

## 2. CONSTRUCTION SPECIFICATIONS

### 2.1 General Requirements

#### 2.1.1. General

- A. Construction on any utility project will not be allowed to begin until all criteria of the design review and approval process have been satisfied and a Utility Construction Permit has been issued by the Department of Public Utilities.
- B. A pre-construction meeting will be required unless waived by the inspector. Prior to beginning any work, at least 48 hours advance notice must be given to the Department of Public Utilities' Inspection Section to schedule a preconstruction meeting.
- C. Cut sheets are required on all gravity and force main wastewater projects, on water main projects where the subgrade has not been reached or in areas where final grades for future roads and paved areas cannot be determined, and on projects where utility lines are installed in easements. Three copies of construction "cut-sheets" shall be submitted to the Department of Public Utilities Inspection Section prior to the beginning of construction. "Cut-sheets" shall show, at a minimum, offset hub elevations and amount of cut. Cut sheets are to be prepared by a licensed engineer or surveyor. Cut sheets shall consist of the following information:
  - 1. Temporary bench marks at each manhole on sanitary sewer projects and at no more than 500 feet on any other project.
  - 2. Each downgrade manhole shall show the plan station and shall begin with station 0+00 to readily identify the station of each service connection.
  - 3. Centerline elevations every 50 feet and at every valve box and manhole location for water main projects where cut sheets are required and for force main projects.

The Department of Public Utilities may waive the requirement for cut sheets if it believes they are not required to properly construct a project.

- D. The Contractor is reminded that prior to the installation of water mains, unless waived by the Inspector, a licensed engineer or surveyor must certify in writing that:
  - 1. All pavement and shoulder areas within the right-of-way are graded to within 6" of subgrade.
  - 2. All ditches and slopes to 1 foot outside the right-of-way have been graded to final grade.

- E. The Contractor shall be required comply with erosion and sediment control requirements of the Department of Public Works before beginning clearing or construction and the requirements of the projects land disturbance permit, if one is required.
- F. The Contractor is reminded of the requirements of permits issued by Hanover County, the Virginia Department of Transportation and other agencies and the obligation that the requirements of these permits be strictly adhered to.
- G. It shall be the responsibility of the Developer or his agent to acquire all off-site easements necessary for water or sewer installation. Easements shall be obtained, recorded, and the deed book and page noted on the plans prior to the plans being approved. Deeds for easements shall be in a form acceptable to the County. The Developer shall adhere to any special agreements negotiated with the landowner regarding restoration of the easement in addition to the usual and customary requirements of the Department of Public Utilities and Department of Public Works.
- H. These specifications are to be used in conjunction with the County's Standard Details, County's approved materials list, County's materials specifications, and the approved plans. If there is a discrepancy between these documents, the Department of Public Utilities shall make the final determination as to which standard is to be enforced.
- I. Connections to the County's water or sewer system shall only be made by a state licensed Class A utility contractor that has been authorized to make such connections by the Department of Public Utilities.

### **2.1.1.2 Laws And Regulations**

The Contractor shall keep fully informed of all State and Federal rules, laws and local ordinances, and regulations which may in any manner affect those employed or engaged in the work, or in any way affecting the conduct of the work and comply with the requirements of all such rules, laws and local ordinances, and regulations.

### **2.1.1.3 Permits**

The Contractor must obtain all required licenses and permits and pay all charges and expenses connected with the work, and be responsible for all damages to persons or property which may occur in connection with the Contractor's work.

Misunderstanding or ignorance on the part of the Contractor will not be considered as a valid excuse for his failure to secure the necessary permits.

### **2.1.1.4 Materials And Workmanship**

It is the intent of the County's specifications to describe in general and broad terms the character of materials and workmanship required with regard to all ordinary features, and to require first-class work and materials in all particulars. For any unexpected features arising during the

progress of the work and not fully covered in the specifications, the County shall require first-class work to be performed and first class materials to be used by the Contractor.

The County reserves the right to employ an independent testing laboratory to conduct tests, in addition to those to be completed by the Developer and/or Contractor, of materials, soils, workmanship, facilities, etc. as the County may deem necessary to assure complete compliance with the requirements of the County's specifications. The Developer and Contractor shall offer full cooperation with personnel in the employ of the County in making these tests. If any such test completed by the County shows that substandard work has been performed or materials provided, the Developer shall be charged the County's cost for completing these tests. The Department of Public Utilities will not issue "Tentative Acceptance" for any part of the water or sewer system serving the project until all such charges have been paid.

#### **2.1.1.5 No Deviation From Plans, Specifications, Etc. By The Contractor**

The Contractor shall not deviate from the plans, profiles, cross-sections and specifications without the approval of the County. If deviation occurs on the part of the Contractor, he shall correct the error at his expense in a manner satisfactory to the County.

#### **2.1.1.6 Other Plans And Working Drawings (Shop Drawings)**

The Department of Public Utilities may require, at its sole discretion, that shop drawings be submitted for materials and equipment to be provided for any project. Shop drawings will not normally be required for regular water and sewer line work construction projects but will normally be required for water or sewer pump stations, water storage tanks, control valves, special structures, and other special projects.

When required, the Contractor shall submit to the engineer and/or the Inspector, for their approval, such additional detailed shop or working drawings as may be required for the construction of any part of the work. Pending the approval of such drawings, any work done or materials ordered shall be at the risk of the Contractor.

Working drawings shall consist of such detailed drawings as may reasonably be required for successful prosecution of the work, and which are not included in the plans furnished by the engineer. These may include drawings for anchor bolts, centering and form work, masonry, layout diagrams, etc.

It is expressly understood that the approval of working drawings relates to the general concept and not the detail and such approval will not relieve the Contractor from any responsibility for errors or omissions in dimensions or quantities.

It is understood that Shop Drawings or Working Drawings processed by the engineer are not Change Orders; that the purpose of Shop or Working Drawing submittals by the Contractor is to demonstrate that the Contractor understands the design concept, to demonstrate his understanding by indicating which equipment and material he intends to furnish and install, and by detailing the fabrication and installation methods he intends to use.

If deviation, discrepancies, or conflicts between Shop Drawing submittals and the plans and specifications are discovered either prior to or after Shop Drawings submittals are processed, the

approved construction plans and the County's specifications shall control and shall be followed unless otherwise authorized by the County. All Shop or Working Drawings and blueprints shall be made at the expense of the Contractor and/or Developer.

#### **2.1.1.7 Discrepancies**

Any discrepancies found between the plans and the County's specifications and site conditions or any inconsistencies or ambiguities in the plans or specifications shall be immediately reported to the engineer, in writing, who shall promptly correct such inconsistencies or ambiguities in writing after obtaining the County's approval. Work done by the Contractor after his discovery of such discrepancies, inconsistencies or ambiguities, prior to County approval, shall be done at the Contractor's risk.

#### **2.1.1.8 Correction Of Work**

The Contractor shall promptly remove from the premises all work rejected by the engineer or County for failure to comply with the County's specifications, whether incorporated in the construction or not, and the Contractor shall promptly replace and re-execute the work in accordance with the County's specifications and shall bear the expense of making good all work of other Contractors destroyed or damaged by such removal or replacement.

If the Contractor does not take action to remove such rejected work within ten (10) days after receipt of written notice, the County may remove such work and store the materials at the expense of the Developer.

#### **2.1.1.9 Qualifications Of Workmen And Equipment**

The Contractor shall employ superintendents, foremen and workmen that are careful, experienced and competent. The County reserves the right to issue a "stop work" order for any utility project if a Contractor fails to employ or utilize qualified personnel.

#### **2.1.1.10 Superintendent**

The Contractor shall personally supervise the work and when not personally present shall be represented by a Superintendent who shall have full authority to act as the Contractor's representative and all orders and instructions given to the Superintendent shall have the same force and meaning as if given to the Contractor in person. The Superintendent or Contractor shall be on duty at all times while construction work is being done.

#### **2.1.1.11 Responsibility Of Contractor**

The Contractor shall take all responsibility for the work, and take all precautions to prevent injuries to persons and property in or about the work.

Until tentative acceptance of the work by the County, it shall be under the charge of the Contractor, and he shall take every care and necessary precaution against injury or damage to the work or any part thereof by the action of the elements or any other cause whatsoever, whether arising from the execution or the non-execution of the work.

The Contractor shall rebuild, repair, restore and make good, at his expense, all injuries or damage to work occasioned by any of the above causes before it will be accepted.

#### **2.1.1.12 Work In Bad Weather**

During stormy or inclement weather, no work shall be done except as can be done satisfactorily and in a workmanlike manner to secure first-class construction throughout. If in the County's opinion satisfactory work is not being performed due to inclement weather, the County may issue a "stop work" order.

#### **2.1.1.13 Work Outside Regular Hours**

If the Contractor desires to perform work outside normal working hours or on Saturdays or Sundays, he shall request permission to work such hours at least 48 hours in advance to allow arrangements to be made for proper inspection. The County may refuse the Contractor permission to work outside of normal hours and may require that the Developer agree to reimburse the County any expenses it incurs due to work occurring outside of normal business hours in addition to the normal inspection fees. Reasonable efforts shall be made by the Contractor to avoid undue noise during the night and on Sundays, if it is necessary to work at such times. Under all conditions, the Contractor is responsible for complying with the County's noise ordinance. Under normal circumstances the Contractor will not be permitted to work on Sundays or County holidays.

The County reserves the right to schedule the Contractor to work outside normal working hours in the interest of public safety or convenience. Normal working hours are defined as 7:00 A.M. to 5:00 P.M., Monday through Friday.

#### **2.1.1.14 Use Of Water**

No water shall be drawn from the County's facilities for testing or other purposes until suitable arrangements have been made with the County's Utility Inspector.

#### **2.1.1.15 Job Safety**

The County shall not be responsible for the Contractor's safety precautions or to means, methods, techniques, sequences or procedures required for the Contractor to perform his work; such precautions include but are not limited to shoring, scaffolding, underpinning, temporary retainment of excavation and any erection methods and temporary bracing.

#### **2.1.1.16 Existing Structures**

The location of existing sewers, water and gas pipes, conduits, other utilities, and structures across or along the line of the proposed work may not be shown on the plans, and if shown, the location, depth and dimensions of such structures may only be approximately correct. The Contractor shall have a working pipe locator on the job at all times.

The Contractor shall dig the test holes for the purpose of locating existing underground structures as required to protect existing underground structures. Such excavation shall not be undertaken without 48 hours prior notice to the County or owner of the existing facility.

#### **2.1.1.17 Care Of Existing Structures**

The Contractor shall be liable for all damage done to any structure or property arising through his negligence or carelessness. He shall take care of and maintain all underground, overhead or surface utilities encountered in the performance of the work.

Prior to commencing work Contractor shall contact the Utility Information Center (“Miss Utility”), telephone 1-800-552-7001 for marking of existing underground utilities.

The Contractor shall observe all precautions with respect to fire and avoid the indiscriminate mutilation or cutting down of trees. Any damage to property not in the work area or easements will be the Contractor’s responsibility to repair and restore.

#### **2.1.1.18 Inspectors**

The Inspector is authorized to inspect all materials and equipment to be utilized, and work done. In case of any dispute arising between the Contractor and the Inspector as to materials furnished or the manner of performing the work, the Inspector will have the authority to reject material or suspend work until the question at issue can be resolved to the satisfaction of all parties.

The County shall have access at all times to all parts of the work being done for the purpose of inspection, measurements, and establishments of lines and grades.

#### **2.1.1.19 Final Inspection**

Before final inspection of the work, the Contractor shall clean up the site of the work including all rights-of-way, leaving it in as clean, neat and sanitary condition as originally found, and shall remove all machinery, tools, surplus material, temporary buildings, and other structures from the site of the work. Disturbed areas shall be stabilized and/or restored.

#### **2.1.1.20 Notification To Property Owners**

When working in off-site easements, the Contractor and/or Developer shall notify in writing all adjoining property owners, at least two (2) weeks prior to the start of any construction, that work will be taking place in the easement. The County may require that such notification be in writing. If the County does require that such notification be made in writing, copies of the letters shall be presented to the County at the pre-construction conference.

End of Section

## **2.2 Trenching, Backfilling And Compaction**

### **2.2.1 General**

#### **2.2.1.1 Quality Assurance**

Work shall conform to County of Hanover requirements and, where construction is within a State or Town right-of-way, the applicable requirements of the Virginia Department of Transportation or Town of Ashland, whichever is appropriate.

#### **2.2.1.2 Safety**

The Contractor is responsible for job site safety. The Contractor shall comply with all applicable safety rules and regulations of OSHA, VOSHA and other agencies having jurisdiction over the work. All safety measures related to, but not necessarily limited to, trenching, confined space, traffic control and other applicable safety measures, shall be strictly adhered to and enforced by the Contractor.

#### **2.2.1.3 Job Conditions**

A. Protection of Existing Utilities: It shall be the responsibility of the Contractor to conduct the work in such a manner as to avoid damage to, or interference with, any utility services. If such damage, interference, or interruption of service occurs as a result of his work, it shall be the Contractor's responsibility to promptly notify the County and utility owner of the occurrence and to repair or caused to be repaired the damage immediately, at his own expense, and to the satisfaction of the County and the owner of the utility. Further, it shall be the Contractor's responsibility to uncover and expose the location of all service connections to avoid damage or interruption of service. If damage occurs, the Contractor shall make the necessary repairs in accordance with the above requirements. It is also the responsibility of the Contractor to determine in advance of beginning his construction effort the exact location of all utilities, and the effect they will have on his work by contacting "Miss Utility" 48 hours prior to starting work, telephone 1-800-552-7001 for assistance.

B. Protection of Persons and Property:

1. Barricades for open excavations or work area shall be provided. All such barricades shall be in accordance with the requirements of the authorities or agencies having jurisdiction.
2. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by work or other operations in the area.

C. Equipment used for this work shall meet all local, State and Federal safety standards and any other applicable standards governing this work. All power machinery shall have adequate mufflers to keep noise to a minimum. The Contractor is responsible for complying with the requirements of the County's noise ordinance.

#### **2.2.1.4 Compaction**

The Contractor is responsible for the correct bedding of utility lines, backfill of pipe trenches, and compaction of backfill as outlined in this section. Where, in the Inspector's opinion, excavated material is not suitable for backfill, select backfill shall be used.

The County may require that the Contractor have density and compaction tests performed by a certified independent laboratory verifying that the trench backfill has been compacted as required. Any material not compacted as required shall be removed and replaced, recompact and retested. Verbal results of tests should immediately be given to the Inspector. Two written copies of all reports by the independent laboratory confirming the field results shall be given to the Inspector within (48) hours of the field tests. Requirements for compaction are covered in further detail later in this section.

#### **2.2.2 Products**

##### **2.2.2.1 Soil Materials**

Definitions:

- A. Unsuitable Soil Materials: Soil that is too wet to permit proper compaction or not appropriate for the use intended as determined by the Inspector.
- B. Non-cohesive Soil Materials: Non-cohesive soil materials include gravels, sand-gravel mixtures, and gravelly-sands.
- C. Cohesive Soil Materials: Cohesive soil materials include clayey and silty gravels, sand-clay mixtures, gravel-silt mixtures, clayey and silty sands, sand-silt mixtures, clays, silts, and very fine sands.
- D. Backfill and Fill Materials:
  - 1. Approved excavated or borrow materials must be free of rock or gravel larger than 2" in any dimension, debris, waste, frozen materials, organic and other deleterious matter.
  - 2. Approved materials must be at a moisture condition suitable for compaction at required density.

#### **2.2.3 Execution**

##### **2.2.3.1 Inspection**

Examine the areas and conditions under which excavating, filling, and grading are to be performed and remedy any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to the County.

### 2.2.3.2 Excavation

A. Excavation consists of removal and disposal of material encountered when establishing required trench elevations. Unauthorized excavation consists of removal of materials beyond indicated subgrade elevations or dimensions without specific direction of County.

B. Unsuitable soil shall be removed to a depth determined by the Inspector and replaced with No. 57 stone, or other material approved by the Inspector, which shall be uniformly and thoroughly compacted.

C. Sheeting, Shoring and Bracing: Provide sheeting, shoring, and bracing as necessary to prevent cave-in of excavation or damage to existing structures on or adjoining the site.

1. Establish requirements for trench shoring and bracing to comply with codes and authorities having jurisdiction. The Contractor's attention is called to Rules and Regulations Governing the Safety and Health of Employees Engaged in Construction as adopted by the Safety and Health Codes Commission of the Commonwealth of Virginia and all latest revisions thereto and issued by the Department of Labor and Industry.

The Contractor shall perform all construction operations in accordance with the U.S. "Occupational Safety and Health Act of 1970", the Standards of the U.S. Department of Labor, Occupational Safety and Health Administration and the latest amendments thereto.

2. Sheeting, shoring and bracing may be left in place with the approval of the County, but must be cut off to a depth of not less than two (2) feet below the surface.

D. Dewatering: Prevent surface water and subsurface or ground water from flowing into excavations and from flooding project site and surrounding area.

1. Do not allow water to accumulate in excavation. Provide and maintain pumps, well points, sumps, suction and discharge lines, and other dewatering system components necessary to convey water away from excavations. Dewatering shall continue until backfilling has been completed.

2. Convey groundwater and surface water removed from excavations to collection or run-off areas approved by the County. Trenches shall not be used as temporary drainage ditches.

3. All dewatering shall comply with the requirements of the latest edition of the Virginia Erosion and Sediment Control Handbook.

E. Stability of Excavations:

1. Slope sides of excavations to comply with local, State and Federal codes and ordinances having jurisdiction. Shore and brace where sloping is not possible because of space restrictions or because of the instability of the material being excavated.
2. Maintain sides and slopes of excavations in a safe condition until completion of backfilling.

F. Material Storage:

1. Stockpile approved excavated materials in approved areas, until required for backfill or fill.
2. Place, grade, and shape stockpiles for proper drainage.
3. Locate and retain soil materials away from edge of excavations.
4. Dispose of excess soil material and waste materials as hereinafter specified.
5. Stabilize soil stockpiles with temporary seeding as required.

G. Excavation for Trenches and Structures:

1. Trenches shall be opened only so far in advance of pipe laying as the County will permit and in no case will this distance exceed 300 feet. The width of the trench at and below the top of the pipe shall not exceed the outside diameter of the pipe plus twenty-four inches (24") except that for pipe eighteen inches (18") or less in diameter, the trench width shall not exceed forty-two inches (42"). The trench walls above the top of the pipe may be sloped or the trench above the top of the pipe may be widened as necessary for bracing, sheeting and shoring. Where these trench widths are exceeded, the Contractor will be required to mechanically tamp an approved backfill material from the bottom of the trench to six (6) inches above the top of the pipe as directed by the County and the trench reexcavated to the proper dimension.
2. Excavate trenches to the depth indicated or required. Carry the depth of trenches for piping to the indicated flow lines and invert elevations.
3. Grade bottom of trenches as indicated. For pressure lines, notch under pipe bells to provide solid bearing for the entire body of the pipe.
4. Cold Weather Protection: Protect excavation bottoms against freezing.
5. Excavation for structures shall conform to the lines and grades as shown, established or as necessary. Where the bottom of the excavation is in unsuitable

material, such material shall be excavated to a depth of one foot below the bottom of the structure or to a depth required by the County and replace with No. 57 stone, coarse sand, or other material approved by the County. Bottoms shall be planked or covered with appropriate fabric if necessary to prevent the mixture of earth with the backfill material. All sheeting, bracing, and shoring required for safety shall be installed in conformity with applicable rules and ordinances.

### **2.2.3.3 Hardpan Excavation**

Hardpan is classified as indurated clay, shale or sand with a cementitious material, which requires loosening with an air spade or blasting before it can be removed from the trench. The same clearances shall be made between the pipe or structure and hardpan material as is described hereinafter for rock excavation.

### **2.2.3.4 Rock Excavation**

- A. Definition: Rock excavation shall comprise solid rock in the original bed or well defined ledges and which can only be removed by blasting and/or drilling or by the use of jack hammers, and shall include all boulders or detached pieces of rock one-half cubic yard or more in content.
- B. Pipe Trench: Rock shall be excavated a minimum of six (6) inches below the bottom of all pipes. The pipes shall be laid on a cushion of #57 stone, or other approved material, of sufficient depth to provide the proper grade. A minimum clearance of six (6) inches shall be provided between the vertical walls of the trench and the bell of the pipe.
- C. Structures: Rock excavation for structures shall extend a minimum of eight (8) inches below the bottom or base of structure and a suitable bedding shall be provided. A minimum clearance of six (6) inches shall be provided between the rock and the exterior face of the structure when forming is not used. The minimum clearance shall be two (2) feet when forming is used.

### **2.2.3.5 Blasting**

- A. Blasting operations shall be in strict accordance with “Rules and Regulations Governing Manufacture, Storage, Handling, Use and Sale of Explosives” issued by the Department of Labor and Industry of Virginia and any County ordinances. All blasting shall be done at the sole risk of the Contractor and shall be done only by experienced licensed personnel. Occupants of nearby structures shall be notified prior to beginning blasting operations.
- B. When blasting is required, the Contractor shall conform to the following requirements:
  - 1. Blasting shall not be permitted before 9:00 A.M. or after 5:00 P.M. on Monday through Friday, unless otherwise authorized by the County.
  - 2. Blasting on Saturdays, Sundays or holidays shall not be permitted, unless specifically authorized by the County.

3. The Contractor shall, each day when necessary to blast, set up an approximate schedule of blasting operations, and provide 24 hours notice to the County, and property owners with occupied buildings within 1000 feet of blasting.
4. The Contractor shall use mats to minimize noise and control flying debris.
5. The Contractor shall obtain all required permits including a permit from the Hanover County Fire Marshall.

#### **2.2.3.6 Backfill For Trenches**

- A. After the installation of the pipe has been field inspected, the trenches shall be backfilled as specified and shown in the County's Standard Details.
- B. Sewer pipe shall have minimum bedding as shown on the County Standard Details. Pipe bedding shall be VDOT #57 stone or other material approved by the Department of Public Utilities. Large clods, sticks, stones, and other unsatisfactory material must be excluded from the initial backfill around and to 12" above the pipe. Approved soil materials may be used for ductile iron and concrete pipe for the initial backfill. For plastic pipe, VDOT # 57 stone, or other approved material, must be used for initial backfill to the top of the pipe. The next foot of the initial backfill must be approved soil materials or VDOT #57 stone.
- C. The initial backfill shall be carefully compacted by hand or pneumatic tamping methods under the pipe, on both sides of the pipe, and above the pipe.
- D. After the initial backfill has been placed, the remainder of the backfilling may be done by hand or with mechanical equipment in lifts no greater than 8".
- E. Where settlement occurs, the trench shall be refilled, contoured and compacted by an approved method to conform to the surface of the ground.
- F. Sheeting and bracing shall, in general, be removed as the backfilling progresses, and in such a manner as to avoid caving of the trench. Voids left by the withdrawal of the sheeting or shoring shall be carefully filled and rammed. Where, in the opinion of the County, damage is liable to result from the withdrawal of the sheeting, it shall be left in place.
- G. No large rocks should come in contact with pipe.
- F. Backfill shall be completed in 8 inch layers with the following percentage of maximum density at optimum moisture content as determined by ASTM D698.
  1. 95 percent within 10 feet of and under pavements, road shoulders and other structures.
  2. 85 percent in all other areas.

H. Under Existing Roadways and Pavement: Backfill for trenches under roadways and other paved areas shall be in accordance with the requirements specified above or, if more stringent, the requirements of the Virginia Department of Transportation or the Town of Ashland.

I. Clay dams: Where required, clay dams shall be installed in the trench to prevent groundwater from flowing down the trench and damaging the subgrade as directed by the Inspector. Clay material with an imperviousness of  $1 \times 10^{-5}$  cm/sec shall be used in clay dams. Material shall be compacted as indicated in paragraph A above. Inspector shall approve clay material prior to use.

### **2.2.3.7 Backfill For Structures**

Around and adjacent to structures, backfill shall be of material of suitable stability and permeability. Backfill shall be placed in 6 inch lifts, each lift being compacted by an approved method. No backfill shall be placed against a structural wall until all connecting structural members are in place. It shall be the Contractor's responsibility to provide compaction to 95% per ASTM D-698. The Contractor shall provide adequate protection to all structures during backfilling and use every precaution to avoid damaging or defacing them.

### **2.2.3.8 Construction In Public Streets, Roads And Alleys**

Unless superseded by other specifications, the requirements of the Town of Ashland, or the Virginia Department of Transportation (VDOT) permit requirements the following shall apply: The Contractor's operations in public streets, roads or alleys, shall be confined to as small a space as is practicable, so as not to cause undue inconvenience to the public or abutting properties, and shall be subject at all times to the approval of the County. Unless otherwise directed by agency controlling the public street, road or alley being worked in, the Contractor shall perform proposed construction within public streets, roads and alleys as follows:

A. Typically, water and sewer lines are to cross roadways at right angles and/or to parallel roadways. Uncased utility lines are to be designed to have sufficient strength to withstand dead loads and superimposed live loads. All restoration materials and workmanship shall conform to the latest edition of the "Virginia Department of Transportation Road and Bridge Specifications" in addition to permit requirements. The Contractor is responsible for obtaining all highway permits and forwarding a copy to the County. Method of construction (trenching, boring, tunneling, jacking, etc.) must be shown on permit and plans. The Contractor is responsible for identifying, locating, adjusting and/or relocating existing utilities, structures and survey markers (including making all the arrangements necessary to coordinate the work to be performed). To avoid unnecessary construction delays, the Contractor needs to make application for a highway permit at least 10 working days prior to starting construction.

Nothing contained herein is intended, nor should be construed, to relieve the Contractor in any manner whatsoever of his responsibility for maintaining trenches, pavement structure, shoulders and generally the work site in an acceptable manner. Prior to the actual open cut, the Department of Public Utilities and the agency having

jurisdiction over the road is to be notified 24 hours in advance to arrange a meeting with their representative and the Inspector.

B. Wherever pavement is permitted to be cut, not over one-half of the road width shall be disturbed at one time, unless an approved method of detouring traffic is reviewed and approved by the agency having jurisdiction. The first opening shall be in travelable condition before the second half can be opened.

C. Where Contractor is granted approval to open cut a road by VDOT or the Town of Ashland, the following requirements shall be complied with unless specific permit requirements are more restrictive:

1. VDOT or Town of Ashland, as appropriate, is to be notified 48 hours prior to any open cut work being performed.
2. Work within the roadway shall be done between the hours of **9 A.M. and 4 P.M.** unless otherwise approved by VDOT or the Town of Ashland.
3. Utilize proper sign layout and channelization devices (i.e., cones, plastic barrels, pavement marking, etc.) during construction, according to VDOT's "Virginia Work Area Protection Manual".
4. The area of the open cut shall be restored in accordance with one of the following applicable standards:
  - a. Asphalt Road
    1. If the average daily traffic count (A.D.T.) is greater than 2000 vehicles, then the pavement design will be determined by engineer depending on route and location.
  - b. Asphalt Road
    1. A.D.T. between 1001 and 2000 vehicles
      - a) Backfill entirely with #21-A or #21-B stone (95% compaction)
      - b) Apply tack coat for all edges and existing surface asphalt (see standard detail)
      - c) Install 1.5 times the thickness of existing pavement or a minimum of 8" BM-2 (base mix) flush with existing pavement
      - d) Overlay a minimum of 10' on both sides of trench with 1½" of SM-2 (surface mix)

2. A.D.T. between 501 and 1000 vehicles
  - a) Backfill entirely with #21-A or #21-B stone (95% compaction)
  - b) Apply tack coat for all edges and existing surface asphalt (see standard detail)
  - c) Install 1.5 times the thickness of existing pavement or a minimum of 6" BM-2 (base mix) flush with existing pavement
  - d) Overlay a minimum of 10' on both sides of trench with 1½" of SM-2 (surface mix)
3. A.D.T. less than 500 vehicles
  - a) Backfill entirely with #21-A or #21-B stone (95% compaction)
  - b) Apply tack coat for all edges and existing surface asphalt (see standard detail)
  - c) Install 1.5 times the thickness of existing pavement or a minimum of 4" BM-2 (base mix) flush with existing pavement
  - d) Overlay a minimum of 10' on both sides of trench with 1½" of SM-2 (surface mix)
- c. Asphalt Road Base with a Surface Treatment Seal
  1. Backfill entirely with #21-A or #21-B stone (95% compaction)
  2. Apply tack coat for all edges and existing surface asphalt (see standard detail)
  3. Install 1.5 times the thickness of existing pavement or a minimum of 6" BM-2 (base mix) flush with existing pavement
  4. Surface treat a minimum of 10' on both sides of trench with blotted seal coat type C: The initial seal and final seal shall conform to the requirements of AASHTO M208 @ .17 gal./sq.yd. With 15 lbs. Of No. 8P stone per sq. yd. each.
- d. Surface Treated Road (Tar and Gravel)

1. Backfill entirely with #21-A or #21-B stone (95% compaction)
2. Apply tack coat for all edges and existing surface asphalt (see standard detail)
3. Install 4" of BM-2 (base mix) in trench flush with existing pavement
4. Surface treat a minimum of 10' on both sides of trench with blotted seal coat type C: The initial seal and final seal shall conform to the requirements of AASHTO M208 @ .17 gal./sq.yd. With 15 lbs. Of No. 8P stone per sq. yd. each.

e. Dirt/Gravel Road or Aggregate Shoulders

1. Select backfill compacted to 95% maximum density (6" lifts)
  2. Backfill trench with 10" of #21-A or #21-B stone (95% compaction)
  3. Apply fresh application of #21-A or #21-B stone to all disturbed areas of the road
5. The pavement cut shall be covered with a temporary or permanent asphalt patch on the same day that excavation is made.
  6. One travel lane will be maintained at all times.

D. Where the Contractor is granted approval to open cut the road for parallel installation within the pavement and service crossings, pavement replacement shall be in accordance with the details reflected in these standards, the approved plans, or the highway permit whichever is more stringent.

E. Placement of all plant mix and surface-treated courses shall be rolled where possible with a unit having a manufacturer's rating of 10 tons, and rolled until the aggregate is keyed into the bitumen. Where rolling is not possible, a mechanical tamp will be used. The stone is to be placed in the trench daily up to 1,500 feet, at which time the pavement shall be covered with a temporary or permanent asphalt patch. If the application of the bituminous layer is delayed for adverse weather conditions, the Contractor shall provide and maintain a base course that is acceptable to both the Virginia Department of Transportation and/or the Town of Ashland, and the Department of Public Utilities until such time as the appropriate pavement patch can be applied and accepted.

F. Upon completion of the installation of the water and sewer lines (not necessarily all testing completed), Contractor shall restore pavement in the manner prescribed on the

VDOT or Town of Ashland permit within ten (10) days. All trenches and repaving shall be maintained in accordance with the highway permit.

G. Site Maintenance and Restoration: Road connections and private entrances are to be kept in a satisfactory condition. Entrances are not to be blocked and sufficient provisions made for safe travel to adjacent property at all times. When entrances are disturbed, they must be restored to original condition or to a condition satisfactory to VDOT and/or the Town of Ashland, the Department of Public Utilities, and the property owner. Road drainage is not to be blocked. The pavement, shoulders, ditches, general roadside and drainage facilities shall be left in as good condition as found (consistent with adjoining sections of the highway), maintained in a satisfactory condition and establish positive drainage in the ditches. All loose material shall be swept from hard surface immediately after backfilling. Calcium chloride before sweeping or approved alternate shall be used to settle dust whenever necessary. Concrete walks and curbs shall be replaced in entire sections. During rainy periods all trenches shall be watched closely for settlement. If emergency situation arises under any circumstances, repairs will be made at the Contractor's expense. Additionally, after paving is complete, the Contractor shall be responsible for any settlement of trenches requiring additional fill, pavement or other corrective measures until the permit or road is accepted (this includes future State or Town roads currently developer owned).

H. Work Zone Protection: The Contractor shall immediately correct any situation which may arise as a result of construction that the Department of Public Utilities deem hazardous to the traveling public. The Contractor shall comply with the requirements of the agency that issued a permit for the construction.

I. Traffic is not to be blocked, rerouted or otherwise impeded without written permission from the appropriate agency. Placement and type of traffic control, warning devices and personnel shall be in accordance with VDOT "Work Area Protection Manual". Where one way traffic is permitted, Contractor shall perform proper flagging for the duration of the project. The Contractor will notify the proper agency at least 24 hours before starting work. If traffic is impeded in any way, the same notice must be given to Fire Department, Rescue Squad, VDOT, Police Department, Sheriff and School Board. All open trenches, pits, etc. shall be secured with barricades and any other necessary equipment to protect the public. The State of Virginia, Town of Ashland, and Hanover County shall not be liable for any damage resulting from construction.

### **2.2.3.9 Disposal Of Waste Materials**

- A. Removal From Project Site: Remove waste materials, including unacceptable excavated material, trash, and debris, and dispose of it legally off the project site.
- B. Dust Control: Water, calcium chloride or approved alternate shall be periodically applied to alleviate problems associated with dust.
- C. Disposal of asbestos cement pipe shall be done in accordance with AWWA Manual 16, "Work Practices for Asbestos Cement Pipe".

End of Section

## **2.3 Sanitary Sewer Systems**

### **2.3.1 General**

#### **2.3.1.1 Requirements Of Regulatory Agencies**

Construction as shown on the approved plans or stated herein shall be performed in accordance with current and applicable requirements as established by the County of Hanover and the Virginia Department of Environmental Quality or any other agencies having jurisdiction. Where conflicts arise between the Contract Documents and previously mentioned requirements, the more restrictive shall apply. If such requirements require a change in the work as stated herein or shown on the plans, the Contractor shall stop work and notify the County for further direction.

### **2.3.2 Products**

#### **2.3.2.1 Approved Materials**

All materials shall conform to the County of Hanover "Approved Materials and Manufacturers" list. All materials shall be new, virgin material. If requested by the County, the Contractor shall submit a statement from the supplier and/or manufacturer stating that all materials being supplied for the work meet AWWA, ASTM and/or County standards and, if requested by the County, the Contractor shall submit the manufacturer's literature for the materials being proposed.

In addition, the Contractor may be required to submit shop drawings for approval. If required, the information needs to be sent as far in advance as possible (at least 14 days) to avoid any unnecessary delays in beginning the project. The County will require two sets of all approved shop drawings for its use. The certification and/or shop drawings must include manufacturer's name, type of product, location of plant, project name and number, etc. for each product.

### **2.3.3 Execution**

#### **2.3.3.1 Installation Of Sanitary Sewer Systems**

- A. Excavating and Backfilling:
  - 1. Contractor shall remove any and all materials encountered in the course of excavating for all underground utility systems. After the pipe is in place, backfill with suitable material, free from frozen earth, rocks, organic materials, etc.
    - a. Provide all necessary shoring required for the protection of excavations, existing utilities and workmen and do all necessary pumping required to keep excavation and pipe free from water from any source at all times.
    - b. Provide sufficient barricades, etc., adjacent to excavations to safeguard against injury to workmen and the public. Provide and maintain sufficient warning lanterns at walks, roadways, and parking areas to provide safety at all times.

c. Where roots of live trees are encountered in excavations, they shall be carefully protected during construction.

d. Exercise special care in backfilling trenches to guard against disturbing the joints.

e. Remove and dispose of any material not used for backfill.

2. Removal of subsurface obstructions which are uncovered during excavation for installation of the sanitary sewer systems shall be by the Contractor at his expense. This shall include removal of existing concrete or brick from existing building foundations, footings, abandoned utility piping, wires, structures, rock boulders, etc., which may not be visible from surface investigations before construction, but will interfere with new installations. If such obstructions are encountered, they shall be removed two feet from around the area of new work and the excavation backfilled with a suitable material as specified.

B. Pipe Handling:

1. Take all precautions to ensure that pipe and related items are not damaged in unloading, handling and placing in trench. Examine each piece of material just prior to installation to determine that no damage has occurred. Remove any damaged material from the site and replace with undamaged material.

2. Keep pipe clean. Exercise care to keep foreign material and dirt from entering pipe during storage, handling and placing in trench. Flushing lines shall be required of by the Contractor when directed to do so by the Inspector.

3. Survey Line and Grade:

a. Line and grade shall be maintained by the Contractor and the County provided with cut-sheets unless the County waives this requirement.

b. Contractor shall have level or transit in good working order on the job set up at all times to periodically check line and grade of pipe.

4. Sewer Pipe Laying:

a. Laying of sewer pipe shall be accomplished to line and grade as indicated on the County approved plans and in the trench only after it has been dewatered and the foundation and/or bedding has been prepared. Mud, silt, gravel, and other foreign material shall be kept out of the pipe and off the jointing surfaces.

b. All pipe laid shall be retained in position so as to maintain alignment and joint closure until sufficient backfill has been completed to

adequately hold the pipe in place. All pipe shall be laid to conform to the prescribed line and grade shown on the drawings. After completion the pipe shall exhibit a full circle of light at one manhole when viewed from the next.

c. The sewer pipe shall be laid upgrade from point of connection to the existing sewer or from a designated starting point. If the starting point is at an existing stub, it shall be removed and a full length of pipe installed. The sewer pipe shall be installed with the bell end forward or upgrade. When pipe laying is not in progress the forward end of the pipe shall be kept tightly closed with a water tight plug or cap. When the upstream end of a sewer does not terminate at a manhole, it shall be plugged and its location marked in a manner approved by the Inspector.

d. The pipe shall be fitted and matched so that when installed it will form a smooth, uniform invert.

e. Prior to joining the pipe, all surfaces of the pipe to be joined and the surfaces of factory made jointing materials shall be clean and dry. Lubricants, primers, adhesives, etc., shall be applied and the pipes joined as recommended by the manufacturer's specifications. Sufficient pressure shall be applied in making the joint to assure that the pipe is "home". The interior of the pipe shall be cleaned of all foreign material as the work progresses. At the end of the work day, the last pipe laid shall be blocked to prevent creep, and closed with a water tight plug or cap.

f. Joining Pipe:

1) Ductile iron pipe is to be joined in accordance with the requirements of AWWA Standard C600 and the manufacturer's recommendations.

2) Polyvinyl chloride (PVC) pipe shall be joined in accordance with ASTM Standard D-2321.

3) Other type pipe shall be joined in accordance with the manufacturer's recommendations and the requirements of the County approved plans and specifications.

g. All visible leaks shall be corrected prior to testing.

C. Manhole Installation:

1. Manholes shall be constructed to the elevations indicated on the County approved plans in accordance with the Standard Details.

- a. Set manhole base section on bed of #57 stone with a minimum depth of 8". Stone shall be thoroughly compacted and carefully leveled to the excavated earth wall.
- b. Join all manhole risers, cone top sections, and any other sections by the use of rubber gaskets.
- c. Install pipe stubs in manholes where called for on the plans. All stubs shall extend beyond the manhole as reflected on the plans and shall be sealed with a watertight plug or cap.
- d. Install flexible manhole connections for all pipes sizes 6" to 24", inclusive and apply sealant to completely fill joint between manhole barrel and flexible connection for the full thickness of the manhole barrel.
- e. Plug lift holes from the outside with nonshrink grout and repair any defects in manhole.
- f. For manhole frame and covers set flush with final grade, set adjusting rings in portland cement mortar bed or in a bitumastic material (minimum of 1/4" thickness). Parge 1/8" to 1/4" thickness on inside and outside of manhole with portland cement.

For manhole frames and covers set above grade. Adjusting rings are not allowed. The manhole frame shall be attached to the concrete manhole by the use of two-1/2" diameter stainless steel epoxied anchor bolts, two-1/2" diameter stainless steel wedge anchors, or two-1/2" diameter stainless steel stud anchors which extend no more than 2" above the top of the manhole frame flange when installed. Stainless steel washers and nuts shall be utilized to firmly attach the frame to the manhole. The flange of the manhole frame shall be drilled neatly with two 5/8"± holes on opposite sides of the frame which align with the anchor bolts. A bitumastic material shall be placed between the manhole frame and the top of the concrete manhole to seal this space. The exterior of the manhole frame shall have portland cement neatly placed around it which shall cover the top of the anchor bolts.

- g. Rings in paved roadways or walkways shall permit upward or downward adjustment of manhole frame. Maximum height of rings shall not exceed 12", otherwise, the cone section will require removal and a new manhole riser installed to allow for the upward and downward adjustment as stated above.
- h. Construct bench of concrete.
  - 1) Elevation of bench at the channel shall be at the spring line of the incoming and outgoing pipe.

- 2) Bench shall be three inches lower at channel than at manhole wall.
  - 3) Where bricked up openings or stubs are provided for future pipe connections, bench and invert shall be so formed.
  - 4) Use sulfide resistant cement for concrete or mortar on all acid-resistant manholes.
  - 5) Where sealant is used, bench shall not be in contact with pipe or flexible pipe connection.
  - 6) All inverts shall be smooth.
- j. All visible and known leaks shall be corrected prior to testing.

D. Service Connections: Place a tee fitting with 6" outlet in the sewer where service connection is to be constructed. Lay 6" PVC or ductile iron pipe from the connection to the property line or easement limits on a grade of not less than 1/4 in. per foot unless otherwise shown on plans. Where connections are laid out of manholes, Contractor shall use a laser beam. Terminate service connection at the property line with an approved watertight plug, and mark the end with 2" x 4" board installed plumb from bottom of 6 inch plug to 2 feet above ground. Service connection shall be of same type of pipe as sewer unless otherwise approved by County. When making a service connection to an existing sewer, the Contractor shall use a mechanical hole cutter and approved saddle or Inserta-Tee gasketed fitting.

E. Existing Manhole Tie-In: Core drilling and a flexible pipe-to-manhole connector shall be used in the connection of the sewer pipe to precast manholes, where stubs or bricked up opening do not exist.

The connector shall be Kor-N-Seal assembly or approved equal.

The connector shall be installed in the manhole wall by activating the expanding mechanism in strict accordance with the recommendation of the connector manufacturer.

The connector shall be of a size specifically designed for the pipe material and size being utilized on the project. All materials must conform to the approved products reflected in these standards.

Where bricked up openings exist, a PVC manhole adapter shall be used in the connection of the sewer pipe to precast manholes and installed using the proper conventional methods such as the process established for the "GPK PVC Manhole Adapters" or equal.

### 2.3.3.2 Testing Of New Sanitary Sewer System

A. Testing Technique for Sanitary Sewer System:

1. Sanitary sewer lines 42" in diameter and smaller shall be tested after backfill using a low-pressure air test in accordance with ASTM C828, latest edition. Sewer lines larger than 42" in diameter shall be tested by infiltration/exfiltration test. All manholes shall be vacuum tested. All testing shall be conducted in the presence of the County's Inspector. All labor, materials, tools, and equipment necessary to make the tests shall be provided by the Contractor. All equipment and methods used shall be acceptable to the County. All monitoring gauges shall be subject to calibration, if deemed necessary.

2. Low-Pressure Air Test:

a. Summary of Method: Plug the section of the sewer line to be tested. Introduce low-pressure air into the plugged line. Use the quantity and rate of air loss to determine the acceptability of the section being tested.

b. Preparation of the Sewer Line: If required by County, flush and clean the sewer line prior to testing and cleaning out any debris. Plug all pipe outlets using approved pneumatic plugs with a sealing length equal to or greater than the diameter of the line being tested. Give special attention to laterals.

c. Ground Water Determination: If a line is located below the water table the elevation of the water table must be determined prior to testing. To determine the elevation of the water table the following procedure shall be utilized unless another procedure is approved by the Inspector. Install a ½ inch capped galvanized pipe nipple, approximately 12" long, through the manhole on top of the lowest sewer line in the manhole. Immediately prior to the line acceptance test, the ground water elevation shall be determined by removing the pipe cap and blowing air through the pipe nipple into the ground so as to clear it, and then connecting a clear plastic hose to the pipe nipple. The hose shall be held vertically and a measurement of the height in feet of water over the invert of the pipe shall be taken after the water has stopped rising in the plastic hose.

d. Procedures: Determine the duration for the section under test by computation from the applicable formulas shown in ASTM C828, latest edition. The pressure-holding time is based on an average holding pressure of 3 psi gage or a drop from 3.5 psi to 2.5 psi gage.

Add air until the internal air pressure of the sewer line is raised to approximately 4.0 psi gage. After an internal pressure of approximately

4.0 psig is obtained, allow time for the air pressure to stabilize. The pressure will normally show some drop until the temperature of the air in the test section stabilizes.

When the pressure has stabilized and is at or above the starting test pressure of 3.5 psi gage, commence the test. Before starting the test, the pressure may be allowed to drop to 3.5 psig. Record the drop in pressure for the test period. If the pressure has dropped more than 1.0 psi gage during the test period, the line shall be presumed to have failed. The test may be discontinued when the prescribed test time has been completed even though the 1.0 psig drop has not occurred.

The test procedure may be used as a presumptive test which enables the installer to determine the acceptability of the line prior to backfill and subsequent construction activities.

If the pipe to be tested is submerged in ground water, the test pressure shall be increased by 1.0 psi for every 2.31 feet the ground water level is above the invert of the sewer.

e. Safety: The air test may be dangerous if, because of lack of understanding or carelessness, a line is improperly prepared.

It is extremely important that the various plugs be installed and braced in such a way as to prevent blowouts. A force of 250 lb. is exerted on an 8 inch plug by an internal pipe pressure of 5 psi. It should be realized that sudden expulsion of a poorly installed plug or of a plug that is partially deflated before the pipe pressure is released can be dangerous.

As a safety precaution, pressurized equipment shall include a regulator or relief valve set at no more than 10 psi to avoid over-pressurizing and damaging an otherwise acceptable line. No one shall be allowed in the manholes during testing.

3. All manholes will be tested using the negative air pressure test (vacuum) in accordance with ASTM C 1244, latest edition for watertightness. Manholes will be visually inspected after backfilling. Contractor may backfill before testing with the understanding that any repairs will be made from the exterior of the manhole.

Manholes shall be vacuum tested and shall have 10" of mercury applied to the manhole and the time measured for the vacuum to drop from 10" to 9" of mercury. See standard details for minimum allowable test times for manhole acceptance at the specified vacuum drop.

Test times for structures other than manholes will be based on the times for manholes of the nearest equivalent volume or as directed by the Inspector.

4. Test for leakage of gravity sewers using either the infiltration or exfiltration test:
  - a. Allowable leakage shall be 50 gallons per inch of pipe diameter per mile per 24 hours up to a maximum of 2,400 gallons per mile per 24 hours for gravity sewers greater than 42" in diameter.
  - b. Use infiltration test when ground water is at least 4 feet above pipe crown along entire length of line to be tested. Plug the pipe at the upper manhole. Install suitable measuring device at the next downstream manhole. Measure the amount of water flowing through the outlet after flow has been stabilized. Test shall be conducted in accordance with ASTM C-654.
  - c. Ground Water Determination: Use same procedure as "low pressure air test" above.
  - d. Exfiltration test shall be accomplished by plugging the sewer at the downstream end and filling the upstream manhole with water to the top of the manhole.

**B. Testing Requirements for Sewer Force Mains:**

1. All pressure testing shall conform to the requirements as established for Water Systems.

**2.3.3.3 Tracing Wire and Locating Tape**

Force mains shall have a tracing wire and locating tape installed.

The tracing wire shall be accessible for test hook-up at all test stations. The tracing wire must be completely insulated from ground. The tracing wire will be attached to the top of the pipe using duct tape at an interval no greater than 16 feet. Tracing wire within test stations shall be stripped ¾" from the end and capped with a wire nut to minimize electrical ground contact. All connections at the main line must be electrically sound and physically secure with screw connections or clamps. In addition all connections must be taped with electrical tape and sealed with an electrical coating sealant. Test stations shall be installed at intervals on no greater than 1,000 feet along force mains. Concrete pads, as detailed, shall be provided for test stations on force mains. Tracing wire for force mains shall be color coded green.

Locating tape shall be installed in the trench approximately 12" below finish grade. Tape shall be polyethylene with metallic core, 2" in width, with continuous printed message "Caution - Force Main Buried Below" Tape shall be Catalog No. 2 WAT as manufactured by the Seton Name Plate Corp. or approved equal.

#### **2.3.3.4 Clean-Up**

Upon the completion of the installation of the sanitary sewer system and prior to tentative acceptance by the County, sediment and debris shall be removed from the system. Unless waived by the by the Inspector, the Contractor shall flush the sewer system and install proper devices to capture debris flushed from the sewer system so that it does not enter the County's existing sewer system prior to the County issuing Tentative Acceptance for the project. The work area shall be restored to its original condition and pavement replaced to the satisfaction of VDOT, the Town of Ashland, and/or the County. All trash and debris shall be removed and properly disposed of. Areas not otherwise stabilized shall be seeded and mulched and a good stand of grass established.

End of Section

## **2.4 Water Distribution System**

### **2.4.1 General**

#### **2.4.1.1 Requirements Of Regulatory Agencies**

Construction as shown on the plans or stated herein shall be performed in accordance with current and applicable requirements as established by the County of Hanover and the Virginia Department of Health or any other agencies having jurisdiction. Where conflicts arise between the construction documents and previously mentioned requirements, the more restrictive shall apply. If such requirements require a change in the work as stated herein or shown on the plans, the Contractor shall stop work and notify the County immediately for further direction.

### **2.4.2 Products**

#### **2.4.2.1 Approved Materials**

All materials shall conform to the County of Hanover "Approved Materials and Manufacturers" list. All materials shall be new, virgin material. If requested to by the County, the Contractor shall submit a statement from the Supplier and/or Manufacturer stating that all materials being supplied for the work meet AWWA, ASTM and/or County standards and, if requested by the County, the Contractor shall submit the manufacturer's literature for the materials being proposed.

Shop drawings, as defined in the General Section, and operation manuals are required on projects where there are special structures, and on Pump Stations, Tanks, Pressure Reducing Vault, and Treatment Plant projects. This requirement includes, but is not necessarily limited to, pipe and accessories, manholes and appurtenances, valves, and other assorted products, etc. Shop drawings shall be submitted by the Contractor to the County for approval. The information needs to be sent as far in advance as possible (at least 14 days) to avoid any unnecessary delays in beginning the project. The Contractor shall submit four more copies than he wants returned for review and approval by the engineer and County.

The certification and/or shop drawings must include manufacturer's name, type of product, location of manufacturing plant, project name and number, etc. for each product.

### **2.4.3 Execution**

#### **2.4.3.1 Installation Of New Water Systems**

- A. Excavating and Backfilling:
  - 1. Contractor shall do all excavating of any and all materials encountered in the course of excavating for all underground utility systems. After the pipe is in place, backfill with suitable earth, free from rocks, organic material, etc.
    - a. Provide all necessary shoring required for the protection of excavations, existing utilities and workmen and do all necessary pumping

required to keep excavation and pipe free of water from any source at all times.

b. Provide sufficient barricades, etc., adjacent to excavations to safeguard against injury to workmen and the public. Provide and maintain sufficient warning lanterns at walks, roadways, and parking areas to provide safety at all times.

c. Where roots of live trees are encountered in excavations, they shall be carefully protected during construction.

d. Exercise special care in backfilling trenches to guard against disturbing the joint.

e. Remove and dispose of any material not used for backfill.

2. Removal of subsurface obstructions which are uncovered during excavation for installation of the water systems shall be removed by the Contractor at his expense. This shall include removal of existing concrete or brick of existing building foundations, footings, abandoned utility piping, wires, structures, rock boulders, etc., which may not be visible from surface investigations before construction, but will interfere with new installations. If such obstructions are encountered they shall be removed two feet from around the area of new facility and backfilled with a suitable material as specified.

**B. Pipe Installation:**

1. Take all precautions to ensure that pipe and related items are not damaged in unloading, handling and placing in trench. Examine each piece of material just prior to installation to determine that no damage has occurred. Remove any damaged material from the site and replace with undamaged materials.

2. Keep pipe clean. Exercise care to keep foreign material and dirt from entering pipe during storage, handling and placing in trench. Contractor shall be responsible for plugging or capping line at the end of each day.

3. Do not lay pipe when weather or trench conditions are unsuitable.

4. **Water Pipe Laying:**

a. Laying of water pipe shall be accomplished only after the trench has been dewatered and the foundation and/or bedding has been prepared. Mud, silt, gravel, and other foreign material shall be kept out of the pipe and off the jointing surfaces.

b. All pipe laid shall be retained in position so as to maintain alignment and joint closure until sufficient backfill has been completed to adequately hold the pipe in place. All pipe shall be laid to conform to the

prescribed line and grade shown on the plans and shall include digging out for bell ends.

c. Water pipe runs intended to be laid straight shall be so laid. Deflection from a straight line may be made by deflecting the joints only when permission has been given by the County. Joint deflection in pipe shall not exceed one-half that recommended by AWWA Standards or the manufacturer whichever is less. Changes in grade or alignment which cannot be made by deflecting pipe joints shall be made by use of proper bends, offsets or special fittings as required.

d. The water pipe, unless otherwise approved by the Inspector, shall be laid up grade from point of connection of the existing water main or from a designated starting point. Water pipe shall be installed with the bell end forward or upgrade. When pipe laying is not in progress, the forward end of the pipe shall be kept tightly closed with a water tight plug or cap; plywood or plastic is not acceptable.

e. The pipe shall be fitted and matched so that when laid in the work, units will form a smooth, uniform invert.

f. Prior to joining the pipe, all surfaces of the pipe to be joined and the surfaces of factory made jointing materials shall be clean and dry. Lubricants, primers, adhesives, etc., shall be applied and the pipes joined as recommended by the manufacturer's specifications. Sufficient pressure shall be applied in making the joint to assure that the pipe is "home". The interior of the pipe shall be cleaned of all foreign material as the work progresses. At the end of the work day, the last pipe laid shall be blocked to prevent creep, and closed with a water tight plug or cap.

g. Joining Pipe:

1) Ductile iron pipe to be joined as follows:

(a) Mechanical joint pipe:

(1) When installing PVC pipe into M.J. fittings, the beveled end of the pipe must be cut off to allow for maximum insertion depth and sealing area to avoid leaks. Thoroughly clean inside of the bell and 8" of the outside of the spigot end of the joining pipe to remove oil, grit, excess coating and other foreign matter from the joint. Paint the bell and spigot with soap solution (half cup granulated soap dissolved in 1 gallon water). Slip cast-iron gland on spigot end with lip extension of gland toward end of pipe. Paint rubber gasket with or dip into the soap solution and place on the spigot end with thick edge

toward the gland.

(2) Push the spigot end forward to seat in the bell. Then carefully press the gasket into the bell so that it is located evenly around the joint. The gland is moved into position, bolts inserted and nuts turned finger tight. Tighten all nuts to torque listed below:

Bolt Size (inches)	Torque (ft - lbs)
5/8	40 - 60
3/4	60 - 90
1	70 - 100
1 - 1/4	90 - 120

(3) Tighten nuts on alternate sides of the gland until pressure on the gland is equally distributed, and torque value is reached.

(4) Permissible deflection in mechanical joint pipe shall not be greater than one-half of that listed in AWWA C600.

(b) Push-on joint ductile iron pipe

(1) Thoroughly clean inside of the bell and 8" of the outside of the spigot end of the joining pipe to remove oil, grit, excess coating, and other foreign matter. Flex rubber gasket and insert in the gasket recess of the bell socket. Apply a thin film of gasket lubricant supplied by pipe manufacturer, to the gasket and spigot end of the joining pipe.

(2) Start spigot end of pipe into socket with care. The joint shall then be completed by forcing the plain end to the bottom of the socket with a forked tool or jack type device. Field cut pipe shall have the end filed to match the manufactured spigot end.

(3) Permissible deflection in push-on joint pipe shall not be greater than one-half of that listed in AWWA C600.

- 2) Polyvinyl chloride (PVC) pipe shall be joined in accordance with the manufacturer's recommendations.

Polyvinyl Chloride (PVC) Push-on Joint Pipe

- a) Thoroughly clean inside of the bell and 1" beyond the reference mark on the spigot end of the joining pipe. Make certain the bell and rubber gasket have no foreign material that could interfere with the proper assembly of the pipe spigot.
  - b) Lubricate the gasket and spigot end of the pipe, using lubricant supplied by pipe manufacturer.
  - c) Insert the spigot end into the bell. Align the pipe sections and push the spigot end in until the reference mark on the spigot end is flush with the end of the bell. Use a bar and block of wood to push pipe home.
  - d) Field cut pipe shall be square cut and beveled to ensure proper assembly. Use a factory finished beveled end as a guide to produce an equivalent angle and length of taper.
- h. Tracing wire shall be accessible for test hook-up at all water meter boxes, and test stations. The tracing wire must be continuous and completely insulated from ground. The tracing wire will be attached to the top of the pipe using duct tape at an interval no greater than 16 feet. Tracing wire within test stations and meter boxes shall be stripped ¾" from the end and capped with a wire nut to minimize electrical ground contact. Test stations shall be installed within 2 feet of all fire hydrants and at intervals no greater than 1000 feet. All connections at the main line must be electrically sound and physically secure with screw connections or clamps. All connections must be taped with electrical tape and sealed with an electrical coating sealant. Tracing wire for water mains shall be color coded blue.
- i. Place underground warning tape directly above all water mains, 12" below finished grade. Tape shall be polyethylene tape with a metallic core, 2" in width, with the continuous printed message "Caution - Water main Buried Below." Tape shall be Catalog No. 2 WAT as manufactured by the Seton Name Plate Corp. or approved equal.

C. Installation of Valves, Fittings, and Hydrants:

1. General: Valves, fittings and hydrants shall be set and joined to the piping system as specified for cleaning, laying and joining pipe.

2. Valves and Valve Boxes: Cast iron valve boxes shall be firmly supported, centered and plumb over the operating unit of valve. Box cover shall be set flush with the surface of finished pavement or at such other level as may be directed by the Inspector. Valve rod extension with guide shall be required to maintain a maximum distance of 2'-4" from operating nut to top of box. All valves shall be properly restrained.

Valve boxes not located in pavement or concrete shall have a 2 foot square by 4" thick concrete pad poured around them. Concrete pad shall be neatly formed with a troweled finish. Concrete shall be minimum 3,000 psi concrete. In limited circumstances, such as when the valve box is located in a narrow ditch bottom (a situation that should be avoided if possible) and pouring the pad would require widening the ditch, the Inspector may waive the requirement for the concrete pad or reduce the dimensions of the concrete pad.

3. Cross Connections: Drainage branches or blow-offs shall not be connected to any sewer, submerged in any stream or installed in any manner which, in the opinion of the Inspector, will constitute a contamination or cross-connection hazard.

4. Hydrants:

Connection to Main: Each hydrant shall be blocked and/or restrained and connected to the main as shown in the standard details. Each hydrant shall be provided with a minimum 6" diameter branch, controlled by an independent 6" gate or resilient seat gate valve.

Setting of Hydrants: When hydrants are set, a drainage pit two feet in diameter and two feet below the bowl of the hydrant shall be excavated.

All hydrant valves shall be restrained to the hydrant tee on the main line.

The pit shall be filled with coarse gravel or #57 clean stone, mixed with coarse sand, to a level of 6" above the weephole. No hydrant drainage pit shall be connected to a sewer. The bowls of all hydrants shall be well braced against unexcavated earth with suitable concrete blocking, and when directed shall be restrained to the pipe with approved harnessing. All hydrants shall be thoroughly cleaned of dirt or foreign matter before setting.

5. Anchorage of Fittings: All fittings (i.e., each bend, tee, plug, valve and cap) shall be prevented from moving by means of adequate thrust reaction blocking and/or mechanical restraints, as shown in the standard details.

D. Installation of Fabricated Steel Tapping Sleeves:

1. General: The following testing and conditions apply to all sleeves:
  - a. The tapping sleeve shall be tested in place to a minimum of 200 psi, for a minimum of 10 minutes with no loss of pressure.
  - b. If the sleeve fails the 200 psi pressure test, the original failed sleeve shall be replaced with an entirely new sleeve.
  - c. Tapping sleeves 16" and larger shall be supported by a concrete pedestal support, as shown in the Standard Details.
2. For Rockwell Tapping Sleeves in addition to the conditions outlined in 1 above, the following procedures must be followed by the Contractor:
  - a. Clean pipe surface thoroughly, particularly in the area where the gasket will seal. The Contractor shall wipe the pipe in the area where the tap is to be made with a 1% chlorine solution prior to installing the sleeve.
  - b. Lubricate pipe and gasket with soap and water. Under no condition shall antifreeze be used.
  - c. Mount body halves on pipe. Contractor shall ensure gasket is secure in gasket groove.

Contractor shall ensure that the tapping nipple is pointing in its final direction so it will not be moved or rotated on the pipe.
  - d. Insert bolts and hand tighten nuts, keeping equal gaps between body halves.
  - e. Prior to tightening nuts, position outlet as required to suit the installation. Contractor shall ensure test connection is accessible.
  - f. Tighten bolts, alternating from one side to the other to equalize the gap between halves. Continue to tighten bolts until sleeve halves conform to the contour of the pipe and all bolts are to a uniform tightness. The required torque for dry threads will be 70-100 ft. lbs. (Lubricated threads 35-50 ft. lbs.) On thin wall or badly corroded pipe care should be taken to prevent crushing or collapsing of the pipe.
  - g. A pressure test is required prior to tapping to test the sleeve and valve in place.

Prior to pressure testing, the Inspector shall obtain a reading of line pressure in the system, either from a hydrant or a service. The pressure test should be at 2 ½ times line pressure or 200 psi, whichever is greater. The

duration of this pressure test shall be a minimum of ten minutes. If the sleeve fails the pressure test it shall be completely removed and returned and a new sleeve used. The tapping sleeve, valve and tapping machine assembly is to be adequately supported during the tapping operation to prevent movement or rotation of the tapping sleeve.

h. Proceed with tapping operation.

Contractor shall complete tapping procedure and perform the necessary checking as required. Contractor shall furnish the Inspector with the tap coupon.

i. Check the bolts for tightness and re-torque, if required.

E. Installation of Services

1. 3/4" and 1"

a. Taps shall be made on a 45° angle.

b. Corporation stops shall have "cc" thread inlet and compression fitting.

c. Tap shall be made with a tapping machine equipped with a bit designed for the type of pipe being tapped.

d. Distance between taps or from a joint or bell shall be a minimum of 18".

e. Service pipe shall be type "K" soft copper.

f. Services shall be installed with 42" minimum cover up to meter yoke where yoke shall be installed so that meter will set 12"-18" below finished grade.

g. Meter yokes shall be from approved materials list and be installed with a tail piece of type "K" soft copper, 36" long.

h. Meter yoke and box shall be set 1' inside right-of-way or easement or as directed by the Inspector. Meters shall be installed on reasonably level ground or conform to the angle of the slope.

i. Backfill shall be hand tamped up to service pipe at tap to prevent corporation stop from being broken off during backfilling.

j. Traffic box to be of cast iron in driveways.

2. 1½” and 2” Services
  - a. Taps shall be made on a 45° angle.
  - b. Corporation stops shall have “cc” thread inlet and copper flare outlet if copper service is used.
  - c. Tap shall be made with a tapping machine equipped with a bit designed for the type of pipe being tapped.
  - d. Distance between taps or from a joint or bell shall be a minimum of 18”.
  - e. Service pipe shall be type “K” hard copper.
  - f. Services shall be installed with 42” minimum cover up to meter yoke where yoke shall be installed so that meter will set 12”-18” from finished grade.
  - g. Meter yokes shall be from approved materials list and be installed with a tail piece of type “K” soft copper, 36” long.
  - h. Meter yoke and box shall be set 1 foot inside right-of-way or easement or as directed by the Inspector. Meters shall be installed on reasonable level ground or conform to the angle of the slope.
  - i. Backfill shall be hand tamped up to service pipe at tap to prevent corporation stop from being broken off during backfilling.

#### **2.4.3.2 Testing Of Water Distribution System**

##### **A. Testing Techniques for Water Distribution System:**

1. Each properly isolated section of the piping system including all water services, shall be subjected to a pressure test of 150 psi, or 1-1/2 times the working pressure whichever is greater, measured at the high point of the system. Maintain this pressure for a minimum of two hours with an allowable leakage as reflected in the Standard Details. Prior to applying pressure to the lines, all reaction blocking, and/or mechanical restraints shall have been completed to the satisfaction of the Inspector. As the pipes are being filled, all air shall be expelled from the pipes by providing manual air relief valves at the high points of the system.

Any defects discovered during this test shall be repaired and the test repeated until the results are satisfactory to the Inspector. The Contractor shall provide all equipment, materials and labor necessary to conduct the test. The Contractor shall provide a suitable test pump and properly calibrated gauge or other means for measuring leakage to include, a clean 50 gallon barrel with top cut out, etc., which is satisfactory to the Inspector.

2. Water from the County's water system shall be used for flushing, sterilization and testing. Filling of water main may be performed provided permission has been obtained from the Inspector who will be responsible for coordinating this activity with the County's Operations and Maintenance Sections. Contractor is not permitted to operate valves on existing lines unless approved by the County's Inspector.

#### 2.4.3.3 Disinfection

A. Prior to being placed in service, the pipe line and appurtenances shall be disinfected in general accordance with ANSI/AWWA C651, latest edition; AWWA Standard for **Disinfecting Water Mains** and the supplemental procedures as set forth below.

1. Section 3 of AWWA C651 emphasizes six basic procedures in the disinfection process. These procedures are to:
  - a. prevent contaminating materials from entering the water main during storage, construction, or repair;
  - b. remove, by flushing or other means, those materials that may have entered the water main;
  - c. chlorinate any residual contamination that may remain, and flush the chlorinated water from the main;
  - d. protect the existing distribution system from backflow due to hydrostatic pressure test and disinfection procedures;
  - e. determine the bacteriological quality by laboratory test after disinfection; and
  - f. make final connection of the approved new water main to the active distribution system.

2. Preliminary Flushing:

The main shall be flushed prior to disinfection at a velocity of not less than 2.5 ft/s unless the County determines that conditions will not permit the required flow. See table "Flushing Schedule". Adequate provisions shall be made by the Contractor for disposal and neutralization of flushing water so that no physical or environmental damage results. Contractor will find additional instructions on flushing in the supplemental procedures within this section.

3. Forms of Chlorine for Disinfection:

It is the Contractor's responsibility to be familiar with and have available for his employees the "Product Data Safety Sheets" of any products used as a source of chlorine and to provide the proper safety instructions and personal

protective equipment to the employees mixing and using materials for disinfection of the water facilities.

a. Acceptable sources of chlorine for disinfection may be obtained from any of the following four sources:

- 1) Liquid sodium hypochlorite (household bleach).
- 2) Liquid sodium hypochlorite (industrial strength).
- 3) Calcium hypochlorite granules.
- 4) Calcium hypochlorite pills affixed to the interior of water pipe. Adhesives used to fix the hypochlorite pills to the interior of the pipe must be FDA approved (food grade) adhesives.

Sources of chlorine shall be in conformance with AWWA B300 Standard for Hypochlorites, and NSF 60 and 61.

b. Only under extreme conditions and with the written approval of the County and under the direction of a holder of a State of Virginia Class III (or higher) water works operator's license can chlorine gas, regulated through proper metering equipment, be mixed with water to obtain a suitable disinfecting solution.

c. The direct introduction of chlorine gas (or liquid) from a pressure cylinder into a water main is not safe and shall not be allowed.

d. The mixing of a source of chlorine to obtain a suitable disinfecting solution shall be as follows:

- 1) Liquid sodium hypochlorite is supplied in strengths from 5.25 percent available chlorine (commercially available household bleach) to 15 percent available chlorine (industrial strength sodium hypochlorite). A water-sodium hypochlorite solution shall be prepared by adding liquid sodium hypochlorite to water.
- 2) A water calcium hypochlorite solution shall be prepared by dissolving calcium hypochlorite granules containing 65% available chlorine by weight in a pre-determined volume of water to make the desired water-calcium hypochlorite concentration. Disinfection of new mains by water calcium hypochlorite solution shall not be used unless a suction or in-line strainer is available on the solution pump to prevent any undissolved solids from entering the piping. An alternative method of straining the solution to remove undissolved granules may be approved by the Inspector on a case-by-case basis.

3) A water-chlorine gas solution may be used only when suitable equipment is available and shall be done under the direct supervision of a person familiar with the physiological, chemical, and physical properties of this element and who has a State of Virginia Class III or above water works operator's license and is properly trained and equipped to handle any emergency that may arise.

4) The direct introduction of chlorine gas (or liquid) from a pressure cylinder into a water main is not safe and shall not be allowed.

4. Method of Chlorine Application and Testing:

a. The continuous feed method of applying the disinfecting solution shall be as follows: Water from the existing distribution system or other approved sources of potable water supply shall flow through an approved flushing mechanism at a constant, measured rate into the newly-laid pipeline. The water shall be mixed with a chlorine-water solution as prepared above, also fed at a constant, measured rate. The two rates shall be proportioned so that the chlorine concentration of the water and water/chlorine solution in the pipe is elevated to and maintained at, a minimum of 50 mg/l available chlorine.

Since the forms of preparation for a water-sodium hypochlorite or water-calcium hypochlorite concentration are a batch process, a method acceptable to the Inspector shall be available to replenish the concentration being fed and mixed with the water flow, so there is no interruption of the flow of disinfection solution.

To assure that this concentration is maintained, the chlorine residual shall be measured at intervals not exceeding 2,000 feet and at the end of all branch lines or cul-de-sacs in accordance with the procedures outlined herein. During the application of the chlorine-water solution, valves, hydrants and any other appurtenances shall be operated in order to be thoroughly disinfected. Chlorine-water solution application shall continue until the entire new main is filled with water having a residual of a minimum of 50 mg/l chlorine solution. The chlorinated water shall be retained in the main for at least 24 hours. The free chlorine residual must be at least 10 mg/l after 24 hours in accordance with AWWA C651.

B. After the applicable retention period, the heavily chlorinated water shall be flushed from the main until the chlorine residual of the water leaving the main is equal to the chlorine residual of the incoming system water. At that time, the new system shall be valved off to allow the residual to dissipate to 0.2 mg/l before taking samples for bacteriological

analysis. Additional instructions for disposal of the heavily chlorinated water are covered later in this section.

B. Bacteriological Tests:

1. After final flushing, and before the water main is placed in service, samples shall be collected and tested for bacteriological quality. Two consecutive negative tests from the same location shall show the absence of coliform organisms. At least two samples shall be collected by the County at least 24 hours apart at intervals determined by the Inspector (not exceeding 2,000 feet apart and at the end of all branch lines and cul-de-sacs) and tested by a qualified laboratory selected by the County. The County shall bill the Contractor a standard fee, to be set by the County, for this service including all retests.

2. Samples for bacteriological analysis shall be collected in approved sterile bottles or bags treated with sodium thiosulfate. If laboratory results indicate the presence of coliform bacteria, the samples are unsatisfactory and disinfection shall be repeated as prescribed above until the samples are satisfactory. Cleaning, disinfection and testing shall be under the direction of the Inspector but remains the responsibility of the Contractor. The Contractor shall be responsible for any cost associated with the loading, hauling, discharging and dechlorination of the heavily chlorinated water.

#### **2.4.3.4 Supplemental Procedures For Disinfecting, Testing, And Flushing**

A. General:

1. All work shall be performed in general accordance with AWWA C651, latest edition.

2. The supplemental procedures are developed to compliment the AWWA C651 Standard, particularly with respect to flushing, testing and tie-in to the existing water distribution system.

3. These procedures and construction acceptance for final tie-in of a new water main are performance based, predicated on the new construction passing pressure and bacteriological testing. In order to best assure satisfactory bacteriological results, it is essential that all aforementioned preventive and precautionary measures be taken prior to and during construction to protect the interiors of pipe, fittings and valves against contamination. Failure to follow the precautionary measures increases the likelihood of unsatisfactory bacteriological tests and increases the construction requirements necessary for final acceptance. Refer to AWWA C651, Section 4, entitled "Preventive and Corrective Measures During Construction".

4. The table entitled “Flushing Schedule” gives flushing flow rates and flushing mechanism sizes for water mains 6” through 24” in diameter. Specific flushing schedules for line sizes above 24” will be project and site specific and directions will be given on the project drawings.

B. Filling and Testing Procedures:

1. Connection of the new water main to the existing distribution system for filling and testing shall be through a Contractor furnished flushing mechanism. The Contractor is to furnish the single gate valve, double check valve flushing assembly and all necessary fittings, reducers, increases and sleeves to make the piping connections. Assembly shall be approved by the Department of Public Utilities prior to its use. A suitable valved piping arrangement for the addition of the water-chlorine solution is to be available on the new line side of the flushing assembly. The assembly is to be furnished with 125 psi rated flange connections and installed in a manner approved by the Inspector.

2. Initial flush time is to be in accordance with table labeled “Flushing Schedule”.

3. Make any necessary repairs and pressure test again until the line passes this test.

4. Disinfect the line in accordance with AWWA C651, Section 5. A water-chlorine solution prepared in accordance with Section 3.03, A.3 above shall be used for disinfection.

5. Bacteriological samples will be taken in accordance with AWWA C651, Section 7.

6. If unsatisfactory bacteriological test results are received, repeat steps 2, 5 and 6.

7. After receiving satisfactory bacteriological test results, the Contractor shall coordinate with the Inspector the connecting of the new main to the existing system. All connecting pipe and fittings shall be clean and free of debris and shall be swabbed or sprayed with a 1 percent sodium hypochlorite solution before they are installed.

8. Final flush of line to be in accordance with table entitled “Flushing Schedule”.

C. The Disinfection and Supplemental Procedures may be modified by the Director of Public Utilities for site specific problems that do not physically allow for following the normal disinfection procedures. Modified instructions will be given in writing from the Director through the Inspector and will be executed by the Contractor in a manner that does not subject the existing distribution system to undue problems and assures that adequate disinfection and flushing will be given to the new main before placing it into service.

D. Flushing:

Water for filling the line and flushing will be taken from the County's water system. The use of water for making the new water main available for service will be as follows:

1. Initial Flush:

See table entitled "Flushing Schedule". This is to be a high velocity flush through all sections of the new line. Since the large volume of water may have effects on the existing distribution system, the initial flushing is to be done only with the approval of and under the direction of the Inspector. System demands may cause this flushing to be done at times when the existing distribution system demands are low.

Because of the large volume of water to be flushed from the fire hydrants or flushing hydrants, the Contractor must inspect the areas of discharge and provide the necessary equipment or materials to prevent any environmental damage or erosion. Sufficient hose length and termination fittings are to be provided so as to discharge the water into stable, heavily vegetated areas, drainage ponds, storm sewers, paved ditches, etc. The Contractor is to be responsible for any damage that may result from flushing.

2. Flush to remove disinfecting solution:

This is a low velocity, low flow, flush through fire or flushing hydrants to remove the disinfecting solution from the new line. For site specific locations the Inspector may require the use of a neutralizing chemical and piping arrangement. (See drawing WAT-8 in the Standard Details section of these standards). The expense of a neutralizing station is the responsibility of the Developer/Contractor.

3. Final Flush:

See the table below. The final flush is a medium velocity, medium flow flush to clear the line of any chlorine solution used in the tie-in and to provide for fresh water throughout the new lines.

Main size (Nominal )	Double Check Valve Single Gate Size (Note 1)	INITIAL FLUSH (Note 2)	FINAL FLUSH (Note 2)
		Min. Flow (gpm)	Max. Flow (gpm)
6"	4"	220	88
8"	4"	400	160
12"	6"	900	350
16"	6"	1500	624
20"	8"	2450	978
24"	10"	3525	1410
30"	Designed by Consultant	5505	2202
36"	Designed by Consultant	7935	3174

**Flushing Schedule**

Notes:

- 1) Approximation of flushing flows can be made by using either a pitot tube or a method of measuring the static discharge pressure from a hydrant used for discharge of the flushing water.
- 2) On a case-by-case basis, dependent upon such variables as length of new water main (<200’); space limitations; or other unforeseeable obstacles, the Inspector may authorize the use of a smaller flushing device if the use of this device will provide for adequate flushing of the new water main.

**2.4.3.5 Testing Of Double Check Assembly**

- A. The Inspector will be responsible for ensuring the appropriate test is performed up to the outside isolation valve located on the inlet side of the double check assembly.
- B. The Developer is responsible for having the double check assembly tested by an approved tester prior to service being authorized to the building. Tests on the double check assembly will be conducted on an ongoing basis annually by a certified tester approved by the Department of Public Utilities. The results of the test will be sent to the Department of Public Utilities.

**2.4.3.6 Abandonment Of Water Service**

Excavate at the main and expose the corporation stop. Turn off the corporation stop and disconnect the service pipe from the corporation stop. If practical, the corporation stop should be

removed and a screw plug installed in the hole. If it is not practical to remove the corporation stop, provide a screw plug for the corporation stop. If the corporation stop is left in place, assist the Inspector in referencing the location of the corporation stop for County records. Remove the meter box, yoke and service line. The Inspector will deliver the meter to the Customer Service Section of the Department of Public Utilities.

#### **2.4.3.7 Abandonment Of Water Mains**

Water mains and hydrants to be abandoned shall be permanently disconnected from the remaining system. Details of the abandonment shall be approved by the Department on a case-by-case basis.

All open ends on abandoned pipe to be permanently sealed by plugging with masonry and/or mortar or plug. All valve boxes, fire hydrants, flushing hydrants (blow-offs) or other appurtenances shall be removed. Salvageable items shall be returned to the Department of Public Utilities.

#### **2.4.3.8 Clean-Up**

Upon the completion of the installation of the water system and prior to the County acceptance all restoration shall be complete. The work area shall be restored to its original condition and pavement replaced to the satisfaction of VDOT, the Town of Ashland, and/or the County. All trash and debris shall be removed and properly disposed of. Areas not otherwise stabilized shall be seeded and mulched and a good stand of grass established.

End of Section