance with provisions of the contract documents and completely coordinated with that of all other trades.. 170

Although such work is not specifically shown or specified, all supplementary or miscellaneous items, appurtenances, and devices incidental to or necessary for a sound, secure, and complete installation shall be furnished and installed as part of this work.

- B. Quality Standards: The Contractor shall utilize the best materials available and shall complete all work in accordance with Department of Transportation, Sedimentation and Pollution Control Act and these specifications.
- C. Submittals: The Contractor shall submit data on the suppliers of all materials to be used in this project, germination results, seed content, etc.
- D. Product Delivery, Storage, and Handling: Units shall be delivered and stored in a manner to provide full protection to all materials until ready to use.
- E. Job Conditions: Verify suitability and condition of all areas to receive grassing.
- F. Erosion Control - General: Contractor to take all precautions to avoid excessive siltation of nearby watercourses during the construction of this project. The erosion control used shall comply with the rules and regulations set forth in the latest edition of the North Carolina Administrative Code, Title 15, Chapter 4 "Sedimentation Control". Contractor to refer to notes on plans regarding erosion control. Temporary measures will be required as shown and described on the plans. Temporary measures shall remain in place until further possibility of stream siltation has passed at which time all temporary measures will be removed by the Contractor. Permanent measures will be required as shown and described on the plans. The Contractor shall be responsible for maintenance of the permanent measures until the completion of the project.
- G. Methods and Measures: The following list of methods and measures for sediment controls should be considered and implemented by the Contractor:
1. Plan buffer zone erosion control measures in advance.

2. Install preliminary controls in advance of clearing and grubbing.
3. Prohibit pumping of ditches directly into any stream or lake. Provide settling basins.
4. Require excavated materials to be piled uphill from ditch - NOT on stream side of ditch.
5. Protect backfill material against accelerated erosion.
6. Tamp, seed and mulch within 30 days after disruption or final installation of materials.
7. Maintain buffer zone protection until area is stabilized.

H. Grassing - General: All unpaved areas disturbed by cause of construction under this project shall be seeded, fertilized and mulched under this contract. Preparation of seedbed and application of fertilizer, seed and mulch shall be performed in accordance with N. C. Board of Transportation Standard Specifications and the N.C Department of Environment and Natural Resources. Type of seed, fertilizer, lime and mulch shall be as called for on the plans for the season at the time of construction.

The above requirements shall be strictly adhered to as required by the Owners through the Engineers. The Contractor shall include his charge for all required grassing in the unit price proposed for erosion control. There will be no separate payment for grassing.

Please see Chapter 12, General and Special Conditions, Special Construction Technical Specifications for additional information and requirements for construction.

