CHESTERFIELD COUNTY

WATER AND SEWER

SPECIFICATIONS AND PROCEDURES

CHESTERFIELD COUNTY, VIRGINIA

FOURTH EDITION

MAY 2020

The standards and procedures specified herein shall supersede any standards and specifications in previous editions.
# REVISION LOG

## MAY 2020 EDITION

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<td>Removal of Corr-21 by Diamond Plastics in III-2-1</td>
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<td>Removal of port requirement for Resilient Seated Gate Valves in III-3-2</td>
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PART I
WATER AND SEWER PROJECT
DESIGN PROCEDURES
CHESTERFIELD COUNTY, VIRGINIA

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1. **GENERAL**

1.1. **Preliminary Items**

These design guidelines have been prepared to assist engineers preparing plans for water and sanitary sewer projects in Chesterfield County, Virginia. These guidelines are for use by experienced design professionals. Variations will be permitted based solely on sound engineering practice and will be reviewed and approved by the Department of Utilities on an individual basis. Such variations must be requested in writing along with sufficient documentation and justification supporting the need for the variation.

Designs shall be in accordance with the Latest Edition of Waterworks Regulations and Sewerage Collection and Treatment Regulations, Virginia Department of Health, Commonwealth of Virginia and any other local, State or Federal agencies having authority. The engineer shall also comply with the requirements of the County’s subdivision and utilities ordinances as they pertain to water and sewer systems. It is the responsibility of the Engineer to inform developers of the contents as set forth in the applicable local ordinances as it relates to the project under review and consideration by the Department of Utilities.

Prior to construction of public water and/or sanitary sewer facilities, construction drawings for the proposed facilities must be submitted for review to the Department of Utilities, Chesterfield County. The construction drawings must be in a form acceptable to the Department. If deemed necessary by the Department, the developer or his agent shall submit an overall plan for the water and/or sanitary sewer systems for the proposed development. The plan must be submitted to the Department of Utilities for review and approval at least thirty (30) days prior to submission of any schematic, tentative subdivision, construction, or site plan for the property. A detailed checklist of overall plan requirements can be found in Appendix 1 of this document.

It is suggested that, for complex projects and projects which may require special considerations, the engineer arrange a meeting with the Department of Utilities staff to discuss the approach to be taken to supply water and sanitary sewer service. All water and sanitary sewer systems must be located and sized properly to serve the entire service area in conformance with the County’s Comprehensive Plan and/or Water and Wastewater Facilities Plan.

1.2. **Future Planning**

Where it is determined that water and/or sanitary sewer lines are necessary to serve property beyond the proposed subdivision or development, the developer is required to design and construct their systems to permit future extensions that will minimize the disruption and disturbance to the residential or non-residential uses proposed for their property/project.
Unless otherwise approved, all water and/or sanitary sewer lines should generally be
terminated in the vicinity of the limits of the subdivision or development being proposed.

Sanitary sewer extensions planned between residential dwellings shall be constructed to the
rear property line and shall be ductile iron pipe. Elevation of the sewer system must be
designed such that future extensions are taken into consideration to allow service to all the
area which naturally drains towards the system with the exception of the larger development
corridors. Sanitary sewer adjacent to larger development corridors shall be deep enough to
serve areas on both sides of those corridors/roadways when there is no other practical sanitary
sewer service available to that corridor. Deep sanitary sewer lines may require wider easement
widths to accommodate the area needed to properly repair or replace the line and
appurtenances in the future. Public water systems must be designed and constructed along
major roads and/or through the development to allow for future extensions without disruption
of that property’s improvements in the future.

In selecting routes for water and sanitary sewer extensions, the Department requires that the
location be such that it maximizes the service areas of the proposed and/or future
development. The developer shall provide easements acceptable to the county to allow for
the future expansion and extension of the public utility system. Spite strips are strictly
prohibited, and the developer will be responsible for additional easement dedication to
accommodate the future extension as required by the utility contract.

1.3. Contract with Utilities Department

The developer must enter into a contract with the Department before any work begins. A copy
of the Utility Contractor’s bid proposal as accepted by the developer is required to prepare the
contract. The Unit Price Bid Proposals shall be based on the approved water and/or sanitary
sewer plans. A contractor with a Class A license in heavy and highway construction must
perform all work, or as deemed acceptable to the Department of Utilities. Appendix 2 provides
a checklist of items to be completed prior to utilities construction. Appendix 3 must be
completed and provided to the Utilities Department to prepare the contract.

1.4. Refunds

Where refunds may be involved, the developer is required to adhere in strict accordance with
the applicable sections of the Chesterfield County Code. The Board of Supervisors must
approve the contracts where refunds are involved prior to the beginning of construction.
Pursuant to the definition, terms, and conditions as set forth in the Chesterfield County Code-
Sections 18-1 (a), (v) & (w), 18-51, 18-53, 18-54, 18-55, 18-55.1, and 18-56, all extensions of the
public water and sewer systems shall apply.
1.5. Contacting Property Owners

Prior to performing any survey and design work on private property, the engineer/surveyor shall notify all landowners that may be affected by the design or installation of the proposed utility line. Notification shall be made in the form of a letter to be sent to the property owner a minimum of ten (10) days before commencing work. Copies of such letters shall be provided to the Utilities Department along with the initial plan submittal. (See sample letter-Appendix 4)

1.6. Construction Drawings

Construction drawings shall contain the information necessary, presented in a clear and legible manner, to construct the utility.

The engineer shall coordinate the location of all proposed water and/or sanitary sewer lines within all existing and proposed road rights-of-way accounting for all existing and proposed infrastructure. In addition, coordination shall be made with other appropriate utility companies and agencies regarding their existing easements, rights-of-way, and facilities.

Where the possibilities of conflicts with existing utilities exist, it shall be the Engineer’s responsibility to secure accurate information on the horizontal and vertical location of such utilities through subsurface exploration.

Construction drawing requirements are summarized in Appendix 5, Engineers Checklist for Water and Sewer Plans. The plans will be reviewed and review comments will be sent to the engineer. When the revisions are made, the engineer must resubmit the plans for additional review. A letter of approval will be sent when all the County criteria are met.

The county’s preference for vertical datum for surveys shall be NVGD 29, however other methods are acceptable with adequately supplied benchmarks on the construction plans.

Horizontal control shall be based on Virginia State Plane Coordinate Grid, South Zone, North American Datum of 1983 (NAD 83) by a minimum of two coordinate points.
2. **SANITARY SEWERS**

2.1. **Sanitary Sewer Location**

2.1.1. **General**

All sanitary sewers located as described in the General Section and in existing or proposed streets shall be constructed along the center of the street. Exceptions to this specified location will be allowed only when it has been shown that it is not practicable to adhere to the standard location. All sanitary sewers shall be laid on a straight line between manholes.

In a parallel installation sanitary sewer lines or manholes shall be at least 10 feet horizontally from any water main whenever possible. The distance shall be measured edge to edge between the affective structures.

2.1.2. **Separation of Water and Sewer**

When local conditions prevent a horizontal separation of 10 feet, a sanitary sewer may be closer to a water line if:

1. The bottom of the water main is at least 18 inches above the top of the sewer.
2. Where the vertical separation cannot be obtained, the sewer shall be constructed of AWWA approved ductile iron (Class 52) water pipe and shall be pressure tested to ensure water tightness prior to backfilling.
3. The sanitary sewer manhole shall be of watertight construction and be tested in place by vacuum testing.

In a crossing installation, sanitary sewers crossing water mains shall be laid to provide a separation of at least 18 inches between the bottom of the water main and the top of the sewer.

When conditions prevent a vertical separation of 18 inches, the following shall be used:

1. Sewers passing over or under water mains shall be in accordance with Item 2 above.
2. Water mains passing under sanitary sewers shall, in addition, be protected by providing:
   A. A vertical separation of at least 18 inches between the bottom of the sewer and the top of the water main.
   B. Adequate structural support for the sewers to prevent excessive deflection of the joints and settling on and breaking of the water mains.
   C. A section of water pipe centered at the point of crossing so that the joints will be equidistant and as far as possible from the sewer.

No water pipe shall pass through or come in contact with any part of a sewer manhole.
Where the sanitary sewer is installed parallel to a storm drainage structure, there shall be at least 10 feet horizontally, measured center to center, between them.

### 2.1.3. Subsurface Utility Locating

Where sanitary sewers must cross existing buried utilities that are considered immovable and are expected to have a variable depth, the engineer shall be required to physically locate the top of the buried utility using “potholing” or other approved Quality Level subsurface utility locating method during the design phase. Items considered immovable include, but are not limited to, water transmission mains and sewer force mains 16 inches in diameter or larger, water mains serving “Water Dependent Customers”, communications duct banks, and gas transmission mains.

### 2.1.4. Sidewalks

Design of sanitary sewer lines and laterals as it relates to sidewalks must be designed to accommodate at least a 10-foot horizontal separation between the County’s public sewer mains. If sidewalks are designed within the public road right-of-way, the end of the sewer lateral must be designed 3 feet behind the house side of the sidewalk or to the right-of-way line, whichever is greater. If sidewalks are designed outside of the public right-of-way and are less than 5 feet from the right-of-way line, the end of the sewer lateral must be designed 3 feet behind the house side of the sidewalk. If the sidewalks are designed outside of the public right-of-way and are more than 5 feet from the right-of-way line, the sewer services must be designed within 1 foot of the right-of-way line.

### 2.1.5. Location Between Subdivision Lots

Sanitary sewer lines located in easements between subdivision building lots shall be ductile iron and extended to the rear property line terminating in a manhole. Minimum easement width shall be 20 feet when between subdivision building lots.

### 2.1.6. Proximity to Curb

The Engineer shall avoid design of sanitary sewer under concrete curb and gutter wherever possible. In locations where the sanitary sewer centerline is within 5 feet of the face of curb, the entire width and depth of the trench shall be backfilled with stone. The stone backfill shall extend 5 feet linearly from the curb and gutter crossing and shall be depicted on the profile view.

### 2.1.7. Casing Pipe Requirements

All sanitary sewer line crossings of railroads and, where required, roadways, and other major structures shall be encased in a casing pipe. A manhole shall be located on either side of the
cased crossing at a minimum distance of 50 feet from the end of the casing pipe. Design of railroad crossings shall comply with the requirements of American Railway Engineering Association Specifications; Part 5- Pipelines (latest revisions). The engineer shall be responsible for the preparation of the necessary application, at least 180 days in advance of construction or advertisement for bid, for submission by the County to the railroad or in a timely fashion as determined by the Department and/or the Engineer.

Carrier pipe within bores for sanitary sewer installation shall be Ductile Iron (Class 52) or C-900 PVC DR 18 (Class 150) and is to be used from manhole to manhole. Carrier pipe shall be restrained. There are to be no lateral connections on the line between the manhole and the casing pipe.

2.1.8. Crossing Waterways

The tops of all sewers entering or crossing streams shall be a sufficient depth below the natural bottom of the streambed to protect the sewer line. In general, one foot of suitable cover shall be provided where the stream is in rock and three feet of suitable cover in other material. Less cover will be considered if the proposed sewer crossing is ductile iron pipe and will not interfere with future improvements to the stream channel.

All sewer pipe within a 100-year backwater where cover is less than 3.0 feet shall be of non-float pipe. Other anti-floatation methods or devices will be considered on an individual basis.

Clay dams shall be utilized where the possibility exists that ground or surface water will follow the sewer trench, causing damage, or undermining of pipe bedding.

In paved channels, the top of the sewer lines shall be placed at least 18” below the bottom of the channel pavement.

Sanitary sewers shall remain fully operational during the 100-year flood. Sewers and their appurtenances located along streams shall be protected against the normal range of high and low water conditions, including the 100-year flood. Sewers located along streams shall be located outside of the streambed and sufficiently removed there from to provide for future possible channel widening.

Sewers entering or crossing streams, estuaries, lakes, or reservoirs shall be constructed of water tight pipe. The pipe and joints shall be tested in place and shall exhibit zero infiltration.

Sewers laid on piers across ravines or streams shall be allowed only when it can be demonstrated that no other practical alternative exists. Such sewers on piers shall be restrained joint ductile iron. These sewers shall be constructed so that they will remain water tight and free from change in alignment or grade due to anticipated hydraulic and physical loads, erosion, and impact.
2.1.9. Pipe Encasement

Polywrapping of ductile iron sewer pipe will be required from manhole to manhole when pipe is laid through wetlands or other areas where aggressive soils are known to exist. Engineer shall perform necessary testing to determine when warranted.

2.1.10. Pipes in Fill

Sanitary sewers constructed in fill shall be of ductile iron pipe (Class 52) with manholes founded on original ground.

2.1.11. Steep Grades

In cases where sanitary sewers are to be constructed on steep grades and velocities greater than 15 feet per second are indicated, solid wall PVC pipe or other abrasion resistant material shall be used.

In addition, sewers laid on a slope of 20 percent or greater shall be anchored securely with concrete anchors or other approved means. Suggested minimum anchorage is as follows but should be determined by the engineer:

1. Not over 36 feet center to center on grades 20 percent to 35 percent.
2. Not over 24 feet center to center on grades 35 percent to 50 percent.
3. Not over 16 feet center to center of grades 50 percent and over.

2.2. Depth of Sanitary Sewer Lines

All sewer lines within existing or proposed streets or areas subject to traffic shall be constructed to provide a minimum cover of 6’ over the pipe. Greater depths shall be required to serve low properties, where street grades may be lowered in the future, where there is a possibility of further extension of the sewer line, or where clearance must be provided for other utilities. Clearance shall be provided for enlargement of undersized drainage structures. Minimum cover for sewer lines in easements shall be 3.5 feet. Where cover over PVC sanitary sewer lines is between 14 feet and 20 feet, an extra foot of stone shall be placed over the pipe. Where cover over sanitary sewer pipe will exceed 20 feet, ductile iron pipe (Class 52) with corrosion resistant lining shall be used.

Unless required for a future sewer extension, sewer depths greater than 14 feet cover shall be avoided when possible. Sanitary sewers with depths exceeding 14 feet of cover may be subject to additional requirements such as wider permanent easement, restraint of parallel water main, special lateral designs, or special pipe protection depending on the application.
2.3. **Sanitary Sewer Manholes:**

2.3.1. **General**

Manholes shall be constructed in accordance with Chesterfield County standards and details. Manholes shall be located at the end of each line, at all changes in pipe size, alignment, grade and at sewer junctions. Maximum spacing between manholes on straight runs shall be 400 feet for all sewers.

Manholes located outside of paved areas or maintained areas shall be constructed so that the frame and cover are 18 inches above the finished grade.

Manhole inserts are to be used in all manholes where the frame and cover are flush with the finished grade. Manhole inserts shall not be placed in sampling manholes.

2.3.2. **Manholes in Flood Areas**

Manholes subject to flooding shall be easily accessible and have watertight manhole covers. All manhole rims shall be 6 inches above the 100-year flood elevation, except where the rim would be more than 4 feet above the existing grade in which case watertight covers shall be used and manhole be set at a height 4 feet above final grade. Unvented sections of sewer shall not exceed 1,000 feet in length.

2.3.3. **Manholes in Easements with Shared Use Paths**

Vandal proof manhole covers shall be used when the sewer is constructed in an easement that is also used as a walking or multipurpose trail or path.

2.3.4. **Inverts**

Sewer inverts of the same diameter shall maintain a 0.1 foot drop whenever possible. Sewer inverts of different diameters shall match crowns. Drop manholes shall be used when the spring line elevation of the incoming sewer line exceeds the spring line elevation of the outgoing sewer line by 2 feet or greater. Interior drop manholes are preferred in most cases.

2.3.5. **Sampling Manholes**

Sampling manholes shall be required for the following:

- Businesses that generate any process wastewater other than normal domestic wastewater.
- Businesses that store any chemicals on site.
- Industrial/ Processing/Manufacturing
- Facilities that discharge over 25,000 gallons per day.
• Hospitals; dental and medical office buildings, veterinary offices
• Drug stores/pharmacies
• Food service establishments and other facilities with commercial kitchens: grocery stores, convenience stores, child care, schools, churches, assisted living.
• Strip malls/multi-unit building
• Restaurants
• Vehicle washing facilities
• Automotive Shops
• Machine Shops
• Warehouse/wholesale distribution
• Packaging/Repackaging
• Laboratories
• Laundries

Sampling manhole shall be part of the private plumbing system located outside of public easements and right-of-way and designed and located to facilitate the collecting of samples by County Staff. Whenever practicable, they should be located outside of traffic areas. For uses that require grease interceptors, grit chambers, and/or oil and water separators, the sampling manhole shall be located at a point downstream of the domestic connection to capture the combined flow.

2.4. Service Connections

Service connections shall be provided in accordance with existing County ordinances, specifications, and details. Plugged service connections are to be provided when required by the Department of Utilities for all lots and parcels within the new development. A minimum size of 6” diameter pipe is required for sewer lateral connections.

All service connections to the public sewer system shall be made to gravity sewer lines. No private connections shall be made to public force mains. Connections from individual private sewage pumps shall be made to laterals at the property line and not directly into a manhole.

Service connections shall be provided at manholes whenever possible. Special designs may be required for service connections exceeding 14 feet of cover. Service connection on ductile iron sewer lines shall also be ductile iron.

2.5. Structural Design

Structural requirements must be considered in the design of all sanitary sewers and appurtenances. This is a matter of detail design and is not subject to simple generalization. The following criteria should be considered by the design engineer:
1. Special Structures-Whenever possible sanitary sewer structures shall be built as shown in the standard details. Structures other than those shown in the standard details shall be considered special structures and shall be designed and detailed by the design engineer.

2. Pipe Foundation-In all cases the proper strength sewer pipe shall be specified for the proposed depth, width of trench and bedding condition. Soil condition should be considered with samples being obtained where necessary to verify pipe selection and foundation design.

### 2.6. Hydraulic Design for Sanitary Sewers

#### 2.6.1. Quantity of Flow

The quantity of sewage for design purpose shall be determined by the future requirements of the total drainage area tributary to the section of sewer under consideration.

Average quantities of sewage, shall be computed as follows:

<table>
<thead>
<tr>
<th>Development Land Use</th>
<th>Gallons per day per acre</th>
<th>Equivalent Persons/Acre</th>
</tr>
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<tbody>
<tr>
<td>Low Density Residential</td>
<td>350</td>
<td>3.5</td>
</tr>
<tr>
<td>Suburban Residential I</td>
<td>700</td>
<td>7</td>
</tr>
<tr>
<td>Suburban Residential II</td>
<td>1,400</td>
<td>14</td>
</tr>
<tr>
<td>Medium-High Density Residential</td>
<td>2,100</td>
<td>21</td>
</tr>
<tr>
<td>High Density Residential</td>
<td>3,500</td>
<td>35</td>
</tr>
<tr>
<td>Office</td>
<td>1,500</td>
<td>15</td>
</tr>
<tr>
<td>Retail</td>
<td>2,000</td>
<td>20</td>
</tr>
<tr>
<td>Residential Mixed Use</td>
<td>4,500</td>
<td>45</td>
</tr>
<tr>
<td>Community Mixed Use</td>
<td>4,500</td>
<td>45</td>
</tr>
<tr>
<td>Regional Mixed Use</td>
<td>7,500</td>
<td>75</td>
</tr>
<tr>
<td>Light Industrial</td>
<td>2,000</td>
<td>20</td>
</tr>
<tr>
<td>Medium and Heavy Industrial</td>
<td>3,500</td>
<td>35</td>
</tr>
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</table>

Where site determinations can be made, sewage flows may be determined by using the following design information:

<table>
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<tr>
<th>Discharge Facility</th>
<th>Design Units</th>
<th>Flow gpd</th>
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<tbody>
<tr>
<td>Residential Units</td>
<td>3.5 people/dwelling</td>
<td>350</td>
</tr>
<tr>
<td>(a) Single Family Units</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Includes Townhouses, Individual House Trailers, etc</td>
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Revised: I-2-7
Chesterfield County WSSP
Fourth Edition
### (b) Apartments and Condominiums

<table>
<thead>
<tr>
<th>Number of People/Room Type</th>
<th>Rate (per unit)</th>
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<tbody>
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<td>4 people/3 bedroom apt.</td>
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</tr>
<tr>
<td>3 people/2 bedroom apt.</td>
<td>300</td>
</tr>
<tr>
<td>2 people/1 bedroom apt.</td>
<td>200</td>
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### Schools with Showers and Cafeteria

<table>
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<th>Rate (per person)</th>
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<tbody>
<tr>
<td>Elementary</td>
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<tr>
<td>High School</td>
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### Motels and Hotels at 65 gals/person (rooms only)

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<tr>
<th>Type</th>
<th>Rate (per room)</th>
</tr>
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<td>130</td>
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### Manufactured Home Parks at 3 persons/trailer

<table>
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<th>Type</th>
<th>Rate (per manufactured home)</th>
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<td></td>
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### Restaurants

<table>
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<th>Type</th>
<th>Rate (per seat)</th>
</tr>
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<td>50</td>
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### Service Stations

<table>
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<tr>
<th>Type</th>
<th>Rate (per vehicle serviced)</th>
</tr>
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<tr>
<td></td>
<td>10</td>
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</tbody>
</table>

### Factories

<table>
<thead>
<tr>
<th>Type</th>
<th>Rate (per person per 8 hr. shift)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>25 + process water</td>
</tr>
</tbody>
</table>

### Shopping Centers

<table>
<thead>
<tr>
<th>Type</th>
<th>Rate (per 1000 ft.² of ultimate floor space)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>250</td>
</tr>
</tbody>
</table>

### Hospitals

<table>
<thead>
<tr>
<th>Type</th>
<th>Rate (per bed)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>300</td>
</tr>
</tbody>
</table>

### Nursing Homes

<table>
<thead>
<tr>
<th>Type</th>
<th>Rate (per bed)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>200</td>
</tr>
</tbody>
</table>

### Homes for the Aged

<table>
<thead>
<tr>
<th>Type</th>
<th>Rate (per bed)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>100</td>
</tr>
</tbody>
</table>

### Doctors Office in Medical Center

<table>
<thead>
<tr>
<th>Type</th>
<th>Rate (per 1000 ft.²)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>500</td>
</tr>
</tbody>
</table>

### Laundromats

<table>
<thead>
<tr>
<th>Type</th>
<th>Rate (per machine)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>500</td>
</tr>
</tbody>
</table>

### Theaters, Auditorium Type

<table>
<thead>
<tr>
<th>Type</th>
<th>Rate (per seat)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>5</td>
</tr>
</tbody>
</table>

### Bowling Alleys

<table>
<thead>
<tr>
<th>Type</th>
<th>Rate (per lane)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>75</td>
</tr>
</tbody>
</table>

### Office Buildings

<table>
<thead>
<tr>
<th>Type</th>
<th>Rate (per 1000 ft.² of ultimate floor space)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>200</td>
</tr>
</tbody>
</table>

**NOTE:** Other classifications may be found in the Virginia Department of Health Sewage Collection and Treatment Regulations, latest edition.

### 2.6.2. Peaking Factor

Design flow shall be determined by using the peaking formula as follows:

\[ Q_d = \begin{cases} 
3.5 Q_a & \text{for average flows 0-18 mgd, } Q_a < 18 \\
2Q_a & \text{for average flows over 18 mgd, } Q_a \geq 18 
\end{cases} \]
### 2.6.3. Design Criteria

The engineer should ensure that the following design criteria are adhered to:

1. Sewers shall have a continuous slope, straight alignment and uniform pipe material between manholes.

2. At all junctions where a smaller diameter sewer discharges into a larger one, and at all locations where the line increases in size, lines shall be installed so crown elevations match.

3. Sewers shall be designed to be free flowing with the hydraulic grade below the crown and with hydraulic slopes sufficient to provide an average velocity, when flowing full, of not less than 2.25 feet per second. Computations of velocity of flow shall be based on a value of “n” = 0.012 as used in the Kutter or Manning formula for velocity of flow.

4. In cases where the calculated depth of flow is less than pipe flowing full the velocity at actual depth of flow should be computed. For sewage flow depth less than ¼ full, allowance should be made for increased value of “n”. In no case should velocities of less than 1.3 feet per second be permitted. Increased velocities shall be accomplished by steeper grades.

5. The following are minimum slopes in feet per hundred feet to be provided for pipes flowing 1/4 of full depth to full depth:

<table>
<thead>
<tr>
<th>Pipe Size</th>
<th>8”</th>
<th>10”</th>
<th>12”</th>
<th>15”</th>
<th>18”</th>
<th>21”</th>
<th>24”</th>
<th>27”</th>
<th>30”</th>
<th>36”</th>
</tr>
</thead>
<tbody>
<tr>
<td>Slope %</td>
<td>.40</td>
<td>.32</td>
<td>.24</td>
<td>.20</td>
<td>.16</td>
<td>.12</td>
<td>.10</td>
<td>.08</td>
<td>.07</td>
<td>.06</td>
</tr>
</tbody>
</table>

6. A minimum slope of 0.52% shall be maintained for terminal 8” lines not likely to be extended.

7. Minimum pipe size between manholes shall be 8”. This does not apply to private onsite sewer systems with sampling manholes.

8. In cases where sewers are to be constructed on steep grades for which high velocities are indicated, the maximum permissible velocity at average flow (before applying peak flow factor) should not exceed 15 feet per second. Suitable drop manholes shall be provided to break the steep slopes and to limit velocities to not more than 15 feet per second in the connecting sewer pipes between manholes.

9. Where drop manholes are impracticable for reduction of high velocity, the sewer shall be of solid wall PVC pipe or other abrasion resistant material.

10. Miscellaneous head losses at manholes, curves and junctions shall be estimated and allowed for as follows:

   a. At manholes on straight runs allow head loss = -0.05 feet.

   b. 90 degree turns made inside of manholes, where the radius of turn is less than 2 pipe diameters allow 0.50 V²/2g. If the radius of turn is greater than 2 pipe
diameters, allow 0.25 V²/2g. In no case should the total allowance be less than 0.05 ft.

11. In general, the pipe diameter should be continually increasing with increase in tributary flow. Where steep ground slopes make possible the use of a reduced pipe size and substantial economy of construction costs is thereby indicated, the pipe size may be reduced but hydraulic allowances shall be made to provide for head loss at entry, increased velocity and effect of velocity retardation at the lower end where the flow will be on flatter slopes. In no case should pipe sizes be reduced more than one nominal size in diameter.

2.6.4. Hydraulic Calculations

Hydraulic computations shall be submitted to the Department of Utilities for approval. Engineer shall submit with all sewer plans the information and calculations of sewer flow demands for the project. The hydraulic analysis form for sanitary sewer design (Detail DES-1) shall be included on all construction plans with proposed sanitary sewer larger than 8 inches.

2.7. Sewage Pump Stations and Force Mains

2.7.1. Pump Station Requirements

Sewage pump stations will be used when it has been determined to be the only practical way to provide sanitary service based upon a finding that:

1. It is economically impractical to extend the gravity sewer and the use of a pump station will not adversely affect the County’s ability to serve the area with a gravity sewer at a future time; and
2. The proposed design and plan for the pump station and connecting lines do not adversely affect the current financial status of the County utility system or the future ability of the County to install a gravity sewer; and
3. The proposed design of the pump station permits replacement of the pump station with a gravity sewer without significant capital outlay at a future time; and
4. The pump station will not overload the existing sewage facilities and will not otherwise negatively affect the County’s ability to efficiently manage the sewer system.

The design of the sewage pumping facility shall be discussed with staff and the required design criteria determined. At a minimum, the following data shall be provided:

1. Structural design and calculations, including reinforcing drawings where applicable, of the facility.
2. Hydraulic design for the equipment selected, including scaled drawings.
3. The pump curve, system curve, and wet well calculations shall be included on the plan sheets.
4. Electrical and mechanical drawings and specifications for the equipment selected.

5. Job Specifications to include but not limited to Appendix 9, “Standard Procedures for the County’s Acceptance of Newly Constructed Pumping Stations”.

2.7.2. Force Main Requirements

Sanitary sewage force mains shall be ductile iron (Class 52) with acid resistant lining or approved equal, with a higher class if the design parameters require a thicker pipe. Force mains are to be designed with a minimum flow velocity of 3.0 feet per second, a maximum flow velocity of 8.0 feet per second, and a Hazen-Williams “C” value of 120. Minimum size shall be 4 inches in diameter. A constant grade shall be used where feasible. Minimum ground cover shall be same as required for water lines or deeper where necessary to accommodate water services and/or future water lines, etc. Plug valves shall be located on either side of creek railroad crossings, and provided every 2,000 feet. Air/vacuum release valves will be provided at appropriate locations and generally require the pipe to be deeper so that adequate cover is provided for the vault to be installed flush with existing grade.

2.7.3. Requirements for Manholes Receiving Flow from Force Mains

Manholes receiving the discharge from force mains shall be designed in accordance with the County’s standard details. In addition, special acid-resistant manholes and sewer pipe shall be provided downstream of the discharge point for 2,500 L.F. On existing systems, all steps shall be removed and manholes shall receive an approved liner for the distance determined by the engineer’s calculations or 2,500 L.F., whichever is greater.

Manholes receiving flow from a single residential parcel sewage pump may be exempt from this requirement depending on design conditions. Single non-residential parcels with a private sewage pump station will be reviewed and considered on a case-by-case basis for exemption to the requirement.
3. **WATER SYSTEMS**

3.1. **Special Projects**

Water pump stations, storage tanks, pressure reducing valves, and flow control valves shall be considered special projects and specific project standards and plans will be prepared by the Engineer and submitted to the County for review and approval. The project standards shall include but not limited to contents as set forth in Appendix 9.

3.2. **Water Line Location**

3.2.1. Water Lines in Roads

Generally, water lines to be installed in proposed subdivision and local streets shall be located 2 feet off the edge of pavement where there is no curb and gutter (shoulder side) and 3 feet off the edge of the gutter pan (pavement side) where there is curb and gutter. However, within proposed curb and gutter streets an alternate design should be considered if right-of-way is available and a design is feasible. On roads where on-street parking is anticipated on one side of the street, the water line shall be located on the side of the street where no parking is allowed. Water lines to be installed along existing roads will generally be installed in easements where the road is likely to be widened in the future and in the right of way where the road will not be widened in the future.

3.2.2. Water Lines Along Thoroughfare Plan Roads

Where water lines are to be installed in roads expected to be widened in the future, they shall be located in easements unless the future road cross section is known and location of water line is designed to avoid future relocation.

Water lines designed along existing and proposed Major Arterial roads as identified in the Thoroughfare Plan shall be in easements. Major Arterial roads with customer frontage shall have water lines on both sides of the road whenever possible.

Ductile iron pipe shall be utilized for water mains constructed adjacent to arterial and collector streets unless otherwise directed by the Department.

3.2.3. Bends, Deflection, and Thrust Restraint

Water lines shall be designed so that changes in alignment are made with bends with approved thrust blocks or approved mechanical joint restraint systems wherever applicable. All mechanical joint thrust restraint system calculations are to be provided for review with a detail sketch showing length of pipe and fittings to be restrained and length of retrained pipe shown on the profile in the plans. See Part III for additional specifications and requirements. The Engineer shall use type 2 trench conditions, ML or Silt 2 soil type, and a test pressure of 150 psi.
with a 1.5 safety factor for thrust-restraint calculations. The calculated length of restraint shall extend to the next joint of pipe. For example, if the calculated thrust restraint for a vertical bend is 40 ft and an 18 ft length of pipe is supplied, a retainer gland would be installed at the bend and at the next three joints of pipe.

Where it is necessary to change alignment by deflecting successive lengths of pipe, the joint deflection shall be limited to the allowable deflection according to standard details in Part II of this manual, which represents one-half the maximum allowable by most manufacturers and only on ductile iron pipe. Joint deflection and bending of PVC pipe is not allowed.

Joint deflection limits apply to vertical as well as horizontal curves. Engineer is to verify existing field conditions to develop soil classifications for calculated bearing pressures. Where water mains are lowered to go under storm sewers or other utility conflicts, restrained 45-degree vertical bends shall be used unless otherwise approved by the Utilities Department.

The engineer must design the system to ensure that the maximum deflection can be accomplished, however, fittings may be necessary, and the engineer shall make this determination during design.

3.2.4. Location of Water Mains in Subdivisions

In subdivisions, water mains will be permitted in easements not following the road only when there is no other feasible alternative and prior approval is obtained from the Department of Utilities. Easements shall be wide enough to provide sufficient space for both installation and maintenance.

Waterlines located in easements between subdivision building lots shall be ductile iron and extended to the rear property line.

3.2.5. Location of Water Mains on Commercial Sites

Water mains shall be located in the drive aisles or accessible easements when possible. Water mains crossing parking spots shall be avoided whenever possible.

There shall be no concrete slabs within a water main easement unless a license agreement is executed with the Utilities Department.

3.2.6. Meter Box Location (Residential)

Design of water mains and water meter boxes as it relates to sidewalks must be designed to accommodate at least a 4 foot horizontal separation between the County’s public water mains. If sidewalks are designed within the public road right-of-way, the street side of all water meter boxes must be designed 3 feet behind the house side of the sidewalk or to the right-of-way line, whichever is greater. If sidewalks are designed outside of the public right-of-way and are less than 5 feet from the right-of-way line, the street side of all water meter boxes must be designed 3 feet behind the house side of the sidewalk to allow room for a residential
companion irrigation meter. If the sidewalks are designed outside of the public right-of-way and are more than 5 feet from the right-of-way line, the water services must be designed within 1 foot outside of the right-of-way line.

For single family residential subdivisions where individual lot irrigation is required by zoning or by covenants, the residential companion meter shall be installed by the developer.

In circumstances where retaining walls are proposed within 5 feet of the right of way, the water meter shall be set in the right of way at least 3 feet from the edge of any sidewalk and a “pigtail” shall be extended under the retaining wall for the plumbing connection. A detail shall be provided on the plans that clearly delineates the water line is private past the right of way line.

Traffic rated meter boxes shall be used when the meter is located in an area that could potentially be subject to vehicular traffic.

3.2.7. Meter Box Location (Commercial)

All commercial water meters shall be located in an easement of sufficient size to allow 3 feet clear space around the meter box. Each meter shall have a separate tap to the main line. The tap shall be located upstream of a fire hydrant or flushing hydrant. Meter boxes shall not be located in areas subject to vehicular traffic unless otherwise approved by the Department of Utilities.

3.2.8. Water Service Lines

Services and meters shall be sized and located in accordance with the Standard Details. Minimum service size shall be 3/4” pipe with 5/8” meter. Services shall be designed and reflected on the plans for both residential and commercial developments. A 1” county service line will be installed in residential applications when: the residential water service from the main to the meter is 60’ or greater; the peak hour pressure at the meter is 40 psi or less; or the water service will be serving a “multi-purpose” residential fire sprinkler system as identified on plans, in which case it will also be fitted with a 1” water meter.

When the peak hour pressure at the probable meter location is less than 40 psi and other variables occur, such as house location, number of fixtures, number of finished floors, etc., a note must be added to the plans: “The builder may consider installing a larger plumbing line from the meter to the house and/or installing a booster pump to obtain a desired pressure.”

When it is intended for a residential structure to be fitted with a multi-purpose fire sprinkler system, a note must be added to the plans: “If the combined domestic and fire flow demand for a residential structure, as approved by the Chesterfield County Fire and EMS Fire & Life Safety Division Department review staff, exceeds the rated capacity of a 1” meter, then the water service shall be installed in accordance with detail FIR-1B.”
Pressure reducing valves shall be installed on the customer side of the meter by builder or property owner, to be operated and maintained by the customer, when the service connection system pressure will be greater than 80 psi. Subdivision construction plans must include “PRV” written on each lot where this condition occurs.

The use of approved saddles for ¾” and 1” residential service lines shall be required for PVC and asbestos cement pipe. Ductile iron water shall be direct tapped for ¾” and 1” residential water services.

Non-residential services shall be in accordance with the following table:

<table>
<thead>
<tr>
<th>Meter Size</th>
<th>Main Line - PVC</th>
<th>Main Line - Ductile Iron</th>
<th>Service size &amp; material</th>
</tr>
</thead>
<tbody>
<tr>
<td>5/8”</td>
<td>Corporation stop (saddle)</td>
<td>Corporation stop (direct tap)</td>
<td>¾” or 1” soft copper</td>
</tr>
<tr>
<td>1”</td>
<td>Corporation stop (saddle)</td>
<td>Corporation stop (direct tap)</td>
<td>1” soft copper</td>
</tr>
<tr>
<td>1½”</td>
<td>New water mains – 2” tapped tee</td>
<td>New water mains – 2” tapped tee or direct tap</td>
<td>1½” hard copper; 2” hard copper to curb stop when crossing Thoroughfare Plan roads</td>
</tr>
<tr>
<td></td>
<td>Existing water mains – 2” corporation stop (saddle)</td>
<td>Existing water mains – 2” corporation stop (direct tap on ≥ 12” main; saddle &lt; 12” main)</td>
<td></td>
</tr>
<tr>
<td>2”</td>
<td>New water mains – 2” tapped tee</td>
<td>New water mains – 2” tapped tee or direct tap</td>
<td>2” hard copper</td>
</tr>
<tr>
<td></td>
<td>Existing water mains – 2” corporation stop (saddle)</td>
<td>Existing water mains – 2” corporation stop (direct tap on ≥ 12” main; saddle &lt; 12” main)</td>
<td></td>
</tr>
<tr>
<td>3” and larger</td>
<td>New lines - Tee</td>
<td>New lines - Tee</td>
<td>Ductile Iron to match meter size</td>
</tr>
<tr>
<td></td>
<td>Existing lines- tapping sleeve and valve when circumstances do not warrant a tee and main valves</td>
<td>Existing lines- tapping sleeve and valve when circumstances do not warrant a tee and main valves</td>
<td></td>
</tr>
</tbody>
</table>

Water service lines shall be perpendicular to the water main whenever possible. This may not be achievable on cul-de-sacs, otherwise water service pipes are to be straight unless otherwise approved by the Utilities Department.

Water meters shall be sized in accordance with Utility Procedure PRO-DEV-001. Upsizing of water meters one nominal size for multi-family buildings will be considered on a case-by-case basis.
3.2.9. Backflow Preventers

On sites requiring private backflow preventers on the domestic service line, the backflow preventer may be located inside the building near the point of entry or in a private freeze proof enclosure outdoors. When located inside the building, a note must be written on the plans stating the location, type, and size of the backflow preventer.

All irrigation meters require a private backflow preventer, which is generally located near the meter in an enclosure outside of the easement.

For buildings with sprinkler systems, the backflow preventer may be located inside the building if the following conditions are met

1. The backflow preventer is 50 feet or less from the public water main.
2. A public gate valve is installed at the easement line as a clear point of demarcation between public and private water main (must be labeled on the plans)
3. Provisions are made in the design to minimize “dead water” in the public main, such as locating the domestic water service as close as possible to the public gate valve.

Refer to Appendix 8 for additional sprinkler requirements.

On certain large commercial or industrial sites where there are large fire protection requirements that result in long water mains with little or no flow that are unlikely to ever be extended to another customer, the Utilities department may require a double detector check valve vault and that the dead-end water mains for fire protection be made private.

3.2.10. Avoidance of Utility Conflicts

The engineer shall consider the location of existing and proposed sanitary sewer and storm drainage systems and all other underground structures and utilities that could affect the location and type of materials for the pipeline. The selected location should avoid conflicts and facilitate future maintenance.

Where the possibility of conflicts with existing utilities and/or other structures exist, it shall be the Engineer’s responsibility to secure accurate information on the exact horizontal and vertical location of such utilities through subsurface exploration and reflect this exact information on the plans.

The engineer shall consider the requirement for separation of water and sanitary sewer facilities and shall use the same requirement stated in the Sanitary Sewer Location section of these standards.

Where the waterline must be lowered to go beneath another pipe, restrained vertical 45° bends shall be used and the pipe shall be brought back to minimum depth in as short a distance as possible. The method of lowering the waterline by deflection shall only be allowed for relatively shallow pipe lowering and ductile iron pipe must be used.
3.2.11. Railroad Crossings

Water main crossings of railroads and where required, roadways shall be encased in a casing pipe. Design of railroad crossings shall comply with the requirements of American Railway Engineering Association Specifications, Part 5 – Pipelines (latest revisions). The engineer shall be responsible for the preparation of the necessary application, at least 180 days in advance of construction or advertisement for bid, for submission by the County to the railroad or in a timely fashion as determined by the Department and/or Engineer.

3.2.12. Stream Crossings

Water mains entering or crossing streams shall be Ductile Iron Pipe (minimum Class 52). The tops of these mains shall be a sufficient depth below the natural bottom of the streambed to protect the pipe. In general, 3.5 feet of suitable cover is required. The pipe and joints shall be designed, constructed, and protected against anticipated hydraulic and physical, longitudinal, vertical, horizontal loads, erosion and impact. Reasons for requesting less cover shall be given in writing to the County prior to plan submittal.

3.2.13. Waterlines Located in Fill Material

Water mains constructed in fill shall be Ductile Iron Pipe (Class 52) with restrained joints.

3.2.14. Above Ground Pipe

Water mains constructed on piers will be permitted only when it can be demonstrated that no other practical alternative exists. The engineer shall submit a design for the piers, pier foundation and pipe that will demonstrate the structural integrity of the proposed system. Above ground pipe shall be adequately supported, protected from damage and freezing, accessible for repair or replacement and above the 100-year flood elevation. The design shall provide valves on both side of the crossing so that the section can be isolated for test and repairs. The valves shall be easily accessible and not subject to flooding.

All exposed water mains shall be ductile iron pipe (minimum Class 52) and adequately insulated as determined by the engineer.

3.2.15. Subaqueous Pipe

Subaqueous water main installations will be permitted only when it can be demonstrated that no other practical alternative exists. The pipe shall be of special construction having flexible watertight joints. Special attention shall be directed to foundation conditions for the pipe and to thrust resistance.
The design shall provide valves and sampling stations at both ends of the crossing so that the section can be isolated for tests and repairs. The valves and sampling stations shall be easily accessible and not subject to flooding.

3.3. Depth of Water Lines

Standard minimum cover will be 42 inches. All water lines shall be constructed to a depth that will provide protection against freezing and thawing, insure adequate cover over valves and other appurtenances and provide service. New installation of water lines adjacent to road ways shall have a minimum of 42 inches of cover from existing/proposed edge of pavement. Greater depths shall be required where street grades will possibly be lowered in the future. Clearance shall be provided for enlargement of undersized drainage structures. Any development which takes place over an existing water main shall be required to maintain the water main at a maximum depth of 10’ below finished grade. Where the depth exceeds 10’ the water main shall be raised to the standard minimum depth of 42”.

3.4. Water Line Appurtenances

3.4.1. General

Valve manholes, air relief valves, fire hydrants, service lines and other appurtenances shall be constructed in accordance with Chesterfield County standards and details.

3.4.2. Fire Hydrants

Hydrants in residential areas should be located at street intersections (not within the return) or mid-block at lot lines as approved by the Chesterfield County Fire and EMS Fire & Life Safety Division. Maximum hydrant spacing shall be in accordance with the latest fire code adopted by Chesterfield County. The developer is to make the necessary improvements to satisfy fire flow demands as determined and required by the Chesterfield County Fire and EMS Fire & Life Safety Division. The developer or his agent must follow the procedure as outlined in Appendix 12. Private fire hydrants shall be painted red from the factory.

3.4.3. Valves

Valves shall be located at distances not to exceed 1,000-foot intervals and at all changes in pipe diameter. Valves shall also be provided at all pipe line intersections to provide shut off for repairs of limited sections without interruption of service to large areas and to facilitate testing. A minimum of two valves shall be provided at tees, three valves at crosses and shall-be located as close to the fitting as practical. All valves are to be restrained to fittings by approved method. Valves shall be installed near the end of all waterlines that will be extended to minimize service disruption during the extension, testing, and tie-in. Proper restraint systems and/or pipe length is required to keep the line in place during construction.
3.4.4. Connections to Existing Water Line

When connecting to an existing water main, installing a tee as opposed to a tapping sleeve and valve is preferred when there are long distances between main line valves (greater than 1,000 feet) or if the distance is less than 1,000 feet and it would be an advantage to add a main line valve for better system control. Therefore, it is important that each project be carefully evaluated by the developer’s engineer with the Department of Utilities’ assistance to determine if a main line valve is needed and/or cutting in a tee is practical, taking into consideration how many customers may be without water.

3.4.5. Air Release and Blow Off Valves

Water mains shall be provided with air release valves and blow offs at suitable locations to allow testing, chlorination, flushing, and draining of the line. Fire hydrants, blow offs, or flushing hydrants shall be installed at dead-end mains.

Blow offs shall be provided at low points on mains 16-inches and larger, unless otherwise approved. For 12-inch mains, blow offs shall be provided at creek crossings.

Engineer should use the following guidelines, regarding location of flush points, air release valves, blow offs, etc. during the design of public water systems:

1. Access to flush points by contractors and the county’s Water Operations and Maintenance Section is very important. Flush points serve no purpose if access to the flush points cannot be obtained.
2. Engineer needs to make sure that appropriate notes i.e., flow (gpm) expected to be dispersed at points of flushing; etc. are put on the plans.
3. Emphasize (through appropriate notes) to contractor to maintain good erosion control and flushing procedures. Erosion control and environmental impacts must be considered whenever a flush point is chosen; therefore, certain controls may be needed at the time the waterline is installed.
4. Engineer needs to advise contractor to coordinate his work through the inspectors and the inspector coordinate with the County Operations and Maintenance Section regarding when to flush (time of day and season, etc.).
5. On most 16” or larger water lines, attempt to locate the flush points as near to the roadways or at a stream (keeping in mind adverse effects to downstream ponds, etc.).
6. Contractor is to perform flushing prior to acceptance of the new water line.
7. Minimize the number of blow offs, and strategically place them so that proper flushing can be performed.
8. Minimize the number of air release valves, taking into consideration the depth that the water line is to be placed.
9. Standardize the design of a blow off needed considering the size of blow off, height of blow off, positioning of blow off, etc.
10. Look at easement considerations that would be needed during flushing process. Property owners and the County’s Right of Way Section shall be solicited for advice during easement acquisition.

3.5. **Structural Design**

Structural requirements must be considered in the design of all water mains and appurtenances. This is a matter of detail design and is not subject to simple generalization. The following criteria should be considered by the design engineer:

1. Special Structures—Structures shall be built as shown in the standard details, however structures other than those shown in the standard details shall be considered special structures and shall be designed and detailed by the design engineer and submitted for review and approval to the Department of Utilities prior to plan submittal or brought to the Department’s attention at the time of plan submittal.

2. Pipe Foundation—In all cases the proper strength water pipe shall be specified for the proposed depth, width of trench and bedding condition. Soil condition should be considered with samples being obtained where necessary to verify pipe selection and foundation design.

3. Thrust protection as shown on plans in the standard details shall consist of concrete thrust blocks against undisturbed earth. Approved mechanical joint restraint systems may be required for ductile iron and PVC C-900 pipe. Hydrant valves shall be installed with hydrant tees and hydrant protected from thrust by approved mechanical joint restraints and concrete thrust blocks.

4. Where valves are placed for future water line extensions, valves are to be restrained to the fitting and restrain pipe prior to the valve. When practical, no services or fire system connections shall be placed downstream of the valve to prevent interruption of service during construction of the future extension. Dead-end lines shall be provided with a flushing hydrant or fire hydrant whichever is practical. Approved mechanical joint restraint systems are to be used as required to provide adequate retention of the pipe and valve.

3.6. **Hydraulic Design for Water Lines**

3.6.1. Pressure and Velocity

Water distribution systems shall be designed to provide adequate flow and pressure for both domestic supply and fire flow based on sound hydraulic analysis. Design shall be based on a maximum flow velocity at peak flows (excluding fire flow) of 5 feet per second and Hazen-Williams “C” Value of 130. Engineer shall be required to comply with the procedures as outlined in Appendix 12.
The water distribution system and any extensions thereto shall be designed to supply the demands of all customers while maintaining 20 psi at maximum day plus fire flow or peak hour domestic, whichever is greater.

Design of the water system shall generally be such as to maintain 40 psi at maximum day demand. When 40 psi cannot be maintained, the engineer shall be responsible for coordinating with the Utilities Department to investigate alternatives to provide 40 psi. Designs providing less than 40 psi will be evaluated on an individual basis.

Also, the design of the water line should be such that a velocity of 3.0 fps can be maintained at blow off devices (flushing hydrants) and at hydrants for proper flushing.

3.6.2. Flow Estimation

The following criteria shall be used in estimating average daily demands:

<table>
<thead>
<tr>
<th>Development Land Use</th>
<th>Gallons per day per acre</th>
<th>Equivalent Persons/Acre</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Density Residential</td>
<td>350</td>
<td>3.5</td>
</tr>
<tr>
<td>Suburban Residential I</td>
<td>700</td>
<td>7</td>
</tr>
<tr>
<td>Suburban Residential II</td>
<td>1,400</td>
<td>14</td>
</tr>
<tr>
<td>Medium-High Density Residential</td>
<td>2,100</td>
<td>21</td>
</tr>
<tr>
<td>High Density Residential</td>
<td>3,500</td>
<td>35</td>
</tr>
<tr>
<td>Office</td>
<td>1,500</td>
<td>15</td>
</tr>
<tr>
<td>Retail</td>
<td>2,000</td>
<td>20</td>
</tr>
<tr>
<td>Residential Mixed Use</td>
<td>4,500</td>
<td>45</td>
</tr>
<tr>
<td>Community Mixed Use</td>
<td>4,500</td>
<td>45</td>
</tr>
<tr>
<td>Regional Mixed Use</td>
<td>7,500</td>
<td>75</td>
</tr>
<tr>
<td>Light Industrial</td>
<td>2,000</td>
<td>20</td>
</tr>
<tr>
<td>Medium and Heavy Industrial</td>
<td>3,500</td>
<td>35</td>
</tr>
</tbody>
</table>

Where site determinations can be made, water demands may be determined by using the following design information:

<table>
<thead>
<tr>
<th>Discharge Facility</th>
<th>Design Units</th>
<th>Flow gpd</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential Units</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(a) Single Family Units</td>
<td>3.5 people/dwelling</td>
<td>350</td>
</tr>
<tr>
<td>Includes Townhouses, Individual House Trailers, etc</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(b) Apartments and Condominiums</td>
<td>4 people/3 bedroom apt.</td>
<td>350</td>
</tr>
<tr>
<td></td>
<td>3 people/2 bedroom apt.</td>
<td>300</td>
</tr>
<tr>
<td></td>
<td>2 people/1 bedroom apt.</td>
<td>200</td>
</tr>
</tbody>
</table>

Published: May 2020
Revised: I-3-10
Chesterfield County WSSP
Fourth Edition
<table>
<thead>
<tr>
<th>Classification</th>
<th>Requirement</th>
<th>Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Schools with Showers</td>
<td>per person-Elementary</td>
<td>10</td>
</tr>
<tr>
<td>And Cafeteria</td>
<td>per person-High School</td>
<td>16</td>
</tr>
<tr>
<td>Motels and Hotels at 65 gals/person</td>
<td>per room</td>
<td>130</td>
</tr>
<tr>
<td>(rooms only)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Manufactured Home Parks at 3 persons/trailer</td>
<td>per manufactured home</td>
<td>300</td>
</tr>
<tr>
<td>Restaurants</td>
<td>per seat</td>
<td>50</td>
</tr>
<tr>
<td>Service Stations</td>
<td>per vehicle serviced</td>
<td>10</td>
</tr>
<tr>
<td>Factories</td>
<td>per person per 8 hr. shift</td>
<td>25 + process water</td>
</tr>
<tr>
<td>Shopping Centers</td>
<td>per 1000 ft.² of ultimate floor space</td>
<td>250</td>
</tr>
<tr>
<td>Hospitals</td>
<td>per bed</td>
<td>300</td>
</tr>
<tr>
<td>Nursing Homes</td>
<td>per bed</td>
<td>200</td>
</tr>
<tr>
<td>Homes for the Aged</td>
<td>per bed</td>
<td>100</td>
</tr>
<tr>
<td>Doctors Office in Medical Center</td>
<td>per 1000 ft.²</td>
<td>500</td>
</tr>
<tr>
<td>Laundromats</td>
<td>per machine</td>
<td>500</td>
</tr>
<tr>
<td>Theaters, Auditorium Type</td>
<td>per seat</td>
<td>5</td>
</tr>
<tr>
<td>Bowling Alleys</td>
<td>per lane</td>
<td>75</td>
</tr>
<tr>
<td>Office Buildings</td>
<td>per 1000 ft.² of ultimate floor space</td>
<td>200</td>
</tr>
</tbody>
</table>

**NOTE:** Other classifications may be found in the Virginia Department of Health Regulations, latest edition.

### 3.6.3. Peaking Factors

To determine maximum daily demands and peak hourly demands the following multipliers shall be used:

- **Maximum Daily Demand** = 1.8 times Average Daily Demand
- **Peak Hourly Demand** = 2.36 times Average Daily Demand
3.6.4. Fire Flow Requirements

Fire flow requirements for non-residential areas shall be in accordance with the National Fire Protection Association Handbook (latest revisions) and the applicable sections of ISO, and shall be coordinated with the Chesterfield County Fire and EMS Fire & Life Safety Division Department. That portion of the Fire Sprinkler Systems to be maintained by the Department of Utilities shall be designed in accordance with the requirements as set forth in Appendix 8.

3.6.5. Minimum Pipe Size

Minimum pipe size shall be 8”, except that terminal water lines may be 6” in diameter unless a larger diameter line is needed to meet the peak domestic demand and/or fire flow requirements. Dead-ends shall be eliminated by looping when feasible.

All fire hydrant leads shall connect to a minimum 8” water line. No connections or services are allowed off the fire hydrant lead.

3.6.6. Redundant Water Feeds

Whenever possible, two supply points shall be provided for subdivisions containing more than 50 lots. This requirement is intended to apply to the whole subdivision, not individual subdivision sections. Multi-section subdivisions that will ultimately have two or more supply points may proceed with phased development on one supply point until either the section containing the second supply point is constructed or the fire flow calculations indicate the second supply point is needed.
PART II

WATER AND SEWER PROJECT
CONSTRUCTION SPECIFICATIONS
CHESTERFIELD COUNTY, VIRGINIA

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1. GENERAL CONDITIONS

1.1. General

Construction will not be allowed to begin until all criteria of the design review process have been satisfied and permission has been granted by the County’s Utilities Construction Inspection Section. If construction begins prior to permission being granted, the County reserves the right to require the Contractor to uncover and/or remove unauthorized work.

A pre-construction meeting will be required. Prior to beginning work, at least forty-eight (48) hours advance notice must be given to the Construction Inspection Section. Notification shall be given to the Inspection Supervisor at 751-4651.

One copy of construction “cut-sheets” shall be submitted to the Utilities Department prior to the beginning of construction of all waterlines, gravity sewer lines and sewer force mains. Cut sheets are to be prepared by a licensed engineer or surveyor. Cut sheets shall consist of the following information:

- Temporary bench marks at each manhole.
- Each downgrade manhole is to begin with station 0+00 to readily identify the station of each service connection.
- Where the County is participating in the cost, elevations on centerline cuts are required every 25 feet.
- Centerline elevations every 50 feet and at every valve box and manhole location for water line, gravity sewer line and force main projects.
- For water designs only, stationing shall be the same as used for the new road.

The Contractor shall be required to have all erosion and sediment control measures in place and approved before beginning clearing or construction.

The Contractor is reminded of the requirements of permits issued by Chesterfield County, the Virginia Department of Transportation and other agencies and the obligation that the requirements of these permits be strictly adhered to.

The Contractor is reminded that prior to the installation of water mains:

- All pavement and shoulder areas within the right-of-way are graded to within six inches (6”) of subgrade.
- All ditches and slopes to one foot (1’) outside the right-of-way have been graded to final grade.
- Markers for the sewer laterals are visible.
- All necessary property pins have been installed.
It shall be the responsibility of the Developer or his agent to acquire offsite easements necessary for water and sewer installation. The Developer shall adhere to any agreements negotiated with the landowner regarding restoration of the easement.

The Contractor will not be allowed to remove the pre-assembled flushing mechanism and make the tie-in to the existing water system until all water and sewer utility work, including punch list items, are completed.

No one other than appropriate Utilities Department employees will be allowed to operate any valve that is part of the Utilities Department system. This includes all valves that become part of the Utilities Department system after a tie-in has been made.

1.2. Definitions

COMPLETION: Completion of work indicates that all sewer pipe, water pipe, valves, appurtenances, building, equipment and any other required items have been installed and appropriately tested in accordance with the plans, specifications and contract, all submittals including and O & M manuals have been made, all punch list items, right-of-way, easement, property, and pavement restoration work has been completed as required. The use of water or wastewater lines by the Contractor for the purpose of completing the testing of equipment or piping, the tie-in of water or wastewater lines, or the continued necessary use of equipment or piping because of tie-ins or testing shall in no way be construed as completion of work until the conditions of the first sentence of this definition had been satisfied.

CONTRACTOR: The Developer’s Agent, acting directly or through his agents, who has been contracted to perform the work.

COUNTY: The party of the second part to the County/Developer Agreement, Chesterfield County, acting through the Director of Utilities or his duly authorized agents.

ENGINEER: The Consulting Engineer who has been designated by the Developer as the Engineer in relation to the project, whether acting directly or through properly authorized agents, inspector’s, or representatives.

FINAL INSPECTION: An inspection by the County inspector and contractor of all items covered by the County/Developer contract that results in a punch list of items remaining to be completed or submitted to satisfy the County’s specifications.

FINAL ACCEPTANCE: A written statement from the County to the Developer stating that as of a certain date all punch list items from the final inspection have been corrected and all necessary submittals have been made and the conditions of the County/Developer contract have been satisfied.

INSPECTOR: The person appointed by the County’s Director of Utilities to carry out instructions given by the County and to inspect the materials and work performed under this agreement.
SUBCONTRACTOR: Any individual, firm or corporation having a direct contract with the Contractor for the performance of the work.

WARRANTY PERIOD: A one (1) year guarantee of equipment and labor by the Developer that begins on the date of final acceptance. (With a three [3] year warranty on road work or in accordance with VDOT’s latest requirements.)

1.3. Laws and Regulations

The Contractor shall keep fully informed of all State and Federal laws and local ordinances, and regulations in any manner affecting those employed or engaged in the work, or in any way affecting the conduct of the work, and of all such orders or decrees of bodies or tribunals having jurisdiction or authority over same. The Contractor shall protect and indemnify the County and its officers and agents against any claim or liability arising from or based on the violation of such laws, ordinances, regulations, orders, or decrees, whether by himself or his employees.

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.

1.4. 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 prosecution of the work.

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

1.5. Materials and Workmanship

It is the intent of the County’s Specifications to describe definitively and fully 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 County’s Specifications, the County will require first-class work to be performed and materials to be used by the Contractor. It is understood that the County/Developer contract includes any and all work that may be necessary to connect the work done with the adjoining work in a proper and skillful manner.
The County reserves the right to employ an independent testing laboratory to conduct tests of materials, etc. as the County may deem necessary to assure complete compliance with the requirements of the County’s Specifications. The contractor shall offer full cooperation with personnel in the employ of the County in making these tests.

1.6. No Deviation from Plans Specifications, Etc. By the Contractor

The Contractor shall not deviate from the plans, profiles, cross-sections, and specifications in any particular except with written consent from the County. If deviation occurs on the part of the Contractor, he shall correct the error at this expense in a manner satisfactory to the County.

1.7. Other Plans and Working Drawings (Shop Drawings)

Such information as is necessary to give a comprehensive idea of the construction contemplated, are shown on the plans. The Contractor shall submit to the County Inspector and Engineer, 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 to the County 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 plans and the County’s Specifications shall control and shall be followed. All Shop or Working Drawings and Blueprints shall be made at the expense of the Contractor.

1.8. 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. Work done by the Contractor after his discovery of such discrepancies, inconsistencies or ambiguities shall be done at the Contractor’s risk.
1.9. **Correction of Work**

The Contractor shall promptly remove from the premises all work rejected by the Engineer or County Inspector 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.

All removal and replacement work shall be done at the Contractor’s expense. If the Contractor does not take action to remove such rejected work within (10) days after receipt of Written Notice, the county may remove such work and store the materials at the expense of the Contractor.

1.10. **Character of Workmen and Equipment**

The Contractor shall employ such superintendents, foremen and workmen that are careful and competent.

1.11. **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 Contractor shall have the same force and meaning as if given to the Contractor in person. The Superintendent or Contractor shall be on duty always while the construction work is being done.

1.12. **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 final 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.

1.13. **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.
1.14. **Work Outside Regular Hours**

If the Contractor desires to perform work outside the regular hours or on Saturday, he shall request permission to work forty-eight (48) hours in advance to allow arrangements to be made for proper inspection. The county may refuse the Contractor permission to work if forty-eight (48) hours’ notice is not given or other just cause. 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 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 8:00 a.m. to 5:00 p.m., Monday through Friday.

1.15. **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 Inspector.

1.16. **Conflicts**

Should any requirements of the County’s Specifications conflict with the requirements of governmental or private authority having authority, then and to the extent of such conflict, these specifications shall be superseded.

1.17. **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.

1.18. **Existing Structures**

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

The Contractor shall dig the necessary test holes for the purpose of locating existing underground structures. Such excavation shall not be undertaken without 48 hours’ prior notice to the County or Owner of the existing facility.
1.19. **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 the Contractor shall contact the Utility Information Center (“Miss Utility”), telephone number 1-800-552-7001 for assistance in locating existing underground utilities.

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

1.20. **Inspectors**

The Inspector is authorized to inspect all work done and materials furnished. 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 referred to and decided.

The Engineer or Inspector shall have access always to all parts of the work being done for the purpose of inspection, measurements and establishments of lines and grades.

1.21. **Responsibilities of Contractor’s Employees**

Each employee of the Contractor, and each one of his Subcontractors, engaged in said work shall for all purposes be deemed taken to the exclusive servants of the Contractor. The contractor shall in no manner be relieved from responsibility or liability because of any fault or delay in the execution of said work, or any part thereof, by any such employee or any Subcontractor or any material supplier whatsoever.

1.22. **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.

1.23. **Standards for Computing Pay Items**

   A. **ROCK AND HARDPAN** – Measurement and payment shall be on a cubic yard basis. The pay depth shall be computed using the actual depth of the rock to the invert of the pipe plus six inches (6"). Pay width shall be thirty-six inches (36") for pipe twelve inches (12") and less in nominal diameter. For pipe between
twelve inches (12") in nominal diameter and 36" in nominal diameter, the pay width shall be the outside diameter of the pipe barrel plus twenty-four inches (24"). Trench depth shall be based on the depth of rock to the outside barrel of the pipe plus six inches (6").

For pipe thirty-six inches (36") or greater in nominal diameter, the pay width shall be the outside diameter plus thirty six inches (36") and pay depth shall be the depth of rock to the outside barrel of the pipe plus six inches (6"). Manhole and structure excavation, including the base, shall be at the depth encountered, plus six inches (6"). The horizontal dimensions shall assume a square extending one foot beyond the exterior walls of the structure when forming is not required and extending two feet when forming is required. No additional payment for rock excavation in trench will be allowed for this assumption.

B. EARTH – When payment is to be computed on a volumetric basis, the width and depth of main line trenches, force main trenches and service trenches shall be computed in the same manner as for Rock and Hardpan except that the depth shall be the bottom of the pipe for force mains, and the invert of the pipe for gravity lines. When excavation payments are computed based on depth or on cut increments, measurements shall be from the ground surface of the center line of the trench to the invert of the pipe line.

C. BEDDING IN ROCK, HARDPAN OR EARTH – The cost of bedding that is required for pipe that is laid in rock or hardpan or earth shall be included in the unit price for these items and no extra compensation shall be allowed.

D. HAND EXCAVATION – Price per cubic yard for hand excavation shall be allowed only when specifically authorized, in writing, by the Engineer. Hand excavation shall be classified as excavation with hand tools rather than with excavating machines. Hand excavation will be permitted only when the Engineer believes that it is necessary and will normally be limited to the amount required to protect trees, utility poles or structures that would otherwise be removed during the course of machine excavation. No allowance shall be made for hand excavation performed to locate or protect culverts and underground utilities.

E. REMOVAL OF UNSTABLE SOIL AND REPLACEMENT WITH SELECT FILL – Price per cubic yard of select material shall be allowed only when the Engineer directs, in writing, that select material shall be provided. The price for providing select material shall include the cost of removing unsuitable material and replacing it with select material in order to allow for a stable foundation below the pipe line and for the cost of providing select material because the excavated material is unsuitable for proper backfilling of the trench. The cost of transporting surplus excavation from other portions of the project will be compensated only when the haul distance exceeds one thousand feet.
E.1. Payment for select material required when pipe is laid in rock and/or hardpan and for backfill because of the inability to use hardpan or rock removed from the trench shall be included in the price bid for "(each size), (each type) PIPE OR APPURtenANCE".

E.2. Payment for select material required when pipe is laid in earth shall be based upon the quantity of select material required for a trench width of the nominal pipe diameter plus 12” increased to the nearest ½' with a minimum trench width of 24” and a select material depth as provided.

F. SHEETING AND SHORING ORDERED LEFT IN PLACE – Price per one thousand board feet (MBF) for furnishing and installing sheeting and shoring ordered left in place, including cutting and bracing. The Contractor shall not be compensated for the cost of placing and removing sheeting or bracing not ordered left in place.

G. CLEARING AND GRUBBING – The cost of clearing and grubbing shall include removal of all trees, stumps and other vegetation. No extra compensation shall be allowed for removing or disposing of trees, stumps and other vegetation.

H. SEEDING

H.1. WOODED AREAS Price per linear foot of easement including furnishing and spreading seed and mulch as required by the specifications.

H.2. LAWN KEPT AREAS Price per linear foot of easement including topsoil, seeding, mulch, fertilizer and lime.

I. STRAW BALES FOR EROSION CONTROL – Price shall be determined per bale for furnishing, installing and maintaining.

J. SILT FENCE – Price per linear foot of fence to furnish, install and maintain.

K. CREEK CROSSING – Price per crossing to furnish and install dams and rip rap. Price shall include any necessary pumping and filtering to provide a complete installation.

L. GRAVEL DRIVEWAYS – Price per linear foot of pipe line trench, surfaced with approved crusher run stone. Stone shall be placed to the same depth as original, with a minimum of 4" (see Detail).

M. ASPHALT DRIVEWAYS – Price per linear foot of trench surfaced with asphalt and granular material (see Detail).

N. CONCRETE DRIVEWAYS – Price per linear foot of pipe line trench, surfaced with concrete and granular material (see Detail).
O. CONCRETE (REINFORCED) – Price per cubic yard of 3,000 PSI compressive strength concrete used to perform the Work. Price shall include all required excavation, backfill, reinforcing, forming and finishing.

P. CONCRETE (NON-REINFORCED) – Price per cubic yard of 2,000 PSI compressive strength concrete used to perform the Work. Price shall include all required excavation, backfill, forming and finishing.

Q. STONE FOR ROAD SHOULDERS – Price per linear foot of pipe line trench, surfaced with approved crusher run stone. Stone shall be placed to a depth of 4 inches, or the same depth as existed prior to construction, whichever is greater.

R. ASPHALT OVERLAY – Price per square yard for placing asphalt per VDOT standards.

S. REPLACE SURFACE TREATED PAVEMENT – Price per linear foot of pipe line trench for replacement of base material and road surfacing on surface treated pavements. Price shall include cutting, removal and disposal of existing pavement.

T. PLACE BASE ASPHALT IN TRENCH – Price per linear foot of pipe line trench for replacement of base material.

U. RIP RAP – Price per linear foot as measured along center line of the stream or ditch that is crossed. Price shall include furnishing and installing.

V. PIPE OR APPURtenANCE – Price per linear foot of water and/or sewer line measured in the horizontal (not slope) and price per each appurtenance for material as specified shall include furnishing, installing, excavating, backfilling testing and sterilizing the pipe and appurtenance at the depth indicated.

Bedding that is required for pipe and appurtenances shall be included in price per linear foot or per each appurtenance. Depth for payment shall be measured to the invert of the pipe.

W. LOCATE AND MAKE CONNECTION TO EXISTING WATER LINE – Price per connection shall include all work necessary for making connection to existing water lines; including fittings and removing abandoned pipe.

X. VALVES – Price per valve shall include any additional excavation required and a valve box for each operator. Where manholes are required, the cost of the manhole and manhole accessories shall be included.

Y. AIR RELEASE VALVE – Price per valve to include all necessary excavation and backfilling, manhole and manhole vent and accessories, meter box, air release valve, gate valve, necessary fittings, saddle and stone (See Standard Details WAT-1 and WAT-2).
Z. BLOW-OFF – Price per each to furnish, install, excavate and backfill including fittings, valve box, splash block, rip rap, valve and pipe (See Standard Detail WAT-4).

AA. FLUSHING HYDRANT – Price per hydrant to furnish, install excavate and backfill including hydrant, meter box, valve, valve stem and sleeve and all necessary fittings per standard detail WAT-3.

BB. FIRE HYDRANTS – Price per fire hydrant shall include furnishing and installing of the hydrant, any barrel extensions required to bring outlet nozzles up to proper height, the 6" service line, restraint and blocking, valve and valve box. The mainline tees will be paid for separately under the appropriate items.

CC. WATER SERVICE CONNECTION (short) – Price per connection to properties on the same side of the street as the water main, shall include corporation stop, saddle, meter box or vault, meter setter, copper service pipe, trenching and backfilling.

DD. WATER SERVICE PIPE (long) – Price per connection to properties on the opposite side of the street from the water main, shall include corporation stop, saddle, meter box or vault, meter setter, copper service pipe in a steel casing pipe, bored or jacked in place and any necessary trenching and backfilling.

EE. TAPPING SLEEVE AND VALVE – Price shall include furnishing and installing the tapping sleeve and valve including any additional excavation and backfill and all necessary machinery and equipment to provide a complete installation.

FF. PREASSEMBLED FLUSHING MECHANISM – Price shall include furnishing, installing and removing the preassembled flushing mechanism as indicated in Standard Detail WAT-6.

GG. SEWER SERVICE CONNECTION – Price per linear foot of service connection pipe installed shall include service tee and an approved plug and marker at the upper end of the service line. The pay length of the connection shall be the horizontal distance from the center line of the main sewer to the upper end of service line.

HH. STANDARD MANHOLES – Price per vertical foot of manhole furnished and installed including manhole base, manhole steps, frame and cover. The pay depth shall be the vertical depth from the top of the manhole cover to the lowest invert plus 8". No extra payment shall be allowed for bedding when rock excavation is encountered.

II. WATERTIGHT MANHOLES – Price per vertical foot of watertight manhole furnished and installed including manhole base, manhole steps, watertight frame and cover. The pay depth shall be the vertical depth from the top of the
manhole cover to the lowest invert plus 8". No extra payment shall be allowed for bedding when rock excavation is encountered.

JJ. ACID RESISTANT MANHOLE – Price per vertical foot of acid resistant manhole furnished and installed including manhole base, manhole steps, frame and cover and lining. The pay depth shall be the vertical depth from the top of the manhole cover to the lowest invert plus 8". No extra payment shall be allowed for bedding when rock excavation is encountered.

KK. DROP CONNECTIONS – Price shall be determined per vertical foot for each drop connection constructed. The pay depth shall be the “A” dimension shown in Standard Detail MAN-14.

LL. LOCATE AND MAKE CONNECTION TO EXISTING MANHOLE – Lump Sum Price shall include all work necessary for making connection to existing manhole and establishing a new flow channel.

MM. SEWAGE AIR RELEASE VALVE – Price per valve to include all necessary excavation and backfilling, manhole and manhole vent and accessories, air release valve, gate valve, all necessary fittings, saddle and stone.

NN. COMBINATION VALVE – Price per each to furnish and install including all excavation and backfill necessary, the valve, manhole, brick, stone and all appurtenances.

OO. CASING PIPE – Price per linear foot for furnishing and installing casing pipe by boring or jacking. Price to include all excavation and backfill of pits.

PP. CASING PIPE (OPEN TRENCH) – Price per linear foot to include all necessary excavation and backfill, furnishing and installing casing pipe in an open trench.

QQ. CARRIER PIPE IN CASING PIPE – Price per linear foot of carrier pipe to install carrier pipe in casing pipe including spacers, blocking and end seals.

RR. MOBILIZATION – Lump sum price shall include all work necessary to mobilize, demobilize and remobilize as necessary to perform work in accordance with the project plans and specifications. Cost for this item shall not exceed 3% of total bid.

1.24. **Notification to Property Owners**

The Contractor shall properly notify all property owners two (2) weeks prior to the start of any construction (including land clearing). Notification shall be in the form of a letter like the “sample” provided as Appendix 4 of this manual.
1.25. **Water Line Tie-Ins**

All water line tie-ins to the existing distribution system including vertical and horizontal relocations shall be coordinated by the Utility Inspector in conjunction with the Operations and Maintenance Section of the Utilities Department. Normal tie-ins shall be scheduled Tuesday through Thursday from 9:00 a.m. to 4:00 p.m. Tie-ins may be permitted outside of this normal time and/or during nighttime hours only after a justified request in writing has been submitted and approved by Chesterfield Utilities.

Tie-ins of water mains and sewer force mains will not be allowed during the entire weeks of Thanksgiving and Christmas. Where Christmas falls on a weekend, there will be no tie-ins allowed two (2) calendar days before and two (2) calendar days after the holidays. Additionally, tie-ins will not be allowed the day before or the day of any Chesterfield County observed holiday. In some cases, tie-ins may be restricted for certain situations such as graduation week of an affected public or private school, as well as when County forces are flushing as part of their annual flushing program or other operational requirements. The Utility Inspector will determine the available tie-in date, in cooperation with the Utilities Operation and Maintenance Section. Scheduling of tie-ins is at the discretion of the Utility Inspector.

The County reserves the right to require the Contractor to perform tie-ins outside of the normal working hours detailed above in the interest of public safety or customer service. No claim for additional compensation shall be made by the Contractor when such occasions occur.

Proper preparation including field verification of the plans shall be accomplished to minimize shutdown time and prevent the tie-in from exceeding scheduled shutdown time. Sufficient personnel, equipment, and materials shall be on site prior to the water being shut off. Where applicable, excavation and pre-assembling of fittings shall be performed. If, in the opinion of the Inspector, sufficient resources are not available, the tie-in will be cancelled and rescheduled.

Tie-ins to asbestos cement pipe shall be made to rough barrel pipe. Tie-ins to the machined section of asbestos cement pipe will not be permitted. Where asbestos cement pipe couplings have been removed, the machined end of the pipe shall be removed. Abandonment of asbestos cement pipe shall be per State and Federal requirements.

Tie-ins involving fittings shall include provisions for temporary blocking until the concrete blocking has cured.

All pipe and fittings used for a tie-in are to be swabbed with a 1% chlorine solution prior to connection.

Before a tie-in will be allowed, all new valves, including fire hydrant valves, shall be accessible and verified fully open by the Contractor, unless there are valves designated as “normally closed”. Prior to tie-in, the Inspector shall verify that all valves, including fire hydrant valves, are fully open and accessible. Immediately after a tie-in has been made, all valves used during
the shutdown shall be verified fully open by the Inspector. The Inspector shall check all fire hydrants to ensure water is available and each hydrant is in working order.
2. **SITE CLEARING**

2.1. **General**

2.1.1. Description of Work

The Contractor shall furnish all labor, materials, equipment and supplies and shall perform all work and services necessary for or incidental to the performance and completion of all site clearing and grubbing, protections and/or replacement of property pins, removal and disposal of debris resulting from site clearing and grubbing, backfilling to original level of any depressions resulting from such removal, and the protection of existing trees and vegetation.

2.2. **Products**

Not applicable to work in this Section.

2.3. **Execution**

2.3.1. General

The contractor shall remove trees, including stumps and roots, shrubs, grass, flowers and other vegetation interfering with the installation of new construction. He shall carefully and cleanly cut roots and branches of trees that will remain where such roots and branches obstruct new construction.

2.3.2. Limits for Site Clearing & Grubbing

Site clearing and grubbing activities shall be limited to those areas designated on the construction drawings as being within the limits of construction or within easements and rights-of-way designated for the work. Under no circumstances will the Contractor be allowed to occupy or cut outside the limits established for the work without written permission of the property owner. Clearing and grubbing shall be as indicated on the approved erosion control plan.

2.3.3. Clearing

Clearing shall consist of the removal from above the surface of existing ground standing trees, shrubs, brush, downed timber, rotten wood, heavy growth of grass and weeds, flowers, vines, rubbish and other debris. Trees may remain the property of the landowner and shall be removed or cut in the lengths as mutually agreed to by the inspector and the landowner. If the landowner does not want the wood, it shall be properly removed and disposed of by the Contractor.
2.3.4. Grubbing

Grubbing shall consist of the removal and disposal of stumps, roots, root mats and other debris to a depth of not less than 18 inches below existing ground elevation.

2.3.5. Ornamental Trees, Shrubs and Flowers

Existing ornamental trees, shrubs and flowers shall be removed in such a manner as not to destroy their viability and shall be stored at or near the site of their removal as approved by the inspector. Such trees, shrubs and flowers shall be maintained in an acceptable manner, watered and protected for healthy growth during the construction period. Said trees, shrubs and flowers shall be replanted as soon as possible or, if so directed, removed from the site. Any trees, shrubs and flowers rendered unusable shall be replaced by the Contractor with approved stock.

2.3.6. Protection

The Contractor shall protect existing trees and other vegetation that is to remain in place against unnecessary cutting, breaking or skinning of roots, skinning and bruising of bark, smothering of trees by stockpiling construction materials or excavating materials within the drip line. Temporary fences, barricades or guards are to be provided as required to protect trees and vegetation to be left standing.

Trees and other vegetation to remain within the limits of contract work shall be watered as required to maintain their health during course of construction operations.

Provide protection for roots over 1 ½” diameter cut during construction operations. Coat cut faces with a wound paint formulated for use on damaged plant tissues. Temporarily cover exposed roots with wet burlap to prevent roots from drying out; cover with earth as soon as possible.

Repair or replace trees and vegetation that will remain, which are damaged by construction operations, in a manner acceptable to the owner. Inspector may require the contractor to employ an arborist to repair damages to trees and shrubs at the contractor’s expense when deemed necessary.

Fill depressions caused by clearing and grubbing operations with suitable soil material, unless further excavation or earthwork is indicated. Fill material shall be placed in horizontal layers not exceeding 6 inches loose depth, and thoroughly compacted to a 90% density equal to adjacent original ground.

2.3.7. Disposal of Waste Materials

The Contractor shall remove all waste material weekly, weather permitting, from the site and shall dispose of it in a legal manner such as an approved landfill. Proper disposal guidelines may be found in, but not necessarily limited to, the County’s “Debris Manifest Ordinance”.
Burning of combustible materials on-site is prohibited.

2.3.8. Erosion Control

All activity performed under this section shall conform in strict compliance with Section 3 entitled “Erosion and Sediment Control” of this document.
3. **SITE DEMOLITION**

3.1. **General**

3.1.1. **Description of Work**

Exact extent of the site demolition may not be fully indicated on the plans. Determine the nature and extent of site demolition that will be necessary by comparing the plans with existing conditions. Perform all work of a demolition nature that may be required or necessary to a full completion of the work, whether or not shown or specified.

Demolition includes removal of all existing site improvements which interfere with new construction, and disposal of demolished materials from the site.

Provide an orderly sequence of demolition and removal to ensure the uninterrupted progress of operations.

3.1.2. **Job Conditions**

Explosives: The use of explosives will be permitted only upon approval by the inspector with appropriate permits and only in accordance with the “Rules and Regulations Governing Manufacture, Storage, Handling, Use and Sale of Explosives” issued by the Department of Labor and Industry.

Conduct demolition operations and the removal of debris to ensure minimum interface with the roads, streets, walks and other adjacent occupied or used facilities.

Do not close or obstruct streets, walks, or other occupied or used facilities without permission from authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by governing regulations.

Damage: Promptly repair damage caused to adjacent facilities by demolition operations to the satisfaction of the inspector.

3.2. **Products**

Not applicable to work of this section.

3.3. **Execution**

3.3.1. **Demolition**

Pollution Controls: Use water sprinkling, temporary enclosures, and other suitable methods to limit the amount of dust and dirt rising and scattering in the air to the lowest practical level. Comply with governing regulations pertaining to environmental protection:
• Do not use water when it may create hazardous or objectionable conditions such as ice, flooding, and pollution.

• Clean adjacent structures and improvements of dust, dirt and debris caused by demolition operations, as directed by the inspector or governing authorities. Return adjacent areas to condition existing prior to the start of work.

Below-Grade Construction: Demolish and remove below-grade construction and concrete slabs-on-grade.

Filling of Holes, Pits and Foundations:

• Fill with suitable material to within four inches of finished grade in lawn areas, compact to 90% density and topsoil to finished grade.

• Fill with suitable material to within 12 inches of finished grade in structural areas and compact as specified in Section 4 – Trenching, Backfill and Compaction.

3.3.2. Disposal of Demolished Materials

Burning of removed materials from the demolished structures on-site is prohibited.

Transport materials removed from demolished structures weekly, weather permitting, and legally dispose of off the site such as an approved landfill. Proper disposal guidelines may be found in, but not necessarily limited to, the County’s “Debris Manifest Ordinance”. 
4. EROSION AND SEDIMENT CONTROL

4.1. General

4.1.1. Related Documents

All work performed shall conform to all rules and regulations set forth by the Virginia Soil and Water Conservation Commission in its “Erosion and Sediment Control Handbook”, Chesterfield County and/or any other regulatory agency which has control or jurisdiction over erosion and sedimentation control in the area in which the project is located.

4.1.2. Description of Work

The Contractor shall furnish all labor, materials, equipment and services necessary for, and reasonably incidental to, preventing pollution of land, air and water and for controlling run-off and erosion of soil. Erosion and sediment control shall be accomplished so as to preclude sedimentation in general and in particular, of the County’s storm water system.

4.1.3. General Control Measures

All disturbed areas including but not restricted to stock piles, dams, banks of sediment basins and temporary road banks left unprotected for more than 30 days shall be temporarily seeded within seven days at the Contractor’s expense.

All disturbed areas shall be protected to control erosion and prevent sedimentation of adjacent properties, storm sewers and/or streams.

Sediment control devices such as diversion berms, sediment traps, filter berms, vegetation stabilization, etc., shall be used to prevent off-site sedimentation at all times.

All borrow and/or spoil materials shall only be stockpiled within the limits of the permitted site.

The proposed grading shall not impair existing surface drainage, constitute a potential erosion hazard, or source of sedimentation to any adjacent property, drainage system or right-of-way.

All points of construction ingress and egress shall be protected to prevent tracking of mud on the public streets.

4.1.4. Storm Drainage Control

If during construction of the utility system the Contractor disrupts the storm drainage, the storm drainage will be piped into the storm drainage system when required or handles by providing positive drainage onto stable areas at nonerosive velocities and in a manner consistent with established drainage patterns. Temporary storm drainage systems shall be approved by the Erosion and Sediment Control inspector.
4.1.5. Stabilization

Within 15 days of achieving final grade, all disturbed areas shall be stabilized with permanent vegetation and permanent mulch.

For vegetating critical areas, adequate mulch, fertilizer and type of seed will be placed to ensure a vigorous ground cover and such application will be repeated if necessary until such growth is established.

Sediment control measures may not be removed or relocated without the approval of the inspector.

4.2. Products

4.2.1. Straw Bales and Silt Fences

Straw Bales and fabric silt fences shall be installed in accordance with the latest edition of the Erosion and Sediment Control Handbook. Straw bales shall be of standard size.

4.2.2. Ground Limestone

Ground limestone shall contain a minimum of 88% of calcium and magnesium carbonates. A total of 100% shall pass the 10 mesh sieve; a minimum of 90% shall pass the 20 mesh sieve; and a minimum of 60% shall pass the 100 mesh sieve. Each container or package of limestone shall be clearly marked with the name of the material, net weight of contents, manufacturer’s name and guaranteed analysis. Upon inspector’s request bulk shipments shall be accompanied by a certificate covering the names, weight and the analysis specified herein.

4.2.3. Commercial Fertilizer

The basic mix shall be 10-10-10 formula, one-half of the nitrogen being in the form of organic nitrogen and shall conform to the applicable state fertilizer laws. It shall be uniform in composition, dry and free flowing and shall be delivered to the site in original, unopened containers, each bearing the manufacturer’s guaranteed analysis.

Any fertilizer which becomes caked or otherwise damaged, making it unsuitable for use, will not be accepted. The basic mix may be altered at the engineer’s discretion, based upon laboratory reports.

4.2.4. Water

Water shall be clean potable water.
4.2.5. Temporary Seeding

Seed shall be fresh, clean, of the latest crop conforming to the current purity and germination standards of the Atlantic Seedmens Association and mixed in the following proportions by weight.

<table>
<thead>
<tr>
<th>Planting Dates</th>
<th>Species</th>
<th>Rate (lbs./1000 s.f.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sept. 1 – Feb. 15</td>
<td>50/50 Mix of Annual Ryegrass (Lolium Multi-Florum) &amp; Cereal (winter) Rye</td>
<td>2</td>
</tr>
<tr>
<td>Feb. 16 – Apr. 30</td>
<td>Annual Ryegrass (Lolium Multi-Florum)</td>
<td>2</td>
</tr>
<tr>
<td>May 1 – Aug. 31</td>
<td>German Millet (Setaria Italica)</td>
<td>1</td>
</tr>
</tbody>
</table>

Upon request, by the inspector, the contractor shall furnish a certified report by the approved seed testing laboratory, showing a test for purity, viability, and seed content of representative samples of the seed which are proposed for use.

4.2.6. Mulch

Mulch shall be straw, free from weed seeds.

4.2.7. Liquid Mulch Binders

Liquid mulch binders shall be in accordance with the Virginia Erosion and Sediment Control Handbook, latest edition.

4.3. Execution

4.3.1. Straw Bales and Silt Fences

The staked straw bales shall be placed as a first priority item. Each bale shall be staked with two wooden stakes at least three feet long. Straw bales shall be maintained throughout the life of the project.

Silt fences shall be placed in strict accordance with state requirements relating to the proper placement and maintenance of this erosion control measure to ensure effective use.

4.3.2. Lime

Distribute ground limestone evenly by machine over all areas. Disc or otherwise till it into the top four inches of the soil at least five days before seeding. The rate of application shall be 40
pounds per 1,000 square feet. This rate may be altered at the engineer’s or inspector’s discretion.

4.3.3. Fertilizer

Distribute fertilizer evenly, by mechanical spreader, over all areas to be seeded and incorporate it into the top four inches of soil. Apply at the rate of 60 pounds per 1,000 square feet not more than one week prior to seeding. This rate may be altered at the engineer’s or inspector’s discretion.

4.3.4. Seeding

Seed at the rate of two pounds per 1,000 square feet and lightly rake into the soil.

4.3.5. Mulching

Apply mulch to all seeded areas the same day as seeding. Spread uniformly by hand or mechanical at the rate of 1 ½ to 2 tons per acre, or 70 to 90 pounds per 1,000 square feet.

4.3.6. Mulch Binding

Application of liquid binders should be heavier at edges where wind catches mulch, in valleys, and at crests of banks. Remaining area should be uniform in appearance.

Apply at the rate recommended by the manufacturers’ specifications.

4.3.7. General Control Measures

The work site, and areas adjacent thereto, shall be kept clean and free of soil, straw or other materials incidental to the work of this section. Surface drainage from cuts and fills within the construction limits, whether or not completed, and from borrow and waste disposal areas, shall, if turbidity producing materials are present, be held in suitable sedimentation ponds or shall be graded to control erosion. Temporary erosion and sediment control measures such as berms, dikes, drains, or sedimentation basins, if required to meet the above standards, shall be provided and maintained until permanent drainage and erosion control facilities are completed and operative. The area of bare soil exposed at any one time shall be held to a minimum. Fills and waste areas shall be constructed by a selective placement to eliminate silts or clays on the surface that will erode and contaminate adjacent rivers, streams, lakes, ponds and properties.

4.3.8. Stockpiling Excavated Material

Contractor shall stockpile excavated material and spoils on the uphill side of the trench and the pipe and/or brush on the downhill side of the trench. Performing this effective control measure will minimize the need for straw bales and silt fences. Disturbance shall be kept to a minimum and methods of controlling erosion shall be performed in accordance with the plans and the contractor is not relieved of his responsibility to perform construction practices which will
prevent erosion more clearly defined in the local and state Erosion and Sediment Control Measures.

4.3.9. Measures

Erosion control measures shall be maintained until permanent vegetation has been established. During periods of operations, erosion control facilities shall be maintained in proper condition and silt removed as directed by the inspector. Removal of erosion control facilities shall include proper disposal of collected silt and debris. Improper erosion control maintenance or installation shall be grounds to stop work on the project by the inspector.

4.3.10. Installation of Rip Rap

Installation shall be in accordance with VDOT Road and Bridge Specifications, latest edition.

4.3.11. Construction in a Wetland or Water of the U.S.

The area of land disturbance must be kept to the minimum necessary for utility installation. Excavated material may be temporarily sidecast within the disturbed area, provided that it is placed upon a filter fabric and in a location that will not allow it to be dispersed by currents or other forces.

In wetlands, the top 6 to 12 inches of the trench should generally be backfilled with topsoil from the trench. Excess material must be removed to upland areas immediately upon completion of the utility line. Any exposed slopes must be stabilized immediately upon completion of the utility line.

In waters of the U.S., the original ditch cross section must be reestablished and stabilized with rip rap immediately upon completion of the utility line.
5. **TRENCHING, BACKFILLING AND COMPACTION**

5.1. **General**

5.1.1. Quality Assurance

Work shall conform to County of Chesterfield requirements and, where construction is within the State right-of-way, the applicable requirements of the Virginia Department of Transportation.

5.1.2. Safety

It is a requirement of OSHA, VOSHA and these Specifications that all safety measures including, but not necessarily limited to trenching, confined space, traffic control and other applicable safety measures be strictly adhered to and enforced by the Contractor.

5.1.3. Job Conditions

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 the Utility Owner of the occurrence and to repair or cause 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” forty-eight (48) hours prior to starting work. Telephone 1-800-552-7001 for assistance.

Protection of Persons and Property:

- Barricade open excavations or work areas and provide them with warning lights and other protective measures as recommended by authorities having jurisdiction.
- 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.

Equipment used for this work shall meet all local, State and Federal safety and any other applicable standards governing this work. All power machinery shall have adequate mufflers to keep noise to a minimum.
5.1.4. Compaction

It is the intent of these Specifications that 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 must 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 at the Contractor’s expense and replaced, re-compacted, and retested. Any and all work performed by an independent laboratory is to be done under a purchase order from the Contractor. Verbal results of tests should immediately be given to the Contractor and Utility 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.

Where water and/or wastewater utilities are to be installed in the paved area of new roadways to be accepted into the State system, the requirements of the Virginia Department of Transportation Chesterfield Residency compaction procedures are to be followed.

5.2. Products

5.2.1. Soil Materials

Unstable Soil Materials – Soil that is too wet to permit proper compaction.

Non-cohesive Soil Materials – Non-cohesive soil materials include gravels, sand-gravel mixtures, and gravelly-sands.

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.

Backfill and Fill Materials

- Approved excavated or borrow materials must be free of rock or gravel larger than two inches (2”) in any dimension, debris, waste, frozen materials, organic and other deleterious matter.

- Approved materials must be at a moisture condition suitable for compaction at the required density.
5.3. **Execution**

5.3.1. **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.

5.3.2. **Excavation**

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 the County. Unauthorized excavation, as well as remedial work directed by the County, will not be compensated for by the County where refunds are involved.

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

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

- Establish requirements for trench shoring and bracing to comply with local 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 and adopted by the Safety and Health Codes Commission of the Commonwealth of Virginia and all the 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.
- Maintain sheeting, shoring, and bracing in excavations regardless of the time period in which excavations will be open. Carry down sheeting, shoring and bracing as excavation progresses in accordance with the proper authority.
- Sheet, shoring and bracing may be left in place with the approval of the Utility Owner, but must be cut off to a depth of not less than two (2) feet below the surface.

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

- Do not allow water to accumulate in the 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.

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

Stability of Excavations:

- The slope sides of excavations are 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 the stability of the material excavated.
- Maintain the sides and the slopes of excavations in a safe condition until completion of the backfilling.

Material Storage: Stockpile approved excavated materials where approved by the County, until required for backfill or fill. Place, grade, and shape stockpiles for proper drainage.

- Locate and retain soil materials away from the edge of the excavations.
- Dispose of excess soil material and waste materials as hereinafter specified.

Excavation for Trenches and Structures:

- 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 500 feet. The width of the trench at and below the top of the pipe shall not exceed the outside diameter of the pipe plus eighteen inches (18”) except that for pipe twelve inches (12”) or less in diameter, the trench width shall not exceed thirty-three inches (33”). 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, at his own expense, 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.

- Excavate trenches to the depth indicated or required. Carry the depth of the trenches for piping to the indicated flow lines and invert elevations.

- Grade the bottom of the trenches as indicated. For pressure lines, notch under pipe bell to provide solid bearing for the entire body of the pipe.

- Where pipe for pressure lines is to be laid, the trench shall be in accordance with the County Standard Details.

- Cold Weather Protection: Protect excavation bottoms against freezing when atmospheric temperature is less than 35 degrees Fahrenheit.
• Excavation for structures shall conform to the lines and grades as shown, established or as necessary. Where the bottom of the excavation is in unstable 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 replaced 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 admixture of earth with the concrete. All sheeting, bracing, and shoring required for safety shall be installed in conformity with applicable rules and ordinance.

5.3.3. 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.

5.3.4. Rock Excavation
Definition – Rock excavation shall be comprised of solid rock in the original bed or well-defined ledges and which can only be removed by blasting and/or drilling or using jack hammers and shall include all boulders or detached pieces of rock one-half cubic yard or more in content.

Pipe Trench – Rock shall be excavated a minimum of six inches (6”) below the bottom of pipes. The pipes shall be laid on a cushion of crushed stone of sufficient depth to provide the proper grade. A minimum clearance of six inches (6”) shall be provided between the vertical walls of the trench and the bell of the pipe.

Structures – Rock excavation for structures shall extend a minimum of six inches (6”) below the bottom or base of the structure and a suitable bedding shall be provided. A minimum clearance of one foot (12”) shall be provided between the rock and the exterior face of the structure when forming is not used. The minimum clearance shall be two feet (2’) when forming is used.

5.3.5. Blasting
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. The Contractor shall obtain a blasting permit from the Chesterfield Fire and EMS, Fire and Life Safety Division – Fire Marshal’s Office.

When blasting is required, the Contractor shall conform to the following requirements:
• Distance from structures: There shall be no blasting within one hundred feet (100’) of any structure or utility line unless the Owner of the structure(s) and/or utility line(s) gives consent in writing.

• Blasting near: When blasting is done near a structure, railway or highway, or any other installation, precautions shall be taken to minimize earth vibrations and air blast effects. Blasting mats or other protective means shall be used to prevent fragments being thrown.

• General: The Contractor will not be permitted to blast under any conditions unless a representative of the County is present. Blasting operations shall be conducted only by approved, competent Operators familiar with the required safety precautions and the hazards involved. Blasting operations shall be performed in accordance with the instructions of the Manufacturer of the explosive materials being used.

• Restricted hours: Blasting will not be permitted before 9:00 a.m. or after 4:00 p.m. on Monday through Friday. Blasting on Saturdays, Sundays or holidays will not be permitted. The Contractor shall, each day when necessary to blast, set up an approximate schedule of blasting operations, and provide twenty-four (24) hours’ notice to the County and property owners with occupied buildings within 1,000 feet of the blasting.

• Personnel: Persons in charge of blasting shall not be under the influence of alcohol or drugs which impair sensory or motor skills, shall be at least twenty-one (21) years of age, and shall demonstrate knowledge of all safety precautions related to the storage, handling, or use of explosives or explosive materials.

• Open flames and lights: Smoking, matches, flame-producing devices, open flames, firearms and firearms cartridges shall not be permitted inside of or within the blast site.

• Blasting safeguards: Before a blast is fired, the person in charge shall make certain that surplus explosive materials are in a safe place, that persons and equipment are at a safe distance or under sufficient cover, and that a loud warning signal reasonable calculated to be heard by individuals not less than one hundred feet (100’) from the blast site has been sounded. The County reserves the right to require the Contractor to have a repair crew and equipment available on-site to repair any damage caused to the Chesterfield utility by blasting operations.

• Electric detonator precautions: Precautions shall be taken to prevent accidental discharge of electric detonators from currents induced by radar and radio transmitters, lightning, adjacent power lines, dust and snow storms, or other sources of extraneous electricity.

• Non-electric detonator precautions: Precautions shall be taken to prevent accidental initiation of non-electrical detonators from stray currents induced by lightning or static electricity.

• Non-sparking tools: Tools used for the opening and closing of packages of explosive materials, other than metal slitters for opening paper, plastic, or fiberboard containers, shall be made of non-sparking materials.
• Manufactured firing devices: Only manufactured firing devices designed for use with the detonators selected shall be used.

• Maintenance of apparatus: All apparatus shall be kept in perfect order and shall be thoroughly inspected before and after each blasting operation.

• Wiring: All wiring connected to electrical firing devices shall be properly and adequately insulated.

• Disposal of packaging: Empty containers and paper and fiber packaging materials that previously contained explosive materials shall be disposed of or reused in an appropriate manner.

• Explosives: Only such explosives as are necessary for the performance of the work shall be brought to the site.

• Abandonment: Explosive materials shall not be abandoned.

5.3.6. Backfill for Trenches

After the installation of the pipe has been field inspected, the trenches shall be backfilled with fine, loose earth deposited carefully on both sides of the pipe or with the appropriate fill material specified on the trench detail or County's Standard Details Section. Large clods, sticks, stones, and other unsatisfactory material must be excluded from the backfill around and to within twelve inches (12”) above the pipe. The fill, or in the case of plastic pipe where stone is used for bedding and backfill to the top of the pipe, the stone shall be carefully rammed by hand or pneumatic tamping methods under, on both sides and to within two to three feet (2’-3’) on top of the pipe. The remainder of the backfilling may be done by hand or with mechanical equipment in lifts no greater than twelve inches (12”). Where settlement occurs, the trench shall be refilled, contoured, and compacted by an approved method to conform to the surface of the ground. Sheet and bracing shall, in general, be removed as the backfilling progresses, and in such 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. No rock should come in contact with the pipe.

• Sewer pipe shall have minimum bedding as shown on the County Standard Details.

• Backfill shall be completed in layers with the following percentage of maximum density at optimum moisture content of + or – 2% as determined by ASTM D698
  o 95 percent (95%) under pavements and road shoulders.
  o 90 percent (90%) in other unpaved areas.

Under Existing Roadways and Pavement: Backfill for trenches under roadways and other paved areas shall be backfilled to the top with 21-A stone, except that all fill above the pipe shall be deposited in layers not exceeding six inches (6”) in thickness. Each lift shall be thoroughly compacted by mechanical or hand tamping methods in accordance with VDOT requirements, so
that when the backfilling is completed, the paving may be replaced as specified in the section entitled “Construction in Public, Streets, Roads and Alleys”.

Clay dams: Clay material with an imperviousness of 10-3 cm/sec shall be used in clay dams. Material shall be compacted as indicated in paragraph A above. The Inspector shall approve clay material prior to use.

5.3.7. Backfill for Structures

Around and adjacent to structures, backfill shall be of material of suitable stability and perviousness. Backfill shall be placed in six-inch (6”) 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 ninety-five percent (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.

5.3.8. Construction in Public Streets, Roads and Alleys

Unless superseded by other specifications or 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 and Virginia Department of Transportation (VDOT). The word VDOT used in the previous sentence means the individual, group or governmental body that has jurisdiction over the streets, roads, and alleys.

General: Typically, water and sewer lines are to cross roadways at right angles and/or to parallel roadways in the roadway or along the side of the roadway. Uncased water 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 or obtain a VDOT statement that no highway permit is necessary before construction can begin. The method of construction (trenching, boring, tunneling, jacking, etc.) must be shown on the permit and the plans. During construction, if deemed necessary by VDOT to assign inspectors to the project, the Contractor is to pay an additional inspection fee to cover their cost. 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 must make application for a highway permit at least ten (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 a manner acceptable to VDOT. Prior to the actual open
Backfill and Compaction: Typically, backfill will be compacted to 95% of the theoretical maximum density of optimum moisture content, as determined by VDOT testing procedure VTN-1. The Contractor shall provide adequate protection to all structures during trenching and backfilling using every precaution to avoid damage or defacement. Not over five hundred feet (500’) of trench shall be opened at any one time. Backfill for water and sewer lines shall be placed generally in accordance with VDOT and County Specifications and the following criteria:

- Prior to excavation of the trench and prior to the installation of surface courses (s), the adjacent plant mix shall be smooth face cut through the full depth.
- No trench shall be backfilled until authorized by the County. Materials for backfilling from the bottom (bedding per County Standards) of the trench to twelve inches (12”) above the water and/or sewer lines shall be #57 stone bedding and backfill for sewer lines and VDOT Type B or approved sand for water lines. Material shall be thoroughly and carefully compacted to insure a sound backfill over and around the water and/or sewer line.
- Backfill shall be compacted by mechanical tamping throughout the depth of the trench in six inch (6”) layers to insure a suitable sub base, acceptable to the County and VDOT.
- Backfilling shall be performed in accordance with the standard details latest revision, for pavement restoration applicable to the situation at hand.

Bituminous Pavement Structure: Wherever pavement is permitted to be cut as shown on the plans, not over one-half of the road width shall be disturbed at one time, unless an approved method of detouring traffic is reviewed and accepted by VDOT. The first opening shall be in travelable condition before the second half can be opened. Where the Contractor is granted approval from VDOT to open cut a road (this applies to crossings only) the permit will include the following stipulations but not limited thereto:

- Chesterfield Residency is to be notified forty-eight (48) hours prior to any open cut work being performed.
- Work within the roadway shall be done between the hours of 9:00 a.m. and 4:00 p.m. or as stated in the VDOT permit.
- 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”.
- The area of the open cut shall be restored in accordance with one of the following applicable standards:
  a. Asphalt Road
     (1.) Backfill entirely with # 21-A or #22 stone (ninety-five percent [95%] compaction).
(2.) Apply tack material to all joists before placing surface mixture.

(3.) Install a minimum of twelve inches (12”) of BM-25.0 asphalt concrete in four (4”) lifts (see Standard Detail).

(4.) Overlay a minimum of twenty-five inches (25”) of both sides of the trench with two inches (2”) of surface mix.

(5.) Seal all joints with liquid bituminous sealer.

b. Asphalt Road Base with a Surface Treatment Seal

(1.) Backfill entirely with #21-A stone (ninety-five percent [95%] compaction).

(2.) Apply tack coat for all edges and existing surface asphalt (see standard detail).

(3.) Install 1.5 times the thickness of the existing pavement or a minimum of six inches (6”) BM-2 flush with the existing pavement.

(4.) Surface treat a minimum of ten feet (10’) on both sides of the 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 pounds of #8P stone/sq. yd. each.

c. Surface Treated Road (Tar and Gravel)

(1.) Backfill entirely with # 21-A or # 21-B stone (ninety-five percent [95%] compaction).

(2.) Apply tack coat for all edges and existing surface asphalt (see standard detail).

(3.) Install four inches (4”) of BM-2 (base mix) in the trench flush with the existing pavement.

(4.) Surface treat a minimum of ten feet (10’) on both sides of the 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 pounds of #8P stone/sq. yd. each.

d. Dirt/Gravel Road or Aggregate Shoulders

(1.) Select backfill is to be compacted to ninety-five percent (95%) maximum density six inches’ lifts (6” lifts).

(2.) Backfill the trench with ten inches (10”) of #21-A or #21-B stone (ninety-five percent [95%] compaction).

(3.) Apply a fresh application of #21-A or #21-B stone to all disturbed areas of the road.

(4.) The pavement cut shall be covered with a temporary or permanent asphalt patch on the same day that excavation is made.

(5.) One travel lane will be maintained always.
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 PAV Details as reflected in Part III of this document and the VDOT permit.

Placement of all plant mix and surface treated courses shall be rolled where possible with a unit having a manufacturer’s rating of ten (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 VDOT and the Utilities Department of Chesterfield County until the appropriate pavement patch can be applied and accepted.

Upon completion of the installation of the water and sewer lines (not necessarily all testing having been completed), the Contractor shall restore the pavement in the manner prescribed on the VDOT permit within ten (10) days. All trenches and repaving shall be maintained in accordance with the VDOT permit and shall be repaired upon request of VDOT.

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 properties at all times. When entrances are disturbed, they must be restored to original condition or to a condition satisfactory to VDOT’s Resident Engineer or 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 positive drainage established in the ditches. All loose material shall be swept from hard surfaces immediately after backfilling. Calcium Chloride or an approved alternate shall be used before sweeping 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 an emergency arises under any circumstance, repairs will be made at the Contractor’s expense. The Contractor shall maintain all trenches and damaged pavement in a manner acceptable to VDOT’s Resident Engineer. 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 roads currently owned by the Developer). Upon completion of the work under permit, the Contractor will notify the Resident Engineer so that an inspection can be made to insure compliance with the highway permit and accepted by VDOT. Where landscaped areas are disturbed, the area shall be left with a minimum of two inches (2”) or more of topsoil and reseeded according to VDOT Specifications, to include reseeding until a stand of grass is obtained.

Work Zone Protection: The Contractor shall immediately correct any situation which may arise because of construction that VDOT or the County deem hazardous to the traveling public, even though it may not be specifically covered in the highway permit or other requirements. In the event that these conditions are not complied with, and after reasonable notice has been given by VDOT, it is hereby agreed and understood that VDOT reserves the right to employ an outside
Contractor to perform the necessary work and bill the firm doing the work. The word “firm” used in the previous sentence means the individual, corporation, or partnership in whose name the permit was issued.

Traffic is not to be blocked, rerouted or otherwise impeded without written permission from the Resident Engineer. Placement and type of traffic control, warning devices and personnel shall be in accordance with the VDOT “Work Area Protection Manual”. Where one-way traffic is permitted, the Contractor shall perform proper flagging for the duration of the project. The Contractor will notify VDOT at least twenty-four (24) hours before starting work. If traffic is impeded in any way the same notice must be given to the Fire Life Safety Division, Rescue Squad, VDOT, Police Department 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 and Chesterfield County shall not be liable for any damage resulting from construction.

5.3.9. Disposal of Waste Materials

Removal from Project Site: Remove waste materials, including unacceptable excavated material, trash, and debris, and dispose of it legally off the project site.

Dust Control: Water, calcium chloride or approved alternate materials shall be periodically sprinkled to alleviate problems associated with dust.

6. WATER DISTRIBUTION SYSTEM

6.1. General

6.1.1. Requirement 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 Chesterfield and the Virginia Department of Health or any other agency having authority. Where conflicts arise between the construction documents and previously mentioned requirements, the more constrictive 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.

6.2. Products

6.2.1. Approved Materials

All materials shall conform to the County of Chesterfield’s “Approved Materials and Manufacturer” list.

All materials shall be virgin material. The Contractor shall submit a notarized statement from the supplier and/or manufacturer to the Inspection Section that all materials being supplied for the work meet AWWA and/or County Standards as appropriate. At least three (3) copies are the County’s use along with any additional copies needed to be returned to the Contractor, Engineer, Suppliers, etc. after approval is made.

In addition, 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 Vaults, and Treatment Plant projects to include pipe and accessories, manholes and appurtenances, valves, and other assorted projects, etc.) are to be submitted by the Utilities Contractor to the Engineering Supervisor in charge of the Inspection Group for approval. The information should be sent as far in advance as possible (at least forty-eight (48) hours) to avoid any unnecessary delays in beginning the project. The appropriate number of copies of shop drawings needed is as defined in the above paragraph.

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

6.3. Execution

6.3.1. Installation of New Water Systems

Excavating and Backfilling:
• The Contractor shall do all excavation of all materials encountered while excavating for all underground utility systems. After the pipe is in place, backfill with suitable earth, free from rocks, organic material, etc.

• Provide all necessary shoring required for the protection of the excavations, existing utilities and workers and do all necessary pumping required to keep the excavation and the pipe free of water from any source always.

• Provide sufficient barricades, etc. adjacent to excavations to safeguard against injury to workers and the public. Provide and maintain sufficient warning lanterns at walks, roadways, and parking areas to provide safety always.

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

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

• Remove and dispose of any material not used for backfilling.

• 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 or 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 (2′) from around the area of the new facility and backfilled with a suitable material as specified.

Pipe Installation:

• Take all precautions to ensure that the pipe and related items are not damaged in unloading, handling, and placing in the 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.

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

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

• Lined and graded hubs shall be set by a registered Surveyor, at intervals to accurately insure the proper location of the water line and the appurtenances. This shall include finished grade centerline stakes for fire hydrants, stakes at all fittings referencing all property pins, etc. Cut sheets are required for all waterline installation.

• 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 materials shall be kept out of the pipe and off the jointing surfaces.

b. All pipe laid shall be retained in position 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 the 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 the County has given permission. Joint deflection in the pipe shall not exceed one half (1/2) that recommended by AWWA Standards or the manufacturer, whichever is less. Changes in grade or alignment which cannot be made by deflecting the 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 the point of the connection to the existing water line or from a designated starting point. The 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. 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.

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. Approved lubricants, primers, adhesives, etc. shall be applied and the pipe joined as recommended by the manufacturer’s specifications. Sufficient pressure shall be applied in making the joint to assure that the pipe is “home”.

g. Joining Pipe:

(1) Ductile Iron pipe is to be joined as follows:

(a) Mechanical Joint Pipe

1. Thoroughly clean the inside of the bell and eight inches (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. Lubricate the bell and spigot end of the pipe, using only approved lubricant (Blue Lube or Slikstyx). (Note: Use of any unapproved lubricant other than Blue Lube or Slikstyx has been shown to cause significant taste and odor conditions when used in drinking water disinfected with chloramines. The County will not accept completed water lines that exhibit taste and odor conditions because of the use of unapproved lubricants.)

Slip the cast-iron gland on the spigot end with the lip extension of the gland toward the end of the pipe. Lubricate the rubber gasket with an
approved lubricant as referenced above and place on the spigot end
with the 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 are inserted and nuts are screwed
up finger tight. Then tighten all nuts to the torques listed below:

<table>
<thead>
<tr>
<th>Bolt Size in Inches</th>
<th>Torque Feet</th>
<th>Torque Pounds</th>
</tr>
</thead>
<tbody>
<tr>
<td>5/8</td>
<td>40</td>
<td>60</td>
</tr>
<tr>
<td>¾</td>
<td>60</td>
<td>90</td>
</tr>
<tr>
<td>1</td>
<td>70</td>
<td>100</td>
</tr>
<tr>
<td>1 ¼</td>
<td>90</td>
<td>120</td>
</tr>
</tbody>
</table>

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

4. Permissible deflection in mechanical joint pipe shall not be greater than
one-half (1/2) of that listed in AWWA C600.

(b) Push-on Joint Ductile Iron Pipe

1. Thoroughly clean the inside of the bell and eight inches (8”) of the
outside of the spigot end of the joining pipe to remove oil, grit, excess
coating, and other foreign matter. Flex the rubber gasket and insert it
into the gasket recess of the bell socket. Apply a thin film of gasket
lubricant (Blue Lube or Slikstyx) to the gasket and spigot end of the
joining pipe. (Note: Use of any unapproved lubricant other than Blue
Lube or Slikstyx has been shown to cause significant taste and odor
conditions when used in drinking water disinfected with chloramines.
The County will not accept completed water lines that exhibit taste and
odor conditions because of the use of unapproved lubricants.)

2. Start the spigot end of the pipe into the 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 (1/2) of that listed in AWWA C600.

(2) Polyvinyl Chloride (PVC) pipe shall be joined in accordance with the
manufacturer’s recommendations.

(a) 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. An approved joint restraint device is required when inserting
PVC pipe into M.J. fittings. This device does not replace the requirements
for a joint restraint system.
(b) Thoroughly clean the inside of the bell and one inch (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.

(c) Lubricate the gasket and spigot end of the pipe, using only approved lubricant (Blue Lube or Slikstyx). (Note: Use of any unapproved lubricant other than Blue Lube of Slikstyx has been shown to cause significant taste and odor conditions when used in drinking water disinfected with chloramines. The County will not accept completed water lines that exhibit taste and odor conditions because of the use of unapproved lubricants.)

(d) 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 the pipe home.

(e) 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.

(3) Asbestos Cement Transition:

(a) When connecting PVC or Ductile Iron pipe to existing asbestos cement pipe, the transition coupling is to be applied to the rough barrel of the asbestos cement pipe and not to a factory or machined end of the asbestos cement pipe.

h. A tracing wire of fourteen (14) gauge copper shall be installed and taped directly on top of all water line pipe in a manner that results in a continuous trace. The wire is to be wrapped around hydrants, blow offs and corporation stops.

i. Place underground warning tape directly above all water mains, eighteen inches (18”) below the finished grade. The tape shall be polyethylene tape with a metallic core, two inches (2”) in width, with the continuous printed message “Caution Waterline Buried Below.” The tape shall be Catalog Number 2 WAT as manufactured by the Seton Name Plate Corporation or an approved equal.

j. In addition to letters h and i of this section above, all lengths of pipe within a joint restraint system shall have a marker tape (Blue with the following text: “Water Restrained Joints”) attached directly to the top of the pipe with duct tape.

Installation of Valves, Fittings, and Hydrants:

- General: Valves, fittings and hydrants shall be set and jointed to the piping system as hereinbefore specified for cleaning, laying and jointing pipe.

- Valves and Valve Boxes: Cast iron valve boxes shall be firmly supported, centered and plumb over the operating unit of the valve. The Box cover shall be set flush with the surface of the finished pavement or at such other level as may be directed by the Inspector. All valves shall be properly restrained.
• 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 hazard or cross connection.

• Hydrants:
  a. Using an approved joint restraint: Each hydrant lateral shall be fully restrained and connected to the main with a minimum of a six-inch (6”) branch, controlled by an independent six-inch (6”) gate or resilient seat valve. All valves shall be restrained with a hydrant tee.
  b. When hydrants are set, a drainage pit two-feet (2') in diameter and two feet (2’) below the boot of the hydrant shall be excavated. The pit shall be filed with one half (1/2) cubic yard of No. 57 clean stone to a level of six inches (6”) above the weep hole. No hydrant drainage pit shall be connected to a sewer. The boots of all hydrants shall be well braced against unexcavated earth. Hydrant laterals greater than 20 feet (20’) may use concrete thrust blocking behind the hydrant per Standard Detail Drawing F1R 4-A. All hydrants shall be thoroughly cleaned of dirt or foreign matter before setting.

• Anchorage of Fittings: All fittings, i.e., each bend, tee, plug, valve, cap, etc. shall be prevented from moving by means of adequate thrust reaction blocking or an approved mechanical restraint joint system.
  a. When ductile iron fittings are used with AWWA C900 PVC pipe in sizes up to eight inches (8”) or Ductile Iron pipe in sizes up to forty- eight inches (48”) and the Engineer has determined that thrust blocking will not provide adequate thrust restraint, an approved Mechanical Joint Restraint System shall be installed.
  b. Under normal conditions, the approved method of restraint shall be concrete thrust blocking per County standard details for dead-ends (cul-de-sacs, etc.), horizontal bends, and tees. A Mechanical Joint Restraint System shall be used for vertical bends, all valves, fire hydrant laterals, reducers, and carrier pipe through casings. Mechanical joint Restraint Systems must be used in certain other approved conditions or special applications (i.e., poor soils) in Chesterfield County’s Public Water System, as shown in the following table:

<table>
<thead>
<tr>
<th>Location (Good Soil Conditions) see Note 1</th>
<th>Method of Restraint</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dead Ends (cul-de-sacs)</td>
<td>Concrete Thrust Block</td>
</tr>
<tr>
<td>Horizontal bends</td>
<td>Concrete Thrust Block</td>
</tr>
<tr>
<td>Tees</td>
<td>Concrete Thrust Block</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Location (Poor Soil Conditions) see Note 1</th>
<th>Method of Restraint</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dead Ends (cul-de-sacs)</td>
<td>Approved Mechanical Joint Restraint System</td>
</tr>
<tr>
<td>Horizontal bends</td>
<td>Approved Mechanical Joint Restraint System</td>
</tr>
<tr>
<td>Tees</td>
<td>Approved mechanical Joint Restraint System</td>
</tr>
</tbody>
</table>

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Chesterfield County WSSP
Fourth Edition
### Location | Method of Restraint
--- | ---
Carrier Pipe Through Casings | Approved Mechanical Joint Restraint System
Reducers | Approved Mechanical Joint Restraint System
Vertical Bends | Approved Mechanical Joint Restraint System
Fire Hydrant Laterals | Approved Mechanical Joint Restraint System
Valves (see Note 2) | Approved Mechanical Joint Restraint System
Crosses | Approved Mechanical Joint Restraint System

**Note 1:** The Engineer determines Soil conditions.

**Note 2:** All valves shall be installed as close to a tee or cross as possible and restrained to that tee or cross using an approved joint restraint device on both sides of the valve. When valves are placed for future waterline extensions the valve must be restrained to the fitting and a minimum of twenty feet (20') of pipe shall extend beyond the valve. Where the valve cannot be restrained to a tee or cross that valve must be restrained as part of an approved Joint Restraint System.

c. When Mechanical Joint Restraint Systems are required due to specific applications, special design considerations, or poor soil conditions as referenced above, the Engineer shall provide the calculations used in determining the required length of pipe on either side of the fitting to be restrained. The Engineer shall use type 2 trench conditions, ML or Silt 2 soil type, and a test pressure of 150 psi with a 1.5 safety factor for thrust-restraint calculations.

d. Mechanical Joint Restraint Systems require that sufficient lengths of pipe, in addition to the fittings, be restrained. The standard length of pipe requiring restraint varies from application to application and is designed based on variables such as soil bearing capacity, soil condition, pipe size, pipe material, pressure, and fittings. Calculated restraint lengths shall be rounded up to the next full pipe joint.

e. When conditions are encountered in the field during construction in which thrust blocks do not provide the required thrust protection, the Developer’s Contractor shall be responsible for ensuring that the Engineer and those individuals on the County staff that are responsible for the plan review, prior to plan approval, are contacted to evaluate and/or adjust the design appropriately. The County’s inspector should consult with the Operations and Maintenance personnel if there are any questions about whether field conditions warrant special or additional restraint systems due too unsuitable soil conditions encountered during construction.

- In easements and in undeveloped wooded areas, plastic markers shall be installed every two hundred feet (200'), and at all valves and fittings. Markers shall be as manufactured by Carsonite or an approved equal. Exceptions are where water lines are installed in “kept” yards where the property owners may object to the placement of these markers. Contractors will be required to properly install the markers per manufacturer’s
recommendations, parallel to the water line facing the roadway, or as directed by the County.

Installation of Fabricated Steel Tapping Sleeves:

- **General:** Rigorous testing and conditions relating to tapping sleeves, applied to all manufacturers, is standard operating procedure. These conditions are as follows:
  a. The tapping sleeve shall be tested in place to a minimum of 200 psi, for a minimum of ten (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 sixteen inches (16”) and above shall be supported by a concrete pedestal support, as shown in the County’s “Standard Details” Section.

- **Rockwell Tapping Sleeve:** In addition to the conditions outlined in Section 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 one percent (1%) chlorine solution prior to installing the sleeve.
  b. Lubricate the pipe and gasket with soap and water. Under no condition should any antifreeze be used.
  c. Mount body halves on the pipe. The Contractor shall ensure the gasket is secure in the gasket groove.
     The Contractor shall ensure that the tapping nipple is pointing in its final direction, so it will not be moved or rotated on the pipe. This half of the sleeve can be blocked in some fashion, so the back half of the sleeve and the bolts can be installed without having to have several people involved in attaching the sleeve.
  d. Insert the bolts and hand tighten the nuts, keeping equal gaps between the body halves.
  e. Prior to tightening the nuts, position the outlet as required to suit the installation. The Contractor shall ensure the test connection is accessible.
  f. Tighten the bolts, alternating from one side to the other to equalize the gap between halves. Continue to tighten the bolts until the sleeve halves conform to the contour of the pipe and all bolts are a uniform tightness. The required torque for dry threads will be 70-100 foot-pounds (Lubricated threads will be 35-50 foot-pounds). 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 line. The pressure test should be at two and one-half (2 ½) times the line pressure or 200 psi, whichever is greater. The
The duration of this pressure test shall be a minimum of ten (10) 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 the tapping operation: The Contractor shall complete the tapping procedure and perform the necessary checking as required. The Contractor shall furnish the Inspector with the coupon.

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

Installation of Services

- **3/4” and 1” Services**
  a. All taps for services on ductile iron pipe shall be direct tapped. Taps made to PVC or asbestos cement pipe shall use a bronze-bodied saddle.
  b. Taps shall be made on a forty-five-degree angle.
  c. Corporation stops shall have a “cc” thread inlet and a copper flare outlet.
  d. The tap shall be made with a tapping machine equipped with a bit designed for the type of pipe being tapped.
  e. The distance between taps or from a joint or bell shall be a minimum of eighteen inches (18”).
  f. Service pipes shall be type “K” soft copper.
  g. Services shall be installed with a three foot six-inch (3’6”) minimum cover up to the meter yoke where the yoke shall be installed so that the meter will set twelve to sixteen inches (12”-16”) from the finished grade.
  h. Meter yokes shall be from approved materials list and be installed with a tail piece of type “K” copper 10”-18” long.
  i. Meter yoke and box shall be set 1’ inside property line or a reasonable distance inside property line to install on reasonable level ground.
  j. Backfill shall be hand tamped up to service pipe at tap to prevent corporation stop from being broken off during backfilling.
  k. Traffic rated meter box to be of cast iron in driveways.

- **1 ½” and 2” Services**
  a. All taps for services on existing ductile iron pipe shall be direct tapped. Taps made to existing PVC or asbestos cement pipe shall use a bronze-bodied saddle.
  b. Connections to newly constructed ductile iron waterlines shall be either direct tapped or use a tapped tee. Connections to newly constructed PVC waterlines shall use a tapped tee.
c. Taps shall be made at the spring line of the pipe.
d. Corporation stops shall have “cc” thread inlet and copper flare outlet.
e. Tap shall be made with a tapping machine equipped with a bit designed for the type of pipe being tapped.
f. Distance between taps or from a joint or bell shall be a minimum of 18”.
g. Service pipe shall be type “K” hard copper.
h. Services shall be installed with 3’ 6” minimum cover up to meter yoke where yoke shall be installed so that meter will set 12”-16” from finished grade.
i. Meter yokes shall be from approved materials list and be installed with a tail piece of type “K” copper 10”-18” long.
j. An approved curb stop shall be located within one foot of the meter box.

Installation of Water Mains and Water Meter Boxes as it relates to sidewalks:

- Sidewalks must be constructed to accommodate at least a four-feet (4’) horizontal separation between the sidewalk and the County’s public water mains.
- If sidewalks are constructed within the public road right-of-way, the street side of all water meter boxes must be installed three feet (3’) behind the house side of the sidewalk or to the right-of-way line, whichever is greater.
- If sidewalks are constructed outside of the public right-of-way and are less than five feet (5’) from the right-of-way line, the street side of all water meter boxes must be installed three feet (3’) behind the house side of the sidewalk.
- If the sidewalks are constructed outside of the public right-of-way and are more than five feet (5’) from the right-of-way line, the water services must be installed within one foot (1’) outside of the right-of-way line.

6.3.2. Testing of The Water Distribution System

Testing Techniques for the Water Distribution System:

- Each properly isolated section of the piping system including all water services shall be subjected to a pressure test of 150 psi, or one and one-half (1 ½) times the working pressure, whichever is greater, measured at the high point of the system. Maintain this pressure for a minimum of two (2) hours with no allowable leakage. 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 suitable taps at the high points of the system. After the system is filled, all taps shall be tightly plugged.

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 and materials and perform all 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 fifty (50) gallon barrel with the top cut out, etc., which is satisfactory to the Inspector.

- The County will furnish the water used for flushing, sterilization and testing without charge. Filling of the water line 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 Section. The Contractor is not permitted to operate valves on existing lines.

- Testing shall be performed in accordance with the AWWA Specifications, latest revision.

6.3.3. Disinfection

Prior to being placed in service, the pipe line and appurtenances shall be disinfected in general accordance with ANSI/AWWA C651-14, the AWWA Standard for Disinfecting Water Mains, and the supplemental procedures and equipment required for disinfecting large diameter water mains. As part of the submittal process, the Contractor shall be required to submit a disinfection plan to the Engineer for approval. At a minimum, the Contractor’s plan shall address the following:

- A description of the chlorination procedure.
- The method of chlorination.
- The method of neutralizing chlorinated water.
- The method of controlling the discharge water such that damage from erosion and flooding is prevented.
- Section 4 of AWWA C651-14 emphasizes six (6) basic procedures in the disinfection process. The 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 mains;
  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 a hydrostatic pressure test and disinfection procedures;
  e. Determine the bacteriological quality by a laboratory test after disinfection; and
  f. Make the final connection of the approved new water main to the active distribution system.

- Preliminary Flushing: The main shall be flushed prior to disinfection at a velocity of not less than 3.0 feet/second unless the Owner determines that conditions will not permit the required flow. See Table 1, entitled “Flushing Schedule”. Adequate provisions will be made by the Contractor, for disposal of flushing water so that no physical or
environmental damage results. The Contractor will find additional instructions on flushing in the supplemental procedures within this section.

- 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 three (3) sources:
   (1) Liquid sodium hypochlorite (household bleach).
   (2) Liquid sodium hypochlorite (industrial strength).
   (3) Calcium hypochlorite granules.

b. Only under extreme conditions and with the written approval of the Owner and 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 line is not safe and shall not be allowed.

d. The use of calcium hypochlorite pills affixed to the interior of the water pipe for disinfection shall not be an acceptable form of disinfection.

e. The mixing of a source of chlorine to obtain a suitable disinfection solution shall be as follows:
   (1) Liquid sodium hypochlorite is supplied in strengths from 5.25% available chlorine (commercially available household bleach) to 15% 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 a 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.
• Method of Chlorine Application and Testing:
  a. The continuous feed method of applying the disinfecting solution shall be as follows:
     (1) Water from the existing distribution system or other approved sources of potable water supply shall flow through an approved flushing mechanism (Standard Detail WAT-6) at a constant, measured rate into the newly-laid pipe line. The water shall be mixed with a chlorine-water solution as prepared above, and 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.
     (2) Since the forms of preparation for a water sodium hypochlorite or water calcium hypochlorite concentration is 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.
     (3) 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, hydrant’s, and any other appurtenances shall be operated 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.
  b. For thirty-six inch (36”) and larger water lines: disinfection by the slug method shall be in accordance with AWWA C651-14, Section 4.5. A preassembled flushing mechanism shall be used between the supply and the process equipment and the chlorinated main always.
  c. The Owner will furnish the personnel and equipment for determining water-chlorine solution strengths and residuals.
  d. 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 and bacteriological testing shall begin as indicated in Section 3.03.B. Additional instructions for disposal of the heavily chlorinated water is covered in Section 3.04.E, entitled “Flushing”.

Bacteriological Tests:
• After final flushing, and before the water main is placed in service, samples shall be collected and tested for bacteriological quality as follows:
a. If total chlorine is 1.5 mg/L or less: Begin bacteriological testing twenty-four (24) hours after the final flush.
   (1) Test for total and fecal coliform for two (2) consecutive days. Both test samples must be less than 1 colony/100 ml.
   (2) Test for heterotrophic plate count on the 2nd day. The test sample must be less than 500 colonies/ml.

b. If total chlorine is greater than 1.5 mg/L: Wait five (5) days or until the residual drops to 1.5 mg/L or less, whichever is sooner, then test.
   (1) Test for total and fecal coliform for two (2) consecutive days. Both test sample must be less than 500 colonies/ml.
   (2) Test for heterotrophic plate count on the 2nd day. The test sample must be less than 500 colonies/ml.

- Samples shall be collected at least sixteen (16) hours apart at intervals determined by the Inspector (not exceeding 1,200 feet apart and at the end of all branch lines and cul-de-sacs) and tested by the County of Chesterfield laboratory and the results submitted to the Owner.

- Samples for bacteriological analysis shall be collected in approved sterile bottles or bags treated with sodium thiosulfate provided by the County laboratory. 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. Water for these operations will be furnished by the Owner, but the Contractor shall be responsible for any cost associated with the loading, hauling, and discharging of the heavily chlorinated water.

6.3.4. Supplemental Procedures for Disinfecting, Testing, and Flushing

General:

- All work shall be performed in general accordance with AWWA C651-14.

- The supplemental procedures are developed to compliment the AWWA C651-14 Standard, particularly with respect to flushing, testing and tie-in to the existing water distribution system.

- These procedures and construction acceptance for final tie-in of a new water main is performance based, predicated on the new construction passing pressure and bacteriological testing. 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 the 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 C651-14, Section 4.8, entitled “Preventive and Corrective Measures During Construction”.
• No contaminated material or any material capable of supporting the growth of microorganisms or causing taste, odor, or other aesthetic water quality concerns shall be used in sealing joints. Sealing material or gaskets shall be handled in a manner that avoids contamination. The lubricant used in the installation of sealing gaskets shall be Blue Lube or Slikstyx pipe gasket lubricant. Blue Lube and Slikstyx are the only pipe joint lubricants for such use. It shall be kept clean and applied clean with dedicated applicators. (Note: Use of any unapproved lubricant other than Blue Lube or Slikstyx has been shown to cause significant taste and odor conditions when used in drinking water disinfected with chloramines. The County will not accept completed water lines that exhibit taste and odor conditions because of the use of unapproved lubricants.)

• Table 1, Flushing Schedule gives flushing flow rates for water mains 6” through 36” in diameter. Flushing mechanism sizes are also provided for water mains 6” through 30” in diameter. Flushing flow rates for line sizes above 36” and flushing mechanism sizes for line sizes above 30” will be project and site specific and directions will be given on the project drawings.

Filling and Testing Procedures:

• Connection of the new water main to the existing distribution system for filling and testing shall be through a contractor furnished flushing mechanism as shown on Standard Detail WAT-6 of these specifications and sized as noted in Table 1, entitled “Flushing Schedule”. 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. A suitable valued piping arrangement for the additions of the water-chlorine solution is to be furnished with 125 psi rated flange connections and installed in a manner approved by the Inspector.

• Initial flush flow rate is to be in accordance with Table 1, entitled “Flushing Schedule”.

• Pressure test the line as noted in Section 3.02, A.1 of these specifications.

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

• Disinfect the line in accordance with AWWA C651-14, Section 4. A Water-chlorine solution prepared in accordance with Section 3.03, A.3 above shall be used for disinfection.

• Bacteriological samples will be taken by the County in accordance with AWWA C651-14, Section 5.

• If unsatisfactory bacteriological test results are received, repeat steps 2, 5 and 6. Where only an unsatisfactory heterotrophic plate count is received, steps 2 and 6 need only be repeated at existing residuals.

• 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. The contractor shall tie-in new water lines to the existing water system within 10 working
days of successful completion of all bacteriological tests, otherwise the disinfection process must be repeated.

• Final flush of line to be in accordance with Table 1, entitled “Flushing Schedule”.

The Disinfection and Supplemental Procedures as covered in sections 3.03 and 3.04 may be modified by the Director of Utilities for site 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 too undue problems and assures that adequate disinfection and flushing will be given to the new main.

The procedure for the disinfection of short leads to fire hydrants and the connector pipe to fire suppression systems/double check assemblies shall be as follows:

Connector piping, fittings, and valves from an existing main to a fire hydrant or to a fire system double check assembly, which does not contain domestic use branches and is equal to or less than eighteen (18) feet in length from the main, may be spray disinfected or swabbed with a minimum 1 percent solution of chlorine just prior to installation, tied-in and flushed at a velocity of not less than 3.0 ft/sec. Bacteriological sampling will be taken downstream for confirmation. Connections to existing mains must be done within 10 working days of the successful completion of all bacteriological tests; otherwise, the disinfection process shall be repeated.

Flushing: Water for filling the line, and flushing, will be supplied by the Owner at no cost to the Contractor. Therefore, the use of water for making the new water line available for service will be as follows:

• Initial Flush: See Table 1, 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 too 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.

• 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. In new subdivisions, or in areas where there is an existing sanitary sewer, this discharge may be made into the sanitary sewer system. The Contractor is to provide sufficient hoses to connect from the hydrants to a manhole in a manner that provides a suitable air gap for backflow prevention. In projects where there are no sanitary sewers, the flushing of the disinfecting solution must not enter any streams or be discharged in a manner that
causes any environmental damage. For site locations the Inspector may require the use of a neutralizing chemical and piping arrangement.

The expense of a neutralizing station is the responsibility of the Developer/Contractor. The Engineer shall indicate the need for a neutralizing station on the drawing.

- Final Flush: See Table 1, entitled “Flushing Schedule”. The final flush is a medium velocity, medium flow flush to clear the line of any chlorine solution used in the tie-in to provide for fresh water throughout the new lines.

### TABLE 1

<table>
<thead>
<tr>
<th>Main Size</th>
<th>Double Check Valve Size</th>
<th>Initial Flush (Note 2)</th>
<th>Final Flush (Note 3)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Single Gate Size (Note 1)</td>
<td>Minimum Flow (gpm)</td>
<td>Maximum Flow (gpm)</td>
</tr>
<tr>
<td>6”</td>
<td>4”</td>
<td>220</td>
<td>88</td>
</tr>
<tr>
<td>8”</td>
<td>4”</td>
<td>400</td>
<td>160</td>
</tr>
<tr>
<td>12”</td>
<td>6”</td>
<td>900</td>
<td>350</td>
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<tr>
<td>16”</td>
<td>6”</td>
<td>1,500</td>
<td>624</td>
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<tr>
<td>20”</td>
<td>8”</td>
<td>2,450</td>
<td>978</td>
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<tr>
<td>24”</td>
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<td>3,525</td>
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</tr>
<tr>
<td>30”</td>
<td>12”</td>
<td>5,505</td>
<td>2,202</td>
</tr>
<tr>
<td>36”</td>
<td>Designed by Consultant</td>
<td>7,935</td>
<td>3,174</td>
</tr>
</tbody>
</table>

Note 1. See the description of “Preassembled Flushing Mechanism”, Detail WAT-6.

Note 2. 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. See WAT-9 “Discharge Flow Rates for Flushing”.

Note 3. On a case by case basis, dependent upon such variables as length of new waterline (less than two hundred feet), 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 waterline.

6.3.5. Testing of Fire Suppression Double Check Assemblies

The County Inspector will be responsible for insuring the appropriate test is performed up to the OS&Y gate valve located on the inlet side of the double check assembly.

The Fire Life Safety Division will be responsible for insuring that the appropriate tests are performed from the OS&Y gate valve located on the inlet side of the double check assembly to the building including the sprinkler system.

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 annually by a certified tester certified by the Virginia DPOR. The results of the test will be sent to the Utilities Department Cross Connection Control Coordinator and forwarded to the proper departments.

6.3.6. Abandonment of Water Service

Excavate at the main and expose the corporation stop. Turn off the corporation stop and disconnect the copper tubing from the corporation stop. 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 turn in the meter to the Operations and Maintenance Section.

6.3.7. Abandonment of Water Mains

Water mains and hydrant laterals to be abandoned shall be permanently disconnected from the remaining system. If the abandonment takes place at a tee, the tee shall be removed from the main and straight pipe installed. For other instances involving fittings, the proper fitting shall be installed to eliminate the previous connection.

All open ends on abandoned pipe are to be permanently sealed by plugging with mechanical joint plug. All valve boxes, fire hydrants, flushing hydrants (blow-offs) or other appurtenances are to be removed. Salvageable items are to be returned to the County’s Utilities Operations and Maintenance Section.

6.3.8. Clean Up

Upon the completion of the installation of the water system and prior to the Owner’s final acceptance, sediment and debris shall be removed from the system. The work area shall be restored to its original condition and the pavement replaced to the satisfaction of VDOT and/or the County.
7. **SANITARY SEWER SYSTEM**

7.1. **General**

7.1.1. 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 Chesterfield and VDOT or any other agency having authority. 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 for further direction.

7.2. **Products**

7.2.1. Approved Materials

All materials shall conform to the County of Chesterfield’s “Approved Materials and Manufacturers” list. All materials shall be virgin material. The Contractor shall submit notarized statement from the Supplier and/or Manufacturer to the Inspection Section that all materials being supplied for the work met AWWA, ASTM and/or County standards, as appropriate. At least three (3) copies for the county’s use are to be made, along with any additional copies needed to be returned to the Contractor, Engineer, Suppliers, etc. after approval is made.

In addition, shop drawings, as defined in the General Conditions, and operation manuals are required to be submitted by the utility contractor on projects where there are special structures, and on Pump Stations and Treatment Plant projects to include pipe and accessories, manholes and appurtenances, valves, and other assorted products, etc. The information must be sent as far in advance as possible (at least 10 business days) to avoid any necessary delays in beginning the project. The appropriate number of copies of shop drawings needed is as defined in the above paragraph.

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.

7.2.2. Pipe Bedding for Gravity Sanitary Sewers

Bedding material is to be crushed stone # 57 gradation in accordance with “VDOT Road and Bridge Specifications”, latest edition.

7.3. **Execution**

7.3.1. Installation of New Gravity Sanitary Sewer and Force Main Systems

Excavating and Backfilling:
• The Contractor shall do all the excavation of any and all materials encountered during 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 workers and do all necessary pumping required to keep the excavation and the pipe free from water from any source always.

  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 backfilling.

• Removal of subsurface obstructions which are uncovered during excavation for installation of the gravity sanitary sewer and force main systems shall be 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 (2') from around the area of new work and the excavation backfilled with a suitable material as specified.

Pipe Handling:

• Take all precautions to ensure that pipe and related items are not damaged in unloading, handling, and placing in the 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.

• Keep the pipe clean. Exercise care to keep foreign material and dirt from entering the pipe during storage, handling and placing into the trench. Flushing the line may be necessary by the Contractor.

Survey Line and Grade for Gravity Sanitary Sewers:

• Line and grade shall be maintained by the Contractor, using a laser, and the Contractor shall adhere to the following criteria:

  a. The control point shall be set at a minimum of fifty (50') intervals. Line and grade of the laser shall be checked at a maximum of one hundred feet (100') intervals.

  b. The level dial on the grade instrument of the laser shall be checked at a minimum of each thirty (30) minutes of use or more frequently if the equipment is being used around the grade instrument which could cause the instrument to become un-level.
c. A blower shall be used when required to keep a uniform air temperature in the pipe to prevent any bending of the light beam.

- The Contractor shall have a level or transit in good working order on the job set up always to periodically check the line and grade of the pipe.

- Cut sheets are required for all sanitary sewer line installations. The following information shall be included on all cut sheets:
  a. A TBM for the run of sewer to be laid with the cut sheet
  b. Hub elevation, pipe invert elevation, top ground elevation, and centerline cut depth at each manhole and at fifty-foot intervals in between
  c. Starting and ending manhole numbers
  d. Length, diameter, material, and grade of pipe to be laid
  e. Each new run of sewer shall start at station 0+00

Sewer Pipe Laying for Gravity Sanitary Sewers:

- Laying of sewer pipe shall be accomplished to line and grade 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.

- All pipe laid shall be retained in position 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.

- The sewer pipe, unless otherwise approved by the County, shall be laid upgrade from the point of connection of 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.

- The pipe shall be fitted and matched so that when installed it will form a smooth, uniform invert. Lined or radius concrete pipe shall be placed as indicated by the marking on the pipe.

- 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.
• Joining Pipe for Gravity Sanitary Sewers:
  a. Ductile iron pipe is to be joined in accordance with the requirements of AWWA Standard C600 and the manufacturer’s recommendations.
  b. Polyvinyl chloride (PVC) pipe shall be joined in accordance with ASTM Standard D-2321 and the manufacturer’s recommendations.

• Pipe laying and joining force mains shall be the same as the requirements for waterlines.

• All visible leaks shall be corrected prior to testing.

• Pipe shall be ductile iron where cover is less than three feet.

Manhole Installation:

• Manholes shall be constructed to the elevations indicated in accordance with the Standard Details.
  a. Set the manhole base section on a bed of #57 stone to a minimum depth of eight inches (8”). Stone shall be thoroughly compacted and carefully leveled to the excavated 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 pipe sizes six inches to twenty-one inches (6” -21”), inclusive and apply sealant to completely fill the joint between the manhole barrel and the flexible connection for the full thickness of the manhole barrel.
  e. Plug the lift holes from the outside with no shrink grout and repair any defects in the manhole.
  f. Set adjusting rings in a Portland Cement mortar bed (minimum of one fourth inch [¼”] thickness) and parge one eighth inch to one fourth inch (⅛” – ¼”) thickness on the inside and the outside of the manhole.
  g. Rings will not be required outside of paved roadways or walkways unless called for on the plans.
  h. Rings in paved roadways or walkways shall permit upward or downward adjustment of the manhole frame. The maximum height of the rings shall not exceed twelve inches (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.
  i. Construct a bench of concrete or brick and mortar.
    (1) The elevation of the bench at the channel shall be at the spring line of the incoming and outgoing pipe.
(2) The bench shall be three inches (3”) lower at the channel than at the manhole wall.

(3) Where stubs are provided for future pipe connections, the bench and invert shall be so formed.

(4) Use sulfate resistant cement for concrete or mortar on all acid-resistant manholes.

(5) Where sealant is used, the bench shall not be in contact with the pipe or the flexible pipe connection.

(6) All inverts are to be smooth.
   i. All leaks shall be corrected prior to testing.

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

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 B.U.O. do not exist.

- The connector shall be a Kor-N-Seal assembly or an approved equal.
- The connector shall be installed in the manhole well 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 the size being utilized on the project. All materials must conform to the approved products reflected in Part IV of this document.
- Where B.U.O. exist, a PVC manhole adaptor 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 Adaptors” or equal.
- When connecting a sewer force main with an existing gravity sewer system, manholes receiving the discharge from the force main shall be lined with corrosion-resistant materials, as approved, for a distance of twenty-five hundred feet (2,500’) downstream of the tie-in-location. All steps are to be removed and a protective coating installed per the manufacturer specifications.
A tracing wire of 14-gauge copper shall be installed and taped directly on top of the force main pipe to result in a continuous trace.

Place underground warning tape directly above all sewer force mains, eighteen inches (18”) below the finished grade. The tape shall be polyethylene tape with a metallic core, two inches (2”) in width, with the continuous printed message “Caution Sewer Force Main Buried Below.” The tape shall be manufactured by the Name Plate Corporation or an approved equal.

Installation of Sewer Lines and Laterals as it Relates to Sidewalks:

- Sidewalks must be constructed to accommodate at least a ten foot (10’) horizontal separation between the County’s public sewer mains and the sidewalk.

- If sidewalks are constructed within the public road right-of-way, the end of the sewer lateral must be installed three feet (3’) behind the house side of the sidewalk or to the right-of-way line, whichever is greater.

- If sidewalks are constructed outside of the public right-of-way and are less than five feet (5’) from the right-of-way line, the end of the sewer lateral must be installed three feet (3’) behind the house side of the sidewalk.

- If the sidewalks are constructed outside of the public right-of-way and are more than five feet (5’) from the right-of-way line, the sewer services must be installed within one foot (1’) outside of the right-of-way line.

7.3.2. Testing of New Gravity Sanitary Sewer and Force Main Systems

Testing Techniques for Gravity Sanitary Sewer Systems:

- Sanitary sewer lines forty- two inches (42”) in diameter and smaller shall be tested after backfill using a low-pressure air test in accordance with ASTM C828-90 or the latest edition. Sewer lines are larger than forty-two inches (42”) in diameter shall be tested by an infiltration/exfiltration test.

- All manholes shall be vacuum tested. All testing shall be conducted in the presence of the county 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 inspector. All monitoring gauges shall be subject to calibration, if deemed necessary.

- 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 the Owner, 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.
c. Ground Water Determination: Install a one half (1/2”) capped galvanized pipe nipple, approximately twelve inches (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 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 test duration for the section under test by computation from the applicable formulas shown in ASTM C828-90 or the 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 prig 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 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 prig. 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 psi gage 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, and the ground water level will be 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. In as much as a force of 250lb. is exerted on an eight inch (8”) 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 nor more than 10 psi to avoid over-pressuring and damaging an otherwise acceptable line. No one shall be allowed in the manholes during testing.

- All manholes will be tested using the negative air pressure test (vacuum) in accordance with ASTM C 1244-93 or the latest edition for water tightness, and the manhole will be
visually inspected after backfilling. The 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 ten inches (10”) of mercury applied to the manhole and the time measured for the vacuum to drop from ten inches (10”) to nine inches (9”) of mercury. The vacuum equipment, shall be approved by the local agency and/or Engineer prior to its use. See detail SEW-12 for the minimum allowable test times for manhole acceptance at the specified vacuum drop.

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

- Written verification must be furnished that the following steps are followed:
  a. The test method is only to be applied to precast concrete manholes.
  b. Stub outs, manhole boots and pipe plugs shall be secured to prevent movement while the vacuum is drawn.
  c. If a manhole fails the test, necessary repairs shall be made and the vacuum test and repairs shall be repeated until the manhole passes the test.

- Test for leakage of gravity sewers using either the infiltration or exfiltration test:
  a. Allowable leakage shall be fifty (50) gallons per inch of pipe diameter per mile per twenty-four (24) hours up to a maximum of 2,400 gallons per mile per twenty-four (24) hours for gravity sewer greater than forty-two inches (42”) in diameter.
  b. Use the infiltration test when ground water is at least four feet (4’) above the pipe crown along the entire length of the line to be tested. Plug the pipe at the upper manhole. Install a suitable measuring device at the next lowest manhole. Measure the amount of the water flowing through the outlet after the flow has been stabilized.
  c. Ground Water Determination: Use the same procedure as “low pressure air test” above.

Testing Requirement for Sewer Force Mains:

- All pressure testing shall conform to the requirements as established for Water Distribution Systems as outlined in Part II Section 5 of this document.

7.3.3. Markers

In easements and in undeveloped wooded areas, plastic markers shall be installed every two hundred feet (200’), and at all manholes, valves, and fittings. Markers shall be as manufactured by Carsoite, Greenline, or an approved equal. Exceptions are where sanitary gravity and force main lines are installed in “kept” yards where the property owners may object to the placement of these markers. Contractors will be required to properly install the markers per the manufacturer’s recommendations, parallel to the sewer line facing the roadway, or as additionally directed by the local agency.
7.3.4. Abandonment of Sewer Lateral Connected to Mains

Sewer Laterals connected to mains shall be disconnected at the tee and the tee capped. The open end of the remaining pipe shall be capped. Depending on the pipe and fitting type, and at the direction of the Inspector, the service line shall be cut approximately one foot from the tee, saddle, Inserta-tee, or other fitting and the service line capped. Capped portion of the active sewer shall be made watertight with properly gasketed device.

7.3.5. Abandonment of Sewer Laterals Out of Manholes

Where sewer service line is connected to a manhole, a gasketed plug shall be installed on the service line and concrete placed over the plug, filling the void and matching the invert and bench. Where an inside drop is encountered, remove the inside drop pipe and fittings and plug the service line with a gasketed device and place concrete over the plug, filling the void to make watertight and permanent plug on the manhole.

7.3.6. Abandonment of Sewer Mains

Pipe shall be cut at the point of abandonment. Each end shall be sealed with a watertight cap and concrete. The design engineer shall designate whether abandoned pipe shall remain in place, be removed, or filled with grout or non-fly ash flowable fill. Non-structural pipe abandoned in right of way shall be removed or filled.

7.3.7. Abandonment of Manholes

The cone and casting shall be removed, four (4) one-inch (1") drainage holes shall be drilled through the bottom of the structure, and the structure filled and compacted with sand. Where a flat-top cone is encountered, remove top and manhole sections to 3.5’ below finished grade. If field conditions dictate, the entire structure may be removed and the void filled and compacted with a suitable material.

7.3.8. Clean Up

Upon the completion of the installation of the sanitary sewer system and prior to the Owner’s final acceptance, sediment and debris shall be removed from the system. The work area shall be restored to its original condition and pavement replaced to the satisfaction of VDOT and/or County.
PART III

APPROVED MATERIALS AND
MATERIAL SPECIFICATIONS
CHESTERFIELD COUNTY, VIRGINIA

APPROVED MATERIALS AND MANUFACTURERS
INTRODUCTION

This document represents a listing of manufacturers whose products have been approved for use within Chesterfield County’s water and sanitary sewer systems. The listing is divided into four sections. Sections 1 and 2 contain lists by type of material and indicate the approved product of each. Section 3 provides detailed materials specifications.

This listing is intended to be used as a reference source for the Utilities Department’s employees, contractors, and vendors. Materials produced by manufacturers not listed herein are not acceptable for use within the County’s systems. Manufacturers interested in submitting products for evaluation and possible approval should communicate their interest to the Chairman of the Product and Design Review Committee, Utilities Department, County of Chesterfield, P.O. Box 608, Chesterfield, Virginia 23832-0009.

It should be noted that in some cases manufacturer approval is on a plant-by-plant basis. The Committee reserves the right to perform a comprehensive plant and product evaluation and testing based on Utilities Department’s “Producing Plant/Product Evaluation Procedures”, and at the sole option of the department, plant evaluations may be required on an on-going basis for new and existing facilities. The Committee also reserves the right to limit the number of approved manufacturers and products as they deem necessary to control parts inventory and maintenance/training requirements.

Revisions to this publication will be made periodically. Users should inquire with the Utilities Department’s Development Section as to availability. Questions concerning the information contained in the listings should be referred to the Product and Design Review Committee. Any errors or omissions should be reported to the committee immediately. Utilities Department will not allow the use of products and materials identified incorrectly in this publication.
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(Minimum Criteria: Meets AWWA and/or ASTM Standards and Chesterfield County Specifications, see Section III, Latest Revisions)

SECTION 1: WATER SYSTEM

A. Pipes

1. C-900 – P.V.C. (DR-18, CL. 235) (Sizes 6” and 8”)
   a. Diamond Plastics Corporation
   b. IPEX, Inc.
   c. North American Pipe Corporation
   d. National Pipe & Plastics, Inc.

2. Ductile Iron (Class 51 minimum or higher based on design classification)
   a. Push-On and Mechanical Joint
      i. American Ductile Iron Pipe
      ii. McWane Ductile
      iii. U.S. Pipe & Foundry Company
   b. Restrained Joint Pipe
      i. American D.I. Pipe Flex-Ring
      ii. McWane Ductile TR-FLEX
      iii. U.S. Pipe TR-FLEX

B. Valves

1. Resilient Seated Gate Valves (for main sizes 6”-12” only)
   a. American Flow Control- Series 500 Gate Valve with Non-Rising Stem (NRS)
   b. American Flow Control – Series 2500 (Resilient Wedge)
   c. American R/D – Series 2000 (Resilient Wedge)
   d. Clow R/W Valve
   e. Kennedy (Model 509 KSFW 8571RSGV)
   f. Kennedy (Model 515 KSFW 7571RSGV)
   g. M&H (Style 4067-NRS; 4068 OSY)
   h. Mueller A-2360 (Resilient Wedge)
i. U.S. Pipe-Metroseal 250: with non-rising stem (NRS) and outside stem yoke (OSY)

2. Butterfly Valves (For Use on 16” and Larger Lines)
   a. Crispin K-Flo Valve Series 500 (16”) and Series 47 (24” and larger)
   b. DeZurik Baw AWWA
   c. M&H Style 4500 (for 16”-24”) and Style 1450 (for 30”-and larger)
   d. Moser Series 810 & 830
   e. Milliken Models 510 and 511
   f. Mueller- Lineseal III
   g. Pratt’s Groundhog Class 150B and Triton HP-250
   h. Rodney Hunt Streamseal (24” and Larger)
   i. ValMatic American BFV

C. Fire Hydrants
   1. American Darling – Mark 73-5
   2. Clow Medallion
   3. Kennedy “K81D” (Dual rated AWWA/ULFM hydrant)
   4. M & H Style 929 Reliant
   5. Mueller Centurion A-421
   6. U.S. Pipe- Metropolitan 250 (Model 94)

D. Meter (Setters) Yokes
   1. For 5/8” Meters: 5/8” x 7” Riser Meter Yoke with on lock wing ball or plug type, full port angle meter stop, with saddle nuts, ¾” copper tube flare or compression connection inlet and outlet.
      a. Cambridge
         i. 6020NL-107H3H3-VO
      b. Ford
         i. V71-7W-22-33NL (plug type angle stop with copper flare connections inlet and outlet)
         ii. V71-7W-44-33GNL (plug type angle stop with compression connections inlet and outlet for copper pipe)
         iii. VB71-7W-22-33NL (ball type angle stop with copper flare connections inlet and outlet)
iv. VB71-7W-44 33GNL (ball type angle stop with compression connections inlet and outlet for copper pipe)

c. McDonald
   i. 729-107WXCC33 (ball type angle stop with copper flare connections inlet and outlet)
   ii. 721-107WXTT33 (ball type angle stop with compression connections inlet and outlet for copper pipe)

d. Mueller
   i. H-1434N (plug type angle stop with plain NPT ends, also requires H-15450 end connections for copper flare inlet and outlet) to be supplied “completely factory assembled” and tightened to proper torque
   ii. H-1470-5N (plug type angle stop with compression connections inlet and outlet for copper pipe)
   iii. B-2434N (ball type angle stop with compression connections for copper flare on inlet and outlet) to be supplied “completely factory assembled” and tightened to proper torque
   iv. B-2470N (ball type angle stop with compression connections inlet and outlet for copper pipe)

2. For 5/8” Meters: 5/8” x 9” Riser Meter Yoke with one lock wing ball or plug type, full port angle meter stop, with saddle nuts, ¾” copper tube flare or compression connection inlet and outlet.
   a. Cambridge
      i. 6020NL-109H4H4-VO

3. For 1” Meters – Non-Residential Domestic Use: 1” x 12” Riser Meter Yoke with two lock wing, ball or plug type angle stop on inlet and outlet, saddle nuts, copper tube flare or compression inlet and outlet with ball valve bypass.
   a. Cambridge
      i. 6020NL-412H4H4-UO (without bypass)
      ii. 6020NL-412H4H4-UOB (with bypass)
   b. Ford
      i. VV74-12W-22-44NL w/ball valve bypass
      ii. VVB-74-12W-22-44NL w/plug valve bypass
iii. VV74-12W-44-44GNL (with compression connections inlet and outlet for copper pipe)

c. McDonald
   i. 729B412WWCC443
   ii. 729B412WWTT443 (with compression connections inlet and outlet for copper pipe)

4. For 1” Meters - Irrigation, Residential, and Residential with Fire Sprinkler System (NFPA 13D): 1” x 12” Riser Meter Yoke with 1 lock wing ball or plug type angle stop on inlet only, saddle nuts, copper tube flare inlet and outlet. No bypass.
   a. Ford
      i. V74-12W-22-44NL
      ii. V74-12W-44-44GNL (with compression connections inlet and outlet for copper pipe)

5. For 1 ½” and 2” Meters (Businesses, etc. with bypass): These products are acceptable provided manufacturer makes the necessary modifications to comply with the County’s materials specifications for 1 ½” and 2” water meter setters.
   a. A.Y. McDonald
      i. 1 ½” meter - Model 720A609 WWFF 665
      ii. 2” Meter - Model 720A709 WWFF 775 for 2” meter
   b. Cambridge
      i. 1 ½” Meter - 6020NL-609F6F6-UUB5
      ii. 2” Meter - 6020NL-709F7F7-UUB5
   c. Ford
      i. 1 ½” Meter - VBB76-7B-11-66NL
      ii. 2” Meter - VBB77-8B-11-77NL
   d. Mueller
      i. 1 ½” and 2” Meter - H-1423N

6. For 1 ½” and 2” Meters (residential and irrigation with no bypass): These products are acceptable provided manufacturer makes the necessary modifications to comply with the County’s materials specifications for 1 ½” and 2” water meter setters.
   a. A.Y. McDonald
a. 1 ½” Meter - 720-609 WWFF 660
b. 2” Meter - 720-709 WWFF 770

b. Cambridge
i. 1 ½” Meter - 6020NL-609F6F6-UUB5
ii. 2” Meter - 6020NL-709F7F7-UUB5
c. Ford
i. 1 ½” Meter - VBB76-7-11-66NL
ii. 2” Meter - VBB77 -8-11-77NL
d. Mueller
i. 1 ½” and 2” Meter - #1422-00N

E. Corporation Stops-Plug Type only for ¾” and 1”; Plug Type or Ball Valves for 1 ½” and 2”

1. Cambridge Brass
a. 301NL-A3H3 (Ball valve with compression outlet for ¾”)
b. 301NL-A4H4 (Ball valve with compression outlet for 1”)
c. 302NL-A3H3 (Plug type with compression outlet for ¾”)
d. 302NL-A3C3 (Plug type with flare outlet for ¾”)
e. 302NL-A4H4 (Plug type with compression outlet for 1”)
f. 302NL-A4C4 (Plug type with flare outlet for 1”)
g. 301NL-A6H6 (Ball valve with compression outlet for 1 ½”)
h. 301NL-A6C6 (Ball valve with flare outlet for 1 ½”)
i. 301NL-A7H7 (Ball valve with compression outlet for 2”)
j. 301NL-A7C7 (Ball valve with flare outlet for 2”)

2. Ford
a. FB-600NL (Plug type with flare outlet only for ¾” and 1”)
b. FB-1000-3GNL (3/4” corp stop with compression connection for copper)
c. FB-1000-3QNL (3/4” corp stop with quick joint connection)
d. C04-33GNL (3/4” connector only to convert a normal F-600-3 corp stop to compression, to avoid using special tapping machine adapters)
e. FB-1000-4GNL (1” corp stop with compression connection for copper) or C04-44G (1” connector only to convert a normal F-600-4 corp stop to compression, to avoid using special tapping machine)

f. FB-600NL (Ball valve with flare outlet only for 1 ½” & 2)

g. FB-1000GNL (Ball valve with compression outlet only for 1 ½” and 2”)

3. JJC
   a. J-1500

4. McDonald
   a. 74701
   b. 74701-T (¾” and 1” corp stop with compression outlet for copper)
   c. 74700-T (¾” and 1” connector only to convert a normal #4701 corp stop to compression, to avoid using special tapping machine adapters)

5. Mueller
   a. H-15000N
   b. H-15008N (¾” and 1” corp stop with compression outlet for copper)
   c. H-15701N (¾” and 1” connector only to convert a normal H-15000N corp stop to compression, to avoid using special tapping machine adapters)

F. Compression Fittings – (for 1 ½” and 2” only)

1. Cambridge Compression- CB

2. Ford Grip Joint

3. McDonald T-Compression

4. Mueller 110

G. Curb Stops – ¾” and 1” copper flare, full port, ball or plug type curb stop, with or without check

<table>
<thead>
<tr>
<th>Copper Flare Plug Type</th>
<th>Copper Flare Ball Type</th>
</tr>
</thead>
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<tr>
<td>Cambridge Brass</td>
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<tr>
<td>¾”</td>
<td>290NL-C3C3</td>
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<tr>
<td>1”</td>
<td>290NL-C4C4</td>
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</table>

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Revised: Fourth Edition
a. ⅜”  Z22-333NL  B22-333NL
b. 1”  Z22-444NL  B22-444NL

3. MacDonald
a. ⅜” & 1”  74713  76100

4. Mueller
a. ⅜” & 1”  H-15300N  N/A

H. Curb Stops – ⅜” and 1” copper compression, full port, ball or plug type curb stop, with or without check

<table>
<thead>
<tr>
<th></th>
<th>Compression Plug Type</th>
<th>Compression Ball Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cambridge Brass</td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. ⅜”</td>
<td>290NL-H3H3</td>
<td>202NL-H3H3</td>
</tr>
<tr>
<td>b. 1”</td>
<td>290NL-H4H4</td>
<td>202NL-H4H4</td>
</tr>
<tr>
<td>Ford</td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. ⅜”</td>
<td>Z44-3336NL</td>
<td>B44-336NL</td>
</tr>
<tr>
<td>b. 1”</td>
<td>Z44-4446NL</td>
<td>B44-4446NL</td>
</tr>
<tr>
<td>McDonald</td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. ⅜” &amp; 1”</td>
<td>74713-T</td>
<td>76100-T</td>
</tr>
<tr>
<td>Mueller</td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. ⅜” &amp; 1”</td>
<td>H-15207N</td>
<td>B-25209N</td>
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</tbody>
</table>

I. Curb Stops – 1 ½” and 2” pipe threaded or compression, full port, ball type curb stop, with or without check

<table>
<thead>
<tr>
<th></th>
<th>Compression Ball Type</th>
<th>Pipe Threaded Ball Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cambridge Brass</td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. 1 ½”</td>
<td>202NL-H6H6</td>
<td>202NL-F6F6</td>
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<tr>
<td>b. 2”</td>
<td>202NL-H7H7</td>
<td>202NL-F7F7</td>
</tr>
<tr>
<td>Ford</td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. 1 ½”</td>
<td>B44-6666NL</td>
<td>B11-666NL</td>
</tr>
<tr>
<td>b. 2”</td>
<td>B44-7776 NL</td>
<td>B11-7776NL</td>
</tr>
<tr>
<td>McDonald</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
J. **Vaults, Precast Concrete**

1. Beasley Concrete, Inc. (Model MB1500)
2. Clear Flow by Americast – (Models TJ 2000, TJ 4000, TJ 6x8, and 6060 Utility Vaults)
3. Hanover Precast (Model 596810 and 596810-HS-20)

K. **Tapping Sleeve**

1. Fabricated Steel Sleeves with Epoxy Coating and Stainless-Steel Bolts and Nuts
   a. Ford FTSC (4”-30”) w/SS bolts
   b. J.C.M. Industries #412 ESS (4”-48”)
   c. ROMAC # FTS 420 SS (4”-30”)
   d. Smith Blair Model #622 w/MJ Branch (4”-30”)
2. Stainless Steel Sleeves with stainless steel flange
   a. Cascade
      i. Model CST-EX (4” – larger)
      ii. Model CST-SL (4”-24”)
   b. Dresser Style 630 (6” – 12”)
   c. Ford FTSS (6”-24”)
   d. JCM Model 432 (6”-24”)
   e. Mueller H304 (6”-24”)
   f. Power Seal
      i. Model 3480 AS and 3480 MJ (6”-24”)
      ii. Model 3490 AS and 3490 MJ (6”-24”)
   g. ROMAC SST and SST III (6”-24”)
   h. Smith-Blair Models 663 (4”-20”)
   i. Total Piping Solutions Triple Tap Series
3. **M.J. Steel Sleeve**
   a. JCM 414 Mechanical Joint
   b. Smith-Blair Model 623 (4”-48”)

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4. M.J. Cast/Ductile Iron Sleeve
   a. American Flow Control
      i. Model 2800-A for A/C pipe
      ii. Model 2800-C for 4” - 12” D.I.
      iii. Model 1004 for PVC pipe and 12” and larger D.I. pipe
   b. Clow (F-5205)
   c. Mueller
      i. H-615 for 4” – 24” on Ductile Iron Pipe
      ii. H-619 for 4” – 12” Asbestos Cement Pipe

5. Other
   a. Mueller H300 (Not to be used on Asbestos Cement and Cast Iron Pipe)

L. Resilient Seated Wedge Tapping Valves
   1. American Flow Control - Series 500 Resilient Wedge Valve (for 6”-12” only)
   2. American Flow Control – Series 2500 (for 16”-30” only)
   4. Clow Model F6114 (for 16” thru 36” only)
   5. Kennedy C509 Model 8950 (for 4” thru 12” only)
   6. Kennedy C515 Model 7950 (for 4” thru 20” only)
   7. M&H C509 Style 4751 (for 4” thru 12”)
   8. M&H C515 Style 7950 (for 4” thru 16”)
   9. Mueller T-2360 Resilient Wedge Valve (for 6”-12” only)

M. Fittings (Bends, Crosses, Tees, and Grade Lok Offset Glands) Ductile Iron Only
   1. The Harrington Corporation (HARCO)
   2. SIGMA Corporation
   3. Star Pipe Products, Inc.
   4. Tyler Union
   5. U.S. Pipe & Foundry Company

N. Couplings (For pipe sizes 16” and smaller)
   1. Cast Couplings (transition or straight)
      a. Ford #FC2A (long sleeve coupling)
      b. Ford FC2W (Wide Range)
c. Hymax® 2 Long Body  
d. Power Seal Model # 3501 (long barrel coupling)  
e. Romac Macro HP (extended range coupling)  
f. Smith Blair (Rockwell) #442 (long sleeve coupling)  

2. Cast D.I. Couplings  
a. FEHR  

O. Air Release or Combination Air Release and Vacuum Valves  
(Engineer is responsible for specifying the appropriate type for its designated use)  
1. APCO (Product Bulletin No. 600 and/or 601)  
2. Cla Val (Models 34, 35 & 36)  
3. Golden Anderson Industries Type 1 GH4-150 Type 4 GH 7-K  
4. Valmatic  

P. Blow Off Valves  
1. 2” Bronze Gate Valve  
   (open to most manufacturers, i.e., Grinell, Epsco, etc.)  

Q. Line Stopping Valves  
1. EZ Valve  
2. Inserta-Valve  
3. Insta-Valve  
4. Hydra-Stop  
5. Team Industrial Services Insert Valve  

R. Water Meter Boxes/Vaults  
1. Precast Concrete Box:  
a. Beasley Concrete, Inc. – Model MB1500 (for 3” and 4” water meters and assemblies)  
b. Clear Flow by Americast Model CFLD6060 (for 3” and 4” water meters and assemblies)  
c. Hanover Precast Vaults (for 3” and larger water meters and assemblies)  
2. Hi-Density Polyethylene Plastic Box (for water meters and assemblies only in areas not subject to vehicular traffic):  
a. Carson Meter Box (for 5/8” water meters) Model MSBC1015-24 with ductile iron or cast-iron cover reader lid.
b. Carson Meter Box (for 1” water meters) Model MSBC 1118-26 with ductile iron or cast-iron cover and reader lid.

c. Carson Meter Box (for 1 ½” or 2” water meters) Model 1730-24 Carson Spec Grade body with 2 mouse holes and heavy-duty plastic cover with cast iron reader lid.

3. Cast Iron Box (for 5/8” and 1” water meters and assemblies only in areas subject to vehicular traffic):
   a. Capitol Foundry Design # MBX-11

4. Glass-Reinforced Plastic Composite Material Chamber (for 1 ½” or 2” water meters and assemblies in areas subject to vehicular traffic):
   a. Cubis Systems StakkaBox Ultima with AX-S Ductile Iron Cover
   b. Cubis Systems StakkaBox Ultima Connect with AX-S Ductile Iron Cover

S. Meter Box Lids

1. 5/8” Meters
   a. Capital Foundry MBX-3166-C (Ductile Iron)
   b. Old Castle 1015-4081 (Ductile Iron)
   c. Sigma LC1015RD (Ductile Iron)
   d. Star Pipe MB1116L-DI (Ductile Iron)

2. 1” Meters
   a. Old Castle 1118-4020 (Ductile Iron)
   b. Sigma LC10118RD (Ductile Iron)

3. 1½” and 2” Meters
   a. Old Castle 1730-4502 (Cast Iron)

T. Valve Boxes (Slip Type Only)

1. Bingham and Taylor
2. Capitol Foundry
3. SIGMA
4. Star Pipe

U. Copper Tubing
   (as manufactured for domestic use) Type “K” (soft) – for ¾” and 1” service lines and Type “K” (hard copper only) – for 1 ½” and 2” service lines

1. Cambridge Lee Industries
2. CERRO Flow Products
3. Kobe Wieland Copper Products
4. Mueller Brass Company
5. Wolverine Tube

V. Service Saddles
(bronze with double stainless-steel straps)
1. Ford Style 202BS or 202BSD
2. Mueller – Model BR2S
3. PowerSeal Model
4. ROMAC – Style 202BS
5. Smith-Blair (Rockwell) SB 325

W. Pipe Restraints (must be UL Listed and FM Approved)
1. For PVC Pipe (Sizes up to 12”)
   a. Capital – EZ-PVC
   b. EBBA Iron
      i. Megalug Series 2000 PV (PVC Pipe – MJ Fittings)
      ii. Megalug Series 1500 (PVC Bell and Spigot Joints)
   c. Mueller – AquaGrip Intergral Restraint System for use on the Centurion Fire Hydrants and Mueller RS Valves
   d. Romac Style 611 (PVC Bell and Spigot Joints)
   e. SIGMA – One-Lok Model SLC
   f. Star pipe – STARGRIP Series 4000 (PVC Pipe – MJ Fittings)
   g. Tuf Grip MJ Restraint (6”-12”)
   h. Uni-Flange
      i. Series 1390-C (PVC Bell and Spigot Joints)
      ii. Uni-Flange Series 1500 (PVC Pipe – MJ Fittings)

2. For Ductile Iron Pipe -
   a. Capital – EZ-LOK restraint gland (4”-24”)
   b. EBAA Iron – Megalug 1100 Series (MJ Fittings) All Sizes
   c. Romac – RomaGrip Sizes 4”-12”
   d. SIGMA One-Lok Model SLD (MJ Fittings) Sizes 4”-36”
   e. Star Pipe – STARGRIP Series 3000 (MJ Fittings) Sizes 4”-48”
   f. Tuf Grip MJ Restraint (6”-24”)
   g. Uni-Flange
i. Series 1390-C (Bell and Spigot Joints) Sizes 6”-12”

ii. Series 1400 Block Buster Wedge Action Retainer Glands (MJ Fittings)
Sizes 4”-24”

X. Markers
1. 66” Carsonite White Utility Marker Post with two (2) factory applied decals
(#CW-112 or CWV-116, whichever is applicable; and Stock #P-101 decal)

2. Greenline Markers – Model #’s FLU1WH66 and DSU1WH66 with factory
applied decals 159A, 029A or 094A, whichever is applicable in Chesterfield
County.

3. Rhino Hybrid 3-rail Post Markers

Y. Flushing Hydrants
1. Gil Industries 2” Aquarius “One-O-One” HH (Chesterfield Type)

2. Kupferle 2” Main Guard Model #78 (Chesterfield Type)

Z. Double Check and Double Detector Check Devices
(U.L. classified or F.M. Approved, AWWA compliant and ASSE listed 1015 for DC’s
and 1048 for DDC’s)

<table>
<thead>
<tr>
<th>Manufacturer</th>
<th>Model #’s</th>
<th>Size</th>
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<tbody>
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<td>Ames Co., Inc.</td>
<td>2000SS</td>
<td>2 ½”-12”</td>
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<td>2000SE</td>
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<td>Cla-val Co.</td>
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<td>DC-45</td>
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### Reduced-Pressure Principle Zone Devices
(U.L. classified or F.M. approved, AWWA compliant and ASSE listed 1013 for RP’s and 1047 for RPD’s.)

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<thead>
<tr>
<th>Manufacturer</th>
<th>Model #'s</th>
<th>Size</th>
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<td>Ames</td>
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<tr>
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<td>5000 SS</td>
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<td>All sizes</td>
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860 2 ½”-10”
880 (V) 2 ½”-10”
Watts Regulator Co. 909 3”-10”
009RP 3”
994 2 ½”-6”
957 2 ½”-8”
990 4”-8”
Zurn Industries, Inc. 375 2 ½”-10
(Wilkins) 475W 2 ½”-10”
975 ¾”-10”

BB. Casing Spacers
1. Advance – Model SSI
2. BWM – Model BWM-SS
3. Cascade
4. CCI – Model CSS
5. PowerSeal – Model No. 4810
6. PSI
   a. Model No. C8G-2
   b. Model No. C12G-2

CC. Lubricants
1. Blue Lube
2. Slikstyx (new product formulation only)

DD. Water Sampling Stations
1. Kupferle MainGuard #94WM
SECTION 2: SANITARY SEWER SYSTEM

A. Pipes – Gravity

1. SDR-35 – P.V.C. (ASTM D3034) (Sizes 6” through 15”)
   a. Diamond Plastics Corporation
   b. IPEX, Inc.
   c. JM Eagle
   d. North American Pipe Corporation
   e. National Pipe & Plastics, Inc.

2. PS46 – P.V.C. (ASTM F679) (Sizes 18” through 48”)
   a. Diamond Plastics Corporation
   b. JM Eagle
   c. North American Pipe Corporation
   d. National Pipe & Plastics, Inc.

3. Other Pipe – minimum wall thickness 0.17”
   a. Advanced Drainage Systems, Inc.
      i. ADS N-12 (ASTM D4101) (Sizes 30” through 60”)
   b. Contech Engineered Solutions
      i. A-2000 Pipe (ASTM F949/F794) (Sizes 24” through 36”)
   c. Diamond Plastics Company
      i. Diamond Pro 21 (ASTM F1803) (Sizes 42” through 60”)
   d. JM Eagle
      i. Ultra Corr (ASTM F949/F794) (Size 36”)
   e. Prime Conduit, Inc.
      i. Vylon Pipe (ASTM F-1803, PS 46) (Sizes 21” through 54”)

4. Ductile Iron Pipe Class 52 Minimum or higher classification
   a. Push-On and Mechanical Joint
      i. American Ductile Iron Pipe
      ii. McWane Ductile
      iii. U.S. Pipe & Foundry Company
b. Restrained Joint Pipe (Pipe Application: Use only where mechanical joint pipe is not available)
   i. American D.I. Pipe Flex-Ring
   ii. McWane Ductile TR-FLEX
   iii. U.S. Pipe TR-FLEX

B. Pipe – Pressure
1. Ductile Iron Pipe Class 52 Minimum or higher classification
   a. Push-On and Mechanical Joint
      i. American Ductile Iron Pipe
      ii. McWane Ductile
      iii. U.S. Pipe & Foundry Company
   b. Restrained Joint Pipe (Pipe Application: Use only where mechanical joint pipe is not available)
      i. American D.I. Pipe Flex-Ring
      ii. McWane Ductile TR-FLEX
      iii. U.S. Pipe TR-FLEX

C. Manholes, Precast Concrete (ASTM C478)
1. Concrete Pipe & Precast
2. Concrete Specialties, Inc.
3. Contractor’s Precast
4. Nansemond Pre-cast Concrete Co., Inc.
5. Tindall Concrete Products, Inc.
6. Winchester Building Supply Co., Inc.

D. Manhole Frames and Covers
1. Street Type (MH -1 -S)
   a. Capitol Foundry
   b. East Jordan Iron Works
   c. Neenah Foundry
   d. Sigma Corporation
   e. U.S. Foundry & Manufacturing Corporation
2. Watertight
   a. Capitol MH 1-S/WT
b. East Jordan Iron Works  
  c. U.S. Foundry & Manufacturing Corporation  

E. **Fittings**  

1. **Concrete**  
   a. Concrete Pipe & Precast Circular Reinforced (ASTM C76)  
   b. Inserta Tee  
   c. Kor-N-Tee  

2. **PVC Sanitary Sewer Fittings (ASTM D3034 SDR35 6” – 27”)**  
   a. GPK Products, Inc.  
   b. The Harrington Corporation (HARCO)  
   c. IPEX, Inc.  
   d. Multi-Fittings  
   e. Nyloplast USA, Inc.  
   f. Royal Municipal Solutions  
   g. Vassallo  

3. **Ductile Iron**  
   a. The Harrington Corporation (HARCO)  
   b. SIGMA Corporation  
   c. Star Pipe Products, Inc.  
   d. Tyler Union  
   e. U.S. Pipe & Foundry Company  

F. **Adaptors**  

1. DFW/HPI Nonshear Coupling (Used only at the direction of the County Inspector where pipe transitioning is necessary due to unlike pipe materials.)  

2. Fernco Pipe Adaptors – (Used only when installing 6” connections where 6” connection is of Ductile Iron material)  

3. GPK Manhole Adaptors (See MAN-14)  
   a. GPK manhole adaptor adapting PVC pipe to concrete with quickrete for manholes with BUO’s.  
   b. GPK PVC drop manhole cross with manhole adaptors (6” and 8” only)  

G. **Gaskets & Flexible Manhole Connectors**  

1. Flat Gasket for Watertight Manholes  
2. IPS Adjustable, Cobra, or Toggle styles
3. Kor-n-seal Connector, NPC Systems, Inc.
4. “O” Ring Gasket
5. Press-Boot Connector, Press-Seal Gasket Corp.
6. Profile RS or Type 4G Gaskets, Press-Seal Gasket Corp.

H. Saddles
1. The General Engineering Company (GENECO) Sealtite Model H with Bell End for SDR-35 PVC
2. Inserta Tee
3. QUICKSEAL QS – 6 (size 21” and above)
4. ROMAC CB Sewer Saddle

I. Manhole Steps
1. American Step Company
   a. Model #ML-10 (Standard Grade)
2. Bowco Industries, Inc.
   a. Model #93810 (48” and 54” Dia. M.H.’s)
   b. Model #93813 (60” Dia. M.H.’s and Larger)
3. Cosmos North America
   a. Model # US-10-OH
4. MA Industries, Inc.
   a. Style No. PSI-PF
5. Press Seal
   a. Model #P-10938 (48” and 54” Dia. M.H. ‘s)
   b. Model #P-14850 (60” Dia. M.H.’s and Larger)

J. Stoppers (Plugs)
1. For PVC Sanitary Sewer Pipe (with wing nuts and ears)
   a. Cherne
   b. IPEX, Inc.
   c. Lansas Posi-Seal Mechanical Plugs
2. For D.I. Pipe (Slip Joint Plug)
   a. American Ductile Iron Pipe
   b. Cherne
   c. The Harrington Corporation (HARCO)
K. Valves

1. Sewage Air/Vacuum Release Valves
   a. A.R.I. Combination Air Valve
      i. Model D-020
      ii. Model D-023
   b. Vent-O-Mat
      i. Series RGX
      ii. Series RGSb - “Anti-Surge” (Note: Engineer must design project using the appropriate valve.)

2. Plug Valves
   a. Clow Eccentric Plug Valve (3” -24”)
   b. DeZurik Series 100 [Figure 118] – (Non-Lubricated Eccentric)
   c. Homestead Eccentric Plug Valve- Series 120
   d. Milliken- Millcentric (Eccentric Plug Valve)
   e. Val-Matic Series 5900 or 5800 Cam-Centric

L. Manhole Adjusting Rings

1. Concrete Reinforced with external sealant to achieve watertight seal
2. LadTech H.D.P.E.

M. Casing Spacers

1. Advance – Model SSI
2. BWM – Model BWM-SS
3. Cascade
4. CCI – Model CSS
5. PowerSeal – Model No. 4810
6. PSI
   a. Model No. C8G-2
   b. Model No. C12G-2

N. Manhole/Structure Rehabilitation

1. Belzona (Light Filler: 5811 & 4141... Heavy Filler 4111)
2. Epoxytec
3. Perma Form/Perma Cast/Cor Gard
4. Raven 405
5. Sauereisen (Liner: 210, F170 & FF190 Sub Straight Filler: F120, F121 & 209
6. Sherwin-Williams
   a. Dura-Plate 5900
   b. Dura-Plate 6100
7. Spectra Shield
8. SPRAYROQ

O. Manhole Inserts
   1. Parsons PMI3SE Manhole Insert w/Valve, Gasket and Strap
   2. S.S.I. HDPE Manhole Inserts
SECTION 3: MATERIALS SPECIFICATIONS

All references to ASTM, AWWA, and other standards shall include latest revisions. In addition, all products must have the approval of the Virginia Department of Health prior to the submittal to the PDRC for consideration.

A. WATER SYSTEMS

1. Water Pipe and Fittings:
   a. Ductile iron pipe shall meet the requirements of AWWA C151. Pipe shall be thickness Class 51. Pipe shall have cement-mortar lining and a bituminous seal coat conforming to the requirement of AWWA Standard C104. Thickness class shall meet the requirements of AWWA C150. A minimum of 5% of the pipe furnished shall be gauged for roundness full length and so marked.
   b. Pipe fittings shall meet the requirements of AWWA C110 (ductile iron or cast iron) or AWWA C153 (ductile iron compact). All fittings shall be Pressure Class 250. Fittings shall have a cement-mortar lining and a bituminous seal coating or a 6-8 mil (nominal thickness) fusion bond epoxy lining/coating in compliance with AWWA C550.
   c. Pipe and fittings shall have either mechanical joint or push-on joint, both conforming to the requirements of AWWA C111. Bolts shall be high strength cast iron having an ultimate tensile strength of 75,000 psi and a minimum yield point of 45,000 psi.
   d. Polyvinyl chloride pipe (PVC) 6” and 8” in size shall conform to the requirements of AWWA Specification C-900, with gasket joints, DR-18 Class 235 with iron pipe O.D. Fittings shall be ductile iron or cast iron, Pressure Class 250, with mechanical joints.
   e. Gaskets- Gaskets for mechanical and push-on joints shall meet the latest AWWA Specifications. Hemp or jute shall not be used. Gaskets for 8” I.D. pipe and smaller shall be 1/16” thick and gaskets for installation on larger size pipe shall be 3/32” thick.
   f. Flange Bolts and Nuts – Flange bolts shall be of the length required for various connections. Bolts shall be of stainless steel and have rough square heads made to American Standard rough dimensions and shall be chamfered and trimmed. Bolts and nuts shall be threaded in accordance with American Standard ASA B1.1-1935 coarse thread series, Class 2 fit.
   g. Tracing wire shall be 14-gauge copper wire and used with all waterline pipe.

2. Valves:
a. Resilient Seated Gate Valves
   i. All resilient gate valves shall fully comply with AWWA C-509 (3”-12”) or C-515 (4”-12”), latest revision.
   ii. All valves shall be manually operated non-rising stem, equipped with operating nut, for installation in a vertical position, unless otherwise specified, and the valve body shall be ductile iron with reinforced flanges.
   iii. All iron surfaces, internal and external must be coated with a minimum 8 mils thickness of hand applied epoxy or 3-5 mils thickness fusion bonded epoxy.
   iv. The valve stem shall have an independent stem nut (not rigidly attached to the gate) which allows the gate to flex without stressing the stem.
   v. All valves shall have either a bronze stem collar bushing with two O-rings above the stem or a stem collar with one O-ring below and O-ring above the stem collar.
   vi. Seating shall use compression closure. The gate shall be of a true bi-directional, mirror image design.
   vii. Valves shall have a smooth bottom design.
   viii. All valves shall open left and have end connections of Mechanical Joint, or as specified by the Department of Public Utilities.
   ix. All castings shall be clean and sound without defects. The castings shall be clean and perfect without blow or sand holes or defects of any kind. No plugging, welding or repairing of cosmetic defects will be allowed.
   x. Valves 3” through 12” must have a minimum 250 psi working and 500 psi (shell) test pressures.
   xi. If the standard valve provided by a Manufacturer does not fully comply with these specifications, but compliance can be attained by providing optional features, then each valve must be permanently marked to indicate the option or options that have been provided. The method of marking valves to indicate that options are included must be approved by the Product and Design Review Committee.
   xii. All bonnet bolts must be stainless steel.
   xiii. All internal and external bolts shall be a minimum Type 304 stainless steel.
b. Resilient Seated Wedge Tapping Valves:
   i. Tapping valves shall meet above specifications as referenced in 2.a. above. The outlet end shall be suitable for use with the type of pipe specified, either M.J. or Hub end.
   ii. Tapping valves will be suitable for use with all approved manufactured tapping sleeves without modification.

3. Butterfly Valves – 16” – 72” All butterfly valves shall conform to the latest revision of AWWA Standard C-504, Class 150-B unless otherwise indicated and meet the following:
   a. Valve bodies shall be ductile iron per ASTM A-536 grade 65-45-12. Body ends shall be flanged with facing and drilling in accordance with ANSI B16.1, Class 125 or mechanical joint in accordance with AWWA Standard C-111 or ANSI A21.11. All mechanical joint end valves shall be furnished complete with joint accessories (bolts, nuts, gaskets and glands), and is for underground use only. All valves shall conform with AWWA C-504, Table 3, Laying Lengths for Flanged Valves and Minimum Body Shell Thickness for all Body Types.
   b. Valve disc shall be ductile iron ASTM A-536, grade 65-45-12. Valve disc shall be of the offset or symmetrical design providing 360-degree uninterrupted seating, and for sizes 24” and larger shall be of the flow through type, cored, or domed.
   c. The resilient seat shall be natural rubber or BUNA-N located on the disc or the body retained by an epoxy backing ring or 18-8, Type 304 stainless steel retaining ring secured to the disc by 18-8, Type 304 stainless steel screws. The seat shall be capable of mechanical adjustment in the field and field replaceable without the need for special tools on 24” and larger valves. Valve body seat shall be 18-8, Type 304 Stainless Steel.
   d. Valve shaft shall be 18-8, Type 304 stainless steel. Valves shall have either one piece (through shaft) or two-piece (stub shaft). The shaft should be attached to the disc by means of O-ring sealed taper pins with lock nuts on 30” and larger valves. Taper pins should be either 304S.S or 416S.S heat treated for added strength or shaft is attached with stainless steel shaft journals hexmated to drive shaft.
   e. The valve assembly shall be furnished with a non-adjustable factory set thrust bearing designed to center the valve disc always.
   f. Shaft bearing shall be contained in the integral hubs of the valve body and shall be of non-cold flowing phenolic backed, PTFE or corrosion resistant self-lubricated sleeve type.
g. Valve shaft seal shall consist of O-rings or Split-V ring. Where the valve shaft projects through the valve body for the actuator connection, the O-ring or Split-V ring packing seal shall be field replaceable as a part of a removable bronze cartridge, without valve disassembly. Connection to the actuator shall be provided by means of at least 2 bolts for 16”-24” valves and at least 4 bolts for 30” and larger valves.

h. When manual actuators are required they shall be amply sized for line conditions. All manual actuators should be traveling nut or wormgear type. All 16” through 24” butterfly valve manual actuators shall be capable of withstanding 300-450 foot-pounds of input torque against the open or closed stops. All actuators shall have adjustable mechanical stop limits. The closed position stop must be externally adjustable.

i. All valves shall be coated with AWWA Standard Epoxy Coatings, in conformance to AWWA Standard C-550, latest revision. All interior ferrous surfaces, including disc, shall be coated a nominal 10 mils thick for long life; and body exterior shall have a minimum 8 mils thickness of hand applied epoxy or 3-5 mils thickness fusion bonded epoxy coating in order to provide protection in shipment and storage, and to afford a superior base for field-applied finish coats.

4. **Tapping Sleeves – Fabricated Steel:**
   a. The body of the tapping sleeve shall be of 3/8” carbon steel, ASTM grade A285.
   b. Flange to be AWWA C207 Class D ANSI, 150 lb. drilling.
   c. The carbon steel body shall have a 12 mil thick coating of fusion-bonded epoxy. Bolts shall be 18-8, Type 304 stainless steel.
   d. Gaskets shall be Grade 60 compounded for use with water, alkalis, mild acids and most hydro-carbon fluids, up to 212 degrees F.

5. **Tapping Sleeves – Stainless Steel:**
   a. The body of the tapping sleeve shall be of 18-8 type 304 stainless steel.
   b. Branch/flange to be 304 stainless steel, 150 lb. drilling.
   c. MJ Gland shall be permanently affixed to the outlet branch and be 304 stainless steel.
   d. Gaskets shall be Grade 60 compounded for use with water, alkalis, mild acids and most hydro-carbon fluids, up to 212 degrees F.
   e. Clamping hardware (nuts, bolts, and washers) shall be 18-8 type 304 stainless steel, with plastic anti-gall washers. Drop-in bolts or welded-on studs are acceptable.
6. **Tapping Sleeves – Fabricated Steel with Mechanical Joint Ends**
   a. Sleeve body, valve flange, gaskets, hardware, and coating to be the same as the fabricated steel tapping sleeve.
   b. The mechanical joint glands to be ASTMA-36 iron or ductile iron.
   c. The gland retaining hardware (nuts, bolts, and washers) to be 18-8 type 304 stainless steel.

7. **Tapping Sleeves – Cast Iron with Mechanical Joint Ends:**
   a. The body and glands of the tapping sleeve shall be of ASTM-126, Class B cast or ductile iron. Sleeve shall be furnished complete with all mechanical joint accessories (bolts, nuts, gaskets, and glands), and shall have a bituminous seal coating.
   b. Valve flange, body gaskets and clamping hardware (bolts, nuts and washers) shall be as specified for the fabricated steel tapping sleeve.

8. **Tapping Sleeve Applications**
   a. The use of tapping sleeves and valves on the County water system will be considered where it can be shown that installation of a tee and line valve on the existing water main will not be beneficial to the County.
   b. The stainless steel, fabricated steel (with mechanical joint ends), or cast/ductile iron (with mechanical joint ends) tapping sleeves may be used for any approved tap on C-900 PVC or ductile iron water main.
   c. The stainless steel, fabricated steel (with mechanical joint ends), or cast/ductile iron (with mechanical joint ends) tapping sleeves may be used for all approved taps on asbestos-cement pipe (except 16” size) and for size-one size or one size down taps on all other pipe material.
   d. Due to the non-availability of the mechanical joint tapping sleeve for 16” asbestos-cement pipe, the stainless steel must be used for taps on this pipe.
   e. The fabricated steel tapping sleeve may be used for approved two (or more) size down taps on C-900 PVC, cast iron or ductile iron water main.
   f. Application Chart:

<table>
<thead>
<tr>
<th>Taps</th>
<th>Size-on-Size</th>
<th>Cast Iron, Asbestos Cement, Transite</th>
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<th>Ductile Iron</th>
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<td>Fabricated Steel</td>
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</tbody>
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Notes:
1. Mueller H300 cannot be used on cast iron or asbestos cement pipe.
2. Except on 16” asbestos cement pipe.
3. Approved for use on 2 or more downsize taps only.

9. **Tapping Sleeve Certification, Testing and Installation:**
   a. All tapping sleeves must be crated for shipment with a signed manufacturer’s tag certifying that the sleeve meets Chesterfield County specifications. The County inspector shall turn this tag in to the contract file with the location of installation noted on the tag.
   
   b. Rigorous testing and conditions relating to tapping sleeves, applied to all manufacturer’s, is standard operating procedure. These conditions are as follows:
      
      i. The tapping sleeve shall be tested in place to a minimum of 200 psi. It is the contractor’s responsibility to order the correct pressure rated tapping sleeve. However, for pre-stressed concrete steel cylinder pipe, taps 12” or less shall be tested to 150 psi and taps larger than 12” shall be tested at 10% above the line pressure of the main being tapped.
      
      ii. If the sleeve fails the 200-psi pressure test, the original failed sleeve shall be replaced with an entirely new sleeve.
      
      iii. The concrete thrust block shall be poured to also support the tapping sleeve from beneath. 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.
      
      iv. Installation instructions must be followed in strict accordance with the latest County’s procedures.

10. **Double Check Assembly Vaults**
   a. The materials used to construct the vaults privately owned and maintained for backflow prevention assemblies for use in Chesterfield County, Virginia shall conform and adhere to the following supplemental specifications. Vaults shall be cast with an access point and conform to the supplemental specification as outlined below. The vault and the individual components, i.e., the lid, walls and base slab shall be adequately designed to handle all applicable loads. Unless approved through the Utilities Department’s Product Review Design
Committee in conjunction with Fire Life Safety Division approval, no vault shall be installed without first acquiring the necessary approvals.

b. Description
   i. The Contractor shall provide all labor, materials, tools, and equipment necessary for the furnishing and installing of all precast/cast concrete vaults as shown on the approved drawings.
   
   ii. An approved manufacturer shall supply precast concrete work as listed in the Chesterfield County Water and Sewer Specifications and Procedures.
   
   iii. Reinforced concrete shall be in accordance with ASTM C857, C858, and ACI-318.

c. Design Requirements
   i. Structural design for precast vaults shall be prepared by a Professional Engineer registered in Commonwealth of Virginia meeting the requirements of these specifications. Any vaults within roadway shall be designed for occasional loading AASHTO #20 vehicular loading.
   
   ii. Distribution of earth loading and live load shall be in accordance with ASTM C890.
   
   iii. All vaults shall be designed for flotation with the water level at the ground surface. The pre-cast vaults shall also be designed to resist all stress encountered during casting, handling, erecting and installation.
   
   iv. All pre-cast design and testing shall be under the supervision of a registered Professional Engineer. Precast concrete vaults shall be manufactured in accordance with the applicable requirements of ASTM C913, “Precast Concrete Water and Wastewater Structures”, and as modified herein.
   
   v. All vaults shall be equipped with a sump pump and applicable piping and valves, 120 v single phase capable of pumping 20gpm@15 ft. TDH.

d. Minimum Submittal Requirements:
   i. Shop drawings and design calculations shall be submitted to the Chesterfield Utilities Department’s Principal Engineer in responsible charge position in the Development Section for each model for approval for all vaults to be approved. The
calculations shall be prepared by a Professional Engineer registered in Commonwealth of Virginia.

ii. Calculations shall be provided, signed, and sealed and be designed for lateral earth pressures, sizing rebar, live load, dead load, buoyancy, and Ultimate moments for top, bottom, and sides of the vault. Calculations not prepared or meeting this specification will be rejected.

iii. Poured-in-place: vaults having job requirements having to cast in place, shall meet the specifications herein.

iv. All drawings shall be fully dimensioned and to show all opening reinforcing steel details, joint details, lifting and erection inserts.

v. Plan view drawings shall indicate the required minimum clearance for link seals of 1” to 3” inches at the entry and exit points of the pipe at the vault walls.

vi. Approved backflow assemblies shall meet the following specifications and/or drawing shall indicate:

vii. The petcocks are plugged and watertight during non-test periods to prevent potential contamination in the event of flooding.

viii. Clearances on the test petcock side of the assembly (if located on the sides and not the top of the assembly) shall be not less than 18-inches.

ix. Clearances below the assembly shall be a minimum of 12-inches and maximum of 24-inches, measured from the lowest point of the assembly to the finished floor.

x. Provide dimensions of the assembly (including influent and effluent valves) if only one manufacturer and model of the assembly is to be included with in the vault.

xi. Indicate on drawing or labeled on plan, that the backflow assembly must be tested at the time of installation and annually thereafter in accordance with the standard procedures accepted, on the required forms, and by a certified tester in accordance with the Chesterfield County Cross Connection program.

e. Fabrication

i. Concrete strength of all vaults will be 28 days at 5,000 psi minimum. It shall be the signing engineer or precast vaults
manufacturer’s responsibility to insure the specified strength is maintained throughout production of the vault. Mix design shall be those, previously used by the manufacturer or signing engineer, which have proven satisfactory for casting vaults like those specified and producing the required strength as mentioned above. All precast concrete shall be air entrained (4-8%). The use of fiber in concrete is optional and shall not be used in place of rebar reinforcement. Concrete shall not contain water soluble chloride ions. Accelerators containing calcium chloride shall not be used in precast concrete containing reinforcing steel or other embedded metals.

ii. Sump pumps shall meet the WAT-19 detail of the Chesterfield County Water and Sewer Specification and Procedures.

iii. All rebar shall be minimum Grade 60. A minimum size #4 (1/2 inch) rebar unless otherwise designed by a professional engineer registered in the Commonwealth of Virginia and approved by Chesterfield County.

f. Vault Components

i. Non-traffic bearing lids: The lift holes shall not displace any of the required reinforcement nor should it protrude from face of concrete maintaining 1-inch cover. If H20 Loading is required: All traffic lids shall be designed for H20 loading in accordance with AASHTO Standards and be designed by a Professional Engineer registered in Commonwealth of Virginia.

ii. Walls: If poured-in-place, all four (4) walls on cast in place vaults shall be cast in one continuous placement. All corners shall have added reinforcement.

iii. Thickness: Designed by a Professional Engineer registered in Commonwealth of Virginia and approved by Product Design Review Committee (PDRC).

iv. Electrical: Conduit entrances shall be supplied per job requirements and will be made available in any size and configuration.

v. Piping: Pipe entry and exit points shall be sealed using an approved link-seal. Piping must not support the vault, nor shall the vault support the pipe at entry and/or exit points.

vi. Hatches: Aluminum access hatch shall consist of a double leaf hinged door, diamond plate surface, and locking mechanism and be not less than 48-inches x 48-inches. Hatch opening
shall be to the ladder side of the vault at the center point of
the wall of as otherwise approved.

vii. Ladder: An offset Aluminum access ladder shall consist of
heavy duty aluminum with a configuration that is VOSHA-
OSHA approved. The ladder shall have provisions for bolting
(doweled) into the wall, ceiling, and the floor of the vault
using Stainless steel anchors. Ladder shall be centered at
hatch opening. All ladders shall be supplied with an approved
ladder up safety post when required to meet VOSHA-OSHA
law.

viii. Clearance Horizontal: Shall be accordance with detail FIR-3 of
the Chesterfield Water and Sewer Specifications and
Procedures.

ix. Clearance Vertical: 10-inches minimum shall be required
above the OS&Y valves fully opened. This measurement shall
be between the top of the fully opened OS&Y stem and the
underside of the vault top.

g. Accessories
i. Strap Anchors: Stainless steel capable of supporting pipe or
accessories indicated and has a minimum 1-inch-wide x 1/8
inch thick.

ii. Steel pipe supports shall be made of ASTM A36 steel pipe and
plates that are coated with red-oxide primer and a black
enamel finish coat acceptable to the county. The supports
shall be adjustable and shall be anchored to the floor of the
vault with Stainless steel anchors.

iii. All manufactures of double check valve assemblies (fire
protections) will be an approved supplier as listed in the
Chesterfield County Water and Sewer Specifications and
Procedures and approved by the Utilities Product Design
Review Committee.

iv. 6-inch Bollards shall be required and is at the discretion of the
Fire Life Safety Division’s approval for placement, color, and
number.

h. Inspection and Certification
i. Precast: Prior to the delivery of a structure, the manufacturer
shall be pre-approved and have presented a vault model
and/or number meeting the requirements of this specification
herein to the Product Design Review Committee of the
Chesterfield County Department of Utilities, in conjunction with the Fire Life Safety Division, for approval. Approved manufacturer shall be listed in the Chesterfield County Water and Sewer Specifications and Procedures or be provided a temporary approval letter until such time that the Utilities specifications are updated.

ii. Poured-In-Place: See Section 1.03 Design Requirements.

i. Sealants

i. Joint sealing material shall be pre-formed, flexible joint sealing compound conforming to ASTM C923.1 and be approved for use in Chesterfield County. On all vaults where the vault is installed using more than one piece, and approved gasket material such as ConSeal CS-102 Butyl Rubber Sealant or equal shall be used for the seam joint. O-Ring rubber gaskets in accordance with ASTM C443. Butyl rubber gaskets in accordance with ASTM C990.

ii. The Product Design Review Committee must approve all sealants.

j. Use of Material

i. Brick, Concrete block, and knockdown boxes shall not be used in the permanent installation.

k. Product Handling

i. Precast sections shall be transported and handled with proper equipment to protect the elements from damage. Sections shall be handled by means of lifting inserts embedded in the concrete.

ii. Safety measures are to be in place to meet local, state, and federal regulations for job safety. This is to include hard hats, steel toe boots and vests notwithstanding other requirements.

l. Installation

i. Vaults shall be provided as shown on the drawings. Vaults shall be set to be vertical, true, and plumb and with sections in alignment within a ¼ inch maximum tolerance to be allowed. The Contractor shall install all precast sections with an approved joint sealing compound in a manner that will result in a watertight joint.

m. Excavation, Bedding and Backfill
i. Excavate and backfill for vaults to specified depths as designed. Backfilling shall be done in a careful manner, bringing the fill up evenly on all sides and be compacted to an acceptable manner to the inspector or county representative. Provide clearances around sidewalls or structure for construction operation, backfill, and placement of stone as specified meeting the requirements of Section 1.06 VAULT COMPONENTS.

ii. When ground water is encountered, structure is to be placed in a dry trench. Pumping is required.

iii. Where possibility exists of watertight structure becoming buoyant in flooded excavation that cannot be pumped, design elements approved by the engineer are to be in place to prevent flotation. Structure must be watertight.

iv. Place bedding and foundation slab: trowel top surface level if cast-in-place. Twelve (12) inches of number #57 stone is to be used extending 1 foot beyond the vault perimeter. Stone is to be level and inspected before placement of the vault.

v. Precast vaults and structures are to be lifted at the lifting points as designed.

vi. When lowering vaults and structures into excavation and joining pipe to vault, take precaution to ensure interior of pipeline remains clear and free of debris.

vii. Bedding: Clean coarse aggregate Gradation No. 57.

do. Configuration

i. Configuration shall be rectangular with a general depth/length ratio of 2:1 or more. Vault shall be placed so that piping too mainline is perpendicular.

o. References

i. ASTM A536 – Standard Specification for Ductile Iron Castings

ii. ASTM C890 – Standard Practice for Minimum Structural Design Loading for Monolithic or Sectional Precast Concrete Water and Wastewater Structures.

iii. ASTM C891 – Standard Practice for Installation of Underground Precast Utility Structures

iv. ASTM C913 – Standard Specifications for Precast Concrete Water and Wastewater Structures.

vi. ASTM C497 – Standard Test Methods for Concrete Pipe, Manhole Sections, or Tile.


viii. ASTM C923 – Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes, and Laterals

ix. ACI-301 – Specifications for Structural Concrete

x. ACI-318 – Building Code Requirements for Structural Concrete

xi. ACI-350 – Code Requirements for Environmental Engineering Concrete Structures

xii. Latest Addition of the Chesterfield County Water and Sewer Specifications and Procedures

p. Valving:

i. The double check valve assembly shall be a Watts No. 709 or equal surrounded by an OS&Y gate valve on both the inlet and outlet side of the assembly.

ii. The Fire Life Safety Division connection may or may not be in the vault. The use of post indicating valves, location of the Fire Life Safety Division connection, and other related fire questions will be addressed by the Fire Life Safety Division.

iii. Pipe stands such as poured concrete or fabricated metal shall be provided to support the entire assembly. Metal Pipe stands shall be galvanized or be coated with an acceptable paint to prevent rust. Concrete block or brick is not an acceptable support material.

11. Fire Hydrants:

a. Fire hydrants shall be manufactured in full compliance with this specification and shall also comply with the American Water Works Association Fire Hydrant Specification C-502, latest revision and the following:

i. Type: Compression – Dry Standpipe: Valve shall open against and close with the pressure. The design shall be such that all
internal operating parts can be removed through the standpipe and main valve rod extended without excavating.

ii. Size: Internal valve diameter shall be a minimum 4 ½”.

iii. Inlet Size and Type: 6” mechanical joint end with accessories.

iv. Hose Nozzles: Each hydrant shall be equipped with two 2 ½” I.D. hose nozzles with National Standard threads, one quarter turn bayonet lock or threaded in with O-ring seal and suitable locking arrangement.

v. Steamer Nozzle: Each hydrant shall be equipped with one 4 ½” Steamer Nozzle having National Standard Threads, one quarter turn bayonet lock, or threaded in with O-ring seal and suitable locking arrangement.

vi. Direction of Open: Left, counter-clockwise.

vii. Size and shape of Operating Nut and Cap Nuts: to be 1 ½” point to flat pentagon. Each hydrant shall be equipped with a weather cap or weather seal.

viii. Seal Plate: The hydrant shall be so constructed that a moisture-proof lubricant chamber is provided which encloses the operating threads, thereby automatically lubricating the threads each time, the hydrant is operated. The lubricant chamber shall be enclosed with at least three O-rings. The two lower O-rings will serve as pressure seals; the third O-ring will serve as a combined dirt and moisture seal to prevent foreign matter from entering the lubricant chamber. The hydrant shall be equipped with either an anti-friction washer or bronze bushing to reduce operating torque. The bonnet will be secured to the hydrant using bolts and nuts.

ix. Standpipe – Ground line Safety Construction: The standpipe sections shall be connected at the ground line by a two-part, bolted safety flange or breakable lugs. The main valve rod sections shall be connected at the ground line by a frangible coupling. The standpipe and ground line safety construction shall be such that the hydrant nozzles can be rotated to any desired position without disassembling and removing the top operating components and the top section of the standpipe. The minimum inside diameter of the standpipe shall be 6”.

x. Main Valve, Rod Assembly: The main valve rod assembly shall be so constructed to allow removal of all operating parts through the standpipe regardless of depth of bury, using a removal wrench which does not extend below the ground line.
of the hydrant. The main valve seat ring shall be bronze and its assembly into the hydrant shall involve bronze to bronze thread engagement, and the valve assembly pressure seals shall be obtained without the employment of torque compressed gaskets. The design of the main valve rod shall be such that the operating threads at the top of the rod and the valve assembly threads at the bottom of the rod are isolated from contact with water in the standpipe or in the hydrant inlet shoe.

xi. Drain Valve: The operation of the drain mechanism shall be correlated with the operation of the main valve and shall involve a momentary flushing of the drain ports each time the hydrant is opened. The drain ports shall be fully closed when the hydrant valve is more than 2 ½ turns open and the drainage channel in the bronze valve seat ring shall connect to two or more outlet drain ports. Springs may be employed in the hydrant valve or drain valve mechanism.

xii. Depth of Bury: Hydrant shall be suitable for installation in trenches 4 ½” deep, unless otherwise specified.

xiii. Painting Instruction: Two prime coats and one aluminum finish coat shall be used, unless otherwise specified. Exposed area of fire hydrant shall receive one field coat of aluminum after installation. The wetted surface of the hydrant shoe shall be epoxy coated to prevent corrosion of the waterway. Private fire hydrants shall be painted red from the factory.

xiv. Pressure Rating: Test pressure 500 psi, working pressure 250 psi.

xv. If the standard hydrant provided by a manufacturer does not fully comply with these specifications, but compliance can be attained by providing optional features, then each hydrant must be permanently marked to indicate the option or options that have been provided. The method of marking hydrants to indicate that options are included must be approved by the Product and Design Review Committee.

12. **Check Valves:**
   a. Check valves shall be of the horizontal swing type; iron body bronze mounted, equipped with weighted lever or spring as specified or shown on the plans.

13. **Water Service Assembly for 5/8” Water Meters**
a. Water Meter boxes (for use with all 5/8” meters) shall be as manufactured by Carson for high density polyethylene boxes or approved equal.
   
i. The Meter box shall be 24’ high (1” box is 26” high) with a cover and reader lid. The box shall have a 1 ¼” anti-settling flange on the bottom edge. It shall be made of hi-density polyethylene plastic or one piece, molded construction for durability with dimensions as shown on the standard detail in Part II of this document. The box must have solid walls with an average thickness of no less than .550” and have been tested to withstand a 15,000 lb. vertical load freestanding. The inside color shall be white to reflect light for ease of meter reading and the outside shall be black to protect against UV degradation during prolonged exposure to sunlight i.e. during outside storage. All edges shall be clean and smooth for safety during handling.

   ii. The meter box cover shall be one-piece, with reader lid made of cast iron or ductile iron for 5/8” and 1” boxes. One-piece cover designed to fit the corresponding opening in the meter box frame and have a square tread plate surface design. “WATER METER” shall be on the reader lid.

   iii. The lid shall have a minimum thickness of .25”, with tensile strength 65,000 psi, yield strength 45,000 psi. The castings shall be made of cast iron or ductile iron.

b. Water meter boxes used in traveled areas shall be made of cast iron as manufactured by Capitol Foundry or approved equal. Material shall consist of gray iron per ASTM A-48 (latest revision) Class 30.

c. Meter yokes/settters shall be ¾” for 5/8” meter with saddle nut. Inlet and outlet sides of meter setter shall be equipped with ¾” flare or compression copper coupling.

d. ¾” Corporation stop with corporation cock thread inlet shall be those as specified in the in the approved materials list shown in Section 1 entitled Water System.

e. Pipe shall be ¾” type “K” copper domestic manufactured.

f. Tail piece on yoke shall be ¾” type “K” copper and be long enough to extend 18” outside of meter box.

g. Service Saddles:
   
i. All saddle castings must be bronze and meet the requirements of AWWA C800 and ASTM B-62.
ii. All saddles must have a minimum of two (2) 1 ½” wide (including bolts) stainless steel straps type 304 (18-8) where welds are passivated for resistance to corrosion. Exception: Ford 202BS which has two (2) bolts and a single strap with a minimum width of 3 ⅜”.

iii. Gaskets must be made of Virgin NBR compound.

iv. Service saddles are required on all taps made onto PVC and AC pipe.

14. Water Service Setter for 1”, 1 ½” and 2” Water Meters:

a. The water meter box and cover (for use with all 1”, 1 ½” and 2” water meters) shall be as manufactured by Carson. The boxes shall conform to the specifications as outlined under the “Water Meter Assembly for 5/8” Water Meters” and the dimensions as specified in the standard detail shown in Part II of this documents for 1”, 1 ½” and 2” water meters.

b. General: All 1”, 1 ½” and 2” meter setters for domestic use at residential homes, condominiums, apartments, townhomes, etc. shall NOT be equipped with a bypass valve. Setters for irrigation uses shall NOT be equipped with a bypass valve. All other 1”, 1 1/2” and 2” meter setters SHALL be equipped with a bypass.

i. Meter setters for 1” meters shall be 1” x 12” riser meter yokes with copper tube flare nut or compression on the inlet and outlet sides.

ii. All 1 ½” and 2” meter setters shall be constructed of seamless threaded red brass pipe, standard Type K hard copper tube (per ASTM B-88-62,) high quality brass (per AWWA C-800), and leadless solder, and provide horizontal female pipe threads on both front and rear connections.

c. Bypass: Meter setters that are equipped with a bypass line and valve shall be appropriately sized with an inverted key or ball type stop threaded directly into the inlet bypass tee fitting. This bypass valve shall have a solid tee head and be either lock wing type or provide a bracket or another device to lock this valve in the “off” position upon installation. If copper tube is used for the bypass line, the compression connection for the copper side of the bypass valve must be as produced by the following manufacturers:

i. Mueller Co., “110” compression connection for copper pipe; or

ii. Ford Meter Box Co., “Grip Joint” connection or copper pipe; or
iii. A.Y. McDonald, “T” compression connection for copper pipe. Otherwise, a tee head inverted plug or ball type bypass valve is required with a threaded connection. Both bypass tee fittings, (inlet and outlet,) shall have brace pipe eyelets cast within them to stabilize setter upon installation, if necessary.

d. Angle Valves: Flanged, inverted key or ball type “tee head” angle valves are required on both meter connections and will include lock wings and meter support bracket to aid in meter installation. Pack Joint or Compression connections are NOT allowed on the vertical riser pipe; these connections must be threaded or soldered copper. Valves shall be double drilled, (2” size only,) to accommodate both 1 ½” and 2” meters. Angle or ball valves shall provide a stop or check to limit movement of tee head at 90 degrees Maximum, (from fully open to completely off.) Arrows cast within the inlet valve shall indicate direction of flow while in service.

e. Dimensions: Meter setters shall accommodate the following meter dimensions:
   i. 1” Male x male pipe thread laying length: 10 ¾” + or – 1/16”
   ii. 1 ½” Flanged meter laying length: 13”, plus gaskets
   iii. 2” Flanged meter laying length: 17”, plus gaskets

f. The rise or height of meter setter, measured vertically from center line of inlet pipe thread to center line of meter flange bolt shall be:
   i. 1” Meter setter, maximum height of 12”
   ii. 1 ½” Meter setter, maximum height of 8 ½”
   iii. 2” Meter setter, maximum height of 9 ½”

g. The copper used on the bypass and vertical riser pipe, if so equipped,) shall be Type K and comply with ASTM B-88-62, which states outside diameters as shown here:
   i. ¾” Nominal pipe size , .875” outside diameter, .065” wall
   ii. 1” Nominal pipe size, 1.13” outside diameter, .065” wall
   iii. 1 ¼” Nominal pipe size, 1.38” outside diameter, .065” wall
   iv. 1 ½” Nominal size pipe, 1.63” outside diameter, .072” wall
   v. 2” Nominal size pipe, 2.13” outside diameter, .083” wall

h. The bypass assembly shall be sized as follows:
   i. 1” Meter setter requires minimum ¾”
ii. 1 ½” Meter setter requires minimum 1 ¼” bypass pipe & valve

iii. 2” Meter setter requires minimum 1 ¼” bypass pipe & valve

15. **Valve Boxes**

   a. All underground valves shall be installed in approved cast iron valve boxes, having suitable base and shaft sections and covers to protect the valve and permit easy access and operation. Box assemblies shall have slip adjustment (two-piece sliding type adjustable valve box).

16. **Air Release Valves**

   a. All valves shall be designed in accordance with the following standards and/or by the Engineer as required.

   b. Type 1: Small orifice valves shall be either of the kinetic design type, employing only one moving part, a stainless-steel float ball or of the stainless-steel float and lever type. It shall maintain closed position to prevent the loss of water by positive seating of the float ball against a smoothly ground contact surface of the exhaust orifice.

      i. It shall automatically provide for the escape of air to atmosphere without the loss of water when the float ball moves away from the orifice seat. The body of the valve shall be cast iron and shall be coated to withstand moist environment.

      ii. Valve shall have a minimum of a one-inch N.P.T. inlet for 6”, 8” and 12” pipe sizes and a two-inch N.P.T. inlet for pipes 16” and larger; and shall have a minimum of a 3/32” outlet orifice for 6”, 8” and 12” pipe sizes and a 3/16” outlet orifice with 16” and larger pipes.

      iii. Valve shall be suitable for 150 psi working pressure.

   c. Type 2: Shall be a combination, dual unit valve, combining one (1) small and one (1) large unit, both employing the kinetic operating principal or of the stainless steel and lever type. For the Kinetic type, the only moving parts shall be two (2) stainless steel balls (one for each unit) which will remain in the respective throat areas when discharging air without blowing shut or collapsing the float ball(s).

      i. In the closed position, resulting from water filled line, the valve shall prevent leakage.

      ii. The large orifice seat shall be of composition material and replaceable.

      iii. The body of the valve shall be cast iron and shall be coated to withstand moist environment.
iv. Valve size shall be six (6) inch with 3/8” orifice for small unit and shall be suitable for 150 psi working pressure.

17. Manholes:
   a. Gate Valve Manhole and Air Release Manhole: Shall be concrete, ASTM C-478 and diameters shall be as shown on plans and meets the specifications as described in Part V, Section B of this document entitled “Sanitary Sewer Systems”.

18. Joint Restraint Devices:
   a. All restraint devices must be UL listed and FM approved. Restraints are acceptable for PVC and D.I. pipe.
   b. PVC Pipe
      i. Where PVC pipe is connected to fittings, mechanical joint restraint shall be incorporated in the design of the follower gland and shall include a restraining mechanism which, when actuated, imparts multiple wedging action against the pipe, increasing its resistance as the pressure increases. Flexibility and minimal deflection of the joint shall be maintained after burial. Glands shall be manufactured of ductile iron conforming to ASTM A536-80. Restraining devices shall be of ductile iron heat treated to a minimum hardness of 370 BHN. There shall be no dissimilar metals allowed. Dimensions of the gland shall be such that it can be used with all AWWA approved standardized mechanical joint bell and tee-head bolts conforming to ANSI/WWA A21.11 and ANSI/WWA C153.53/A21.53 of latest revision. The mechanical joint restraint device shall have a working pressure of at least the working pressure of the pipe with a minimum of 150 psi. Twist-off nuts shall be used to insure proper actuating of the restraining devices.
      ii. As part of a joint restraint system, all bell and spigot end joints within this length shall be restrained with a clamping ring and an additional ring designed to fit behind the bell end of the PVC pipe. The rings shall relate to T-Head Bolts or Rods.
      iii. All clamping rings shall incorporate serrations on the inside surface to provide positive restraint on the outside surface of the pipe and shall provide full support around the circumference of the pipe to maintain roundness.
      iv. Restraining devices shall have a pressure rating equal to or greater than the PVC pipe, and shall be capable of
withstanding a minimum test pressure of 2 times the pressure rating of the device.

v. Restraining devices and T-bolts shall be manufactured from high strength ductile iron, ASTM A536, Grade manufactured from completely corrosion resistant COR-TEN STEEL or equal.

vi. Restraining devices shall be as approved by Chesterfield County’s Product and Design Review Committee.

c. Ductile Iron Pipe

i. Mechanical joint restraint shall be incorporated in the design of the follower gland and shall include a restraining mechanism which, when actuated, imparts multiple wedging action against the pipe, increasing its resistance as the pressure increases. Flexibility and minimal deflection of the joint shall be maintained after burial. Glands Shall be manufactured of ductile iron conforming to ASTM A536-80. Twist-off nuts shall be used to insure proper actuating of the restraining devices.

ii. Restraining devices shall be of ductile iron heat treated to a minimum hardness of 370 BHN. There shall be no dissimilar metals allowed. Dimensions of the gland shall be such that it can be used with all AWWA approved standardized mechanical joint bell and tee-head bolts conforming to ANSI/AWWA A21.11 and ANSI/AWWA C153.53/A21.53 of latest revision. The mechanical joint restraint device shall have a working pressure of the pipe, with a minimum of 150 psi.

iii. As part of a joint restraint system, all bell and spigot end joints within this length shall be restrained with an approved bell and spigot restraint device. Clamping ring restraint devices require an additional ring be designed to fit behind the bell end of the D.I. pipe. The rings shall be connected with T-Head Bolts or Rods. Rods must be protected from corrosion either by rod material or coating.

19. Markers:

a. All markers shall have one of the applicable decal description to reflect the following:

i. Upper decal, white and blue 2 7/8” x 11” standard, worded “CAUTION WATER PIPELINE”
ii. Upper decal, white and blue 2 7/8” x 11” standard, worded “CAUTION WATER VALVE”

b. In addition, the lower decal shall contain the following:
   i. Lower decal, white and blue 2 7/8” x 1 ¾” standard, worded “MISS UTILITY – 1800-552-7001, CHESTERFIELD UTILITIES”.

c. Total height shall be 66”.

d. Basic marker shall be white in color.

20. **Flushing Hydrants – (Chesterfield Model)**

   a. Flushing hydrants shall be manufactured in full compliance with the following specifications and shall also comply with AWWA’s latest specifications on flushing hydrants

   b. The flushing hydrant shall offer a 360-degree directional discharge and shall have easy above ground accessibility always. It shall be capable of being locked and shall be freeze-proof. It shall be equipped with National Standard fire thread connections and a breakaway union for high traffic areas.

   c. It shall be of size 2”.

   d. The hydrant barrel shall be 2” iron pipe. The exterior shall be painted with approved coating for durability. The overall length of hydrants can vary per the depth of water systems.

   e. The barrel and the standpipe shall be joined with a breakable malleable union. A brass hose connection, 2 ½” NSFT with attached cap and chain, shall be provided for convenience in flushing.

   f. The body valve shall have bronze body with automatic weep, such that when the valve is in OFF position the hydrant barrel shall automatically drain. The valve stem shall be above ground and shall be lockable to prevent tampering. Its operating device shall be of key type design, with permanent attachment to the valve stem.

21. **Cast Couplings:**

   a. **Center Sleeve:** Made of ductile iron, Spec ASTM-A536, and coated with an enamel shop coat, sized to accommodate all AWWA pipes of the same nominal size. The center sleeve length of long barrel (sleeve) couplings shall be a minimum of 10”.

   b. **End Ring:** Made of ductile iron Spec ASTM-A536, and color coded with an enamel shop coat to easily identify its use on various types of pipe.

   c. **Gaskets:** SBR rubber compound, Grade 30 per Spec ASTM D-2000 for normal water service and an extended shelf life.
d. **Bolts:** High strength low alloy steel bolts with heavy hex nuts, per AWWA C-111.

### 22. Casing Spacers:

a. Casing Spacers shall be bolt on style with a shell made in two sections of heavy T-304 stainless steel. Connecting flanges shall be ribbed for extra strength. The shell shall be lined with a PVC liner .090” thick with 85-90 durometer or neoprene rubber. All nuts and bolts are to be 18-8 stainless steel. Runners shall be made of ultra-high molecular weight polymer (UHMW) or glass reinforced plaster. Runners shall be supported by risers, made of heavy T-304 stainless steel or 10-gauge welded steel. The supports shall be mig welded to the shell and all welds shall be passivated or 3/8” diameter stud welded to band and locked with a locking fastener. The height of the supports and runners combined shall be sufficient to keep the carrier pipe at least .75” from the casing pipe wall at all times.

### B. SANITARY SEWER SYSTEMS

#### 1. Gravity Sewer and Force Main Pipe and Fittings:

a. Polyvinyl chloride (PVC) (non-pressure) pipe (6”-15”) and fittings shall meet requirements of ASTM D3034 Type PSM SDR-35 or ASTM F1760 SDR-35 with elastomeric gasket joints meeting requirements of ASTM D3212. Bedding shall be as required by the County for plastic pipes as shown in the County’s Standard of Details.

b. Polyvinyl Chloride (PVC) (non-pressure) pipe (18”-48”) and fittings shall meet requirements of ASTM F679, Table I Type SDR-35 for large diameter solid wall PVC pipe with elastomeric gasket joints meeting requirements of ASTM D3212. Bedding shall be as required by the County for plastic pipes as shown in the County’s Standard of Details.

c. Vylon H.C. PVC Gravity (non-pressure) sewer pipe (21”-54”) shall meet requirements of ASTM F1803 and fittings shall meet the requirements of ASTM 3034-35 PVC sewer pipe with elastomeric gasket joints meeting requirements of ASTM D3212. Bedding shall be as required by the County for plastic pipes as shown in the County’s Standard Details.

d. Ultra-Corr PVC sewer (non-pressure) pipe (36”) shall be seamless profile wall and meet the requirements of ASTM F1803 and fittings shall meet the requirements of ASTM 3034-35 PVC sewer pipe with elastomeric gasket joints meeting requirements of ASTM D3212. Bedding shall be as required by the County for plastic pipes as shown in the County’s standard details. Pipe shall have a smooth interior with a corrugated cross-sectional rib exterior. Exterior corrugations shall be perpendicular to the axis of the pipe to allow placement of the...
sealing gasket without field marking, beveling, sealing channels, gluing welding, additional cutting, or machining. The pipe stiffness shall be a minimum of 50 psi when tested at 5% deflection in accordance with D 2412. Pipe shall be green in color.

e. Ductile Iron (gravity or pressure) pipe shall meet requirements of AWWA C151. Pipe shall be thickness Class 52. Pipe shall have cement-mortar lining and a bituminous seal coat. Thickness classes shall meet requirement of AWWA C150.

f. Pressure Pipe and fittings shall have either mechanical joint or push-on joint, both conforming to the requirements of AWWA C111. Bolts shall be high strength cast iron having an ultimate tensile strength of 75,000 psi and a minimum yield point of 45,000 psi.

g. Pressure Pipe fittings shall meet the requirements of AWWA C110 (ductile iron or cast iron) or AWWA C153 (ductile iron compact). All fittings shall be Pressure Class 250. Fittings shall have a cement-mortar lining and a bituminous seal coating or a 6-8 mil (nominal thickness) fusion bond epoxy lining/coating in compliance with AWWA C550.

h. Pressure Polyvinyl chloride pipe (PVC) 6”, 8”, and 12” in size shall conform to the requirements of AWWA Specification C-900, with gasket joints, DR-18 Class 150 with iron pipe O.D. Fittings shall be ductile iron or cast iron, Pressure Class 250, with mechanical joints.

i. Push-on-joint and rubber gasket shall meet requirements of AWWA C111.

j. Cement mortar lining with bituminous seal coat for ductile iron pipe and fittings shall be meet requirements of AWWA/ANSI C104/A21.4. Cement mortar lining shall be standard thickness.

k. Exterior bituminous coating for cast iron fittings and ductile iron pipe shall meet requirements of AWWA/ANSI CC106/A21.6 or AWWA/ANSI C151/A21.51 as applicable.

2. **Sanitary Sewer Manholes:**

   a. Manholes shall be constructed of precast reinforced concrete manhole sections in accordance with requirements of ASTM C478 and as shown on the Standard Details.

   b. A maximum of two lift holes per manhole section may be provided.

   c. Provide tongue and groove joints in manhole sections with a preformed groove in the tongue for placement of an O-ring type round, rubber gasket or Press Seal, Inc’s Profile RS gasket.

      i. Gasket shall comply with requirements of ASTM C361
ii. Gasket shall provide the sole element in sealing the joint from either internal or external hydrostatic pressure.

d. Provide flexible pipe connections to manholes for pipes 21 inches in diameter and smaller in size.

i. Materials shall consist of EPDM and elastomers designed to be resistant to water, sewage, acids, ozone, weathering and aging. Use neoprene conforming to ASTM C443 and ASTM C923 and all stainless steel elements of the connector shall be non-magnetic Series 304 Stainless, excluding the worm screw for tightening to steel band around the pipe which shall be Series 305 Stainless. The worm screw for tightening the steel band shall be torqued by a break-away torque wrench available from the precast manhole supplier, and set for 60-70 inch/lbs.

ii. Cast or core drill openings in manholes to receive connectors. Connectors shall be suitable for field repair or replacements. Connectors not suitable for field replacement is unacceptable.

iii. The assembled connectors shall allow at least an 11 degree angular deflection of the pipe and at least one inch of lateral misalignment in any direction and be suitable for a normal variation in diameter or roundness for the pipe material used.

iv. Connectors shall be Kor-N-Seal as manufactured by National Pollution Control Systems, Inc. or approved equal.

e. Manhole steps shall be corrosion-resistant and shall be one-half inch grade 60 steel reinforcing rod encapsulated in a copolymer polypropylene. The steps shall conform with ASTM C478 paragraph 11 and to the dimensions shown on the Standard Details.

f. Manhole frames and covers shall be molded of gray cast iron conforming to ASTM A48, Class 30. Castings shall not be coated. Seating surfaces between frame and cover shall be machined. The dimensions and weights shall conform to the requirements shown on the Standard Details.

g. Sealant for manhole frames shall be a one-component polyurethane sealant like Sika “Sikaflex” type 430.

h. Sealant for flexible pipe connections shall be a two-component polysulfide sealant like Sika “Sikaflex” type 412 with primer type 419.

i. All manholes shall be watertight.

3. Sewage Air/Vacuum Break Valves without Bias Mechanism
a. All valves shall be designed in accordance with the following standard and/or by the Engineer as required.

b. The Sewage Air Release and Vacuum Break Valve shall consist of a compact tubular or conical all stainless steel fabricated body, hollow direct acting float and solid large orifice float in H.D.P.E. – stainless steel nozzle and woven dirt inhibitor screen, nitrile rubber seals and natural rubber seat.

c. The valve shall have an integral “Anti-Surge” Orifice mechanism which shall operate automatically to limit transient pressure rise or shock induced by closure to less than 1.5x valve rated working pressure.

d. The intake orifice area shall be equal to the nominal size of the valve i.e., a 6” valve shall have a 6” intake orifice.

e. Large orifice sealing shall be affected by the flat face of the control float seating against a nitrile rubber ‘O’ ring housed in a dovetail groove circumferentially surrounding the orifice.

f. Discharge of pressurized air shall be controlled by the seating and unseating of a small orifice nozzle on a natural rubber seal affixed into the control float. The nozzle shall have a flat seating land surrounding the orifice so that damage to the rubber seal is prevented.

g. The valve construction shall be proportioned regarding material strength characteristics, so that deformation, leaking or damage of any kind does not occur by submission to twice the designed working pressure.

h. Connection to the valve inlet shall be facilitated by flanged ends conforming to ANSI B16.1 Class 125 or Class 250 Standards.

i. Flanged ends shall be supplied with the requisite number of stainless steel screwed studs inserted for alignment to the specified standard. Nuts, washers, or jointing gaskets shall be excluded.

4. Sewage Air/Vacuum Break Release Valves with Bias Mechanism

a. All valves shall be designed in accordance with the following standard and/or by the Engineer as required.

b. The Sewage Air Release and Vacuum Break Valve shall consist of a compact tubular all stainless steel fabricated body, hollow direct acting float and solid large orifice float in H.D.P.E. – stainless steel nozzle and woven dirt inhibitor screen, nitrile/E.P.D.M. rubber seals and natural/E.P.D.M. rubber seat.
c. The valve shall have an integral ‘Anti-Surge’ Orifice mechanism which shall operate automatically to limit surge pressures or shock induced by liquid oscillation and/or rapid air/gas discharge to less than 1.5x valve rated working pressure.

d. The intake orifice area shall be equal to the nominal size of the valve i.e., a 6” valve shall have a 6” intake orifice. Large orifice sealing shall be affected by the flat face of the control float seating against a nitrile/E.P.D.M. rubber ‘O’ ring housed in a dovetail groove circumferentially surrounding the orifice.

e. Discharge of pressurized air shall be controlled by the seating and unseating of a small orifice nozzle on a natural/E.P.D.M. rubber seal affixed into the control float. The nozzle shall have a flat seating land surrounding the orifice so that damage to the rubber seal is prevented.

f. The valve construction shall be proportioned regarding material strength, and characteristics, so that deformation, leaking or damage of any kind does not occur by submission to twice the designed working pressure.

g. Connection to the valve inlet shall be facilitated by flanged ends conforming to ANSI B16.1 Class 125 and Class 250 and ANSI B16.5 Class 150 and Class 300 Standards.

h. Flanged ends shall be supplied with the requisite number of stainless steel screwed studs inserted for alignment to the specified standard. Nuts, washers, or jointing gaskets shall be excluded.

5. Sewage Plug Valves

a. All plug valves shall be of the non-lubricated, eccentric type with resilient faced plug and round ports of no less than 90%, or rectangular ports or no less than 80%, of the connecting pipe area, except valves of 24” or larger size shall have port areas of no less than 70% of the connecting pipe area.

b. Valves shall be for buried underground service as well as plant service and shall be rated for 175 psi up to 12” and 150 psi for sizes 14” and larger. Drip-tight shut off shall be provided at full rated working pressure in the standard flow direction and 50 psi in the reverse direction, except when full-rated sealing is required in both directions.

c. Valves 6” and larger shall be equipped with geared actuators with a 2” square operating nut. Handwheel and power actuated valves shall also include a 2” square operating nut for emergency operation.

i. All gearing shall be enclosed in a semi-steel housing and be suitable for running in a lubricant with seals provided on all
shafts to prevent entry of dirt and water into the actuator. The actuator shaft and the quadrant shall be supported on permanently lubricated bronze bearings. Actuators shall clearly indicate valve position and an adjustable stop shall be provided to set closing torque and to provide seat adjustment to compensate for change in pressure differential or flow direction change. All exposed nuts, bolts and washers shall be zinc plated.

ii. Valves and gear actuators for buried or submerged service shall have seals on all shafts and gaskets on the valve and actuator covers to prevent the entry of water. Actuator mounting brackets for buried or submerged service shall be totally enclosed and shall have gasket seals. All exposed nuts, bolts, springs and washers shall be stainless steel.

d. Valves shall open left (counterclockwise) and shall have mechanical joint end connections, or as specified by the Department of Public Utilities.

e. Valve bodies and all other cast iron parts shall conform in all respects to the American Society for Testing Materials’ Standard Specifications of Gray Iron Castings, ASTM Specification Designation A-126, Class B. The castings shall be clean and perfect without blow or sand holes or defects of any kind. No plugging or stopping of holes will be allowed.

i. Body ends shall be flanged with facing and drilling in accordance with ANSI B16.1, Class 125 or mechanical joint in accordance with AWWA Standard C-111 or ANSI A21.11. All mechanical joint end valves shall be furnished complete with joint accessories (bolts, nuts, gaskets, and glands).

f. Valve bodies shall be furnished with a raised seat surface completely covered with 90% pure nickel to ensure that the resilient plug face contacts only nickel, or a one-piece 304 stainless steel seat ring threaded to the body. The nickel seat must be welded to the valve body or the body seat ring to produce a metallurgical bond with interpenetration to the base metal with a bond strength equal to or greater than the valve body or seat ring material. The nickel or stainless-steel seat must be machined to a finish of not more than 16 micro-inches to achieve minimal friction and wear to the resilient plug face during valve operation. Whether welded or screwed, the valve seat shall be designed to provide uniform contact with the resilient plug face and to prevent the plug face from contacting any cast iron surface. Resilient seats or seats attached to the body by screws or any
other method not specified herein are not acceptable. Plated or sprayed nickel seats or epoxy seats are not acceptable.

g. Valve bodies shall be furnished with an adjustable closed position stop. The seat end and standard flow direction shall be cast onto the valve body.

h. Resilient faced plug/operating shaft shall be of a one-piece design of ASTM A126 Class B cast iron with a seating surface eccentrically offset from the center of the plug shaft and shall have a precision molded resilient facing of chloroprene (Neoprene), Buna-N (nitrile) or nitrile-butadiene (Hycar). With the valve in the open position, all surfaces of the plug/shaft shall be substantially out of the fluid flow path.

i. Valve shaft journal bearings shall be sleeve type, sintered, oil impregnated permanently lubricated, type 316 ASTM A743 grade CF-8M or AISI type 317 L stainless steel, or phenolic backed Teflon. Thrust bearings shall be in the upper and lower journal areas and shall consist of stainless steel, Teflon, or a combination of those materials. Grit seals shall be provided in the upper and lower journals to prevent abrasive material from entering the bearing and seal areas.

j. Valve shaft seals shall conform to AWWA Standard C504-87, Section 3.7 and shall be of the bronze cartridge type utilizing O-rings, or the adjustable multiple V-ring type and shall be replaceable without disassembling the valve, while the valve is under system pressure.

k. Valve interiors and exteriors shall be coated per AWWA Standard C550-90 with a two-component high build epoxy suitable for potable water service, with interior surfaces receiving 8-10 mils (dry film thickness) and exterior surfaces receiving 3-5 mils (dft) or 8-10 mils (dft) hand-applied epoxy coating. For buried or submerged service, 8-10 mils (dft) of asphalt varnish may be substituted for the exterior coating.

l. Valve testing shall be conducted per AWWA C504-87 Section 5, covering rubber seated butterfly valves. Each valve shall be performance tested per paragraph 5.2 assuring valve operation.

  i. Body seat and shell leakage testing is to be conducted on each valve as per paragraphs 5.3 and 5.4.

  ii. Proof of design testing shall be conducted per paragraph 5.5 and witnessed by a third-party inspection agency. Certified copies of this report shall be available upon request.

m. Eccentric plug valves for wastewater service shall be as approved by Chesterfield County’s Product and Design Review Committee.
If the standard valve provided by a manufacturer does not fully comply with these specifications, but compliance can be attained by providing optional features, then each valve must be permanently marked to indicate the option or options that have been provided. The method of marking valves to indicate that options are included must be approved by the Product and Design Review Committee.
PART IV

STANDARD DETAILS
CHESTERFIELD COUNTY, VIRGINIA

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FINISHED GRADE

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NOTES:
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2. BLOCKING DIMENSIONS ARE BASED ON A STATIC PRESSURE OF 150 PSI AND AN ALLOWABLE SOIL BEARING CAPACITY OF 2000 PSF OR GREATER.
3. WHERE SOIL BEARING CAPACITY IS LESS THAN 2000 PSF, APPROVED MECHANICAL JOINT RESTRAINT SYSTEM MUST BE USED.
4. FITTINGS TO BE WRAPPED IN 4 MIL POLYETHYLENE TO PROTECT NUTS, BOLTS, OR OTHER.
CARRY CONCRETE TO UNDISTURBED EARTH OR FIRM SUBGRADE

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CHESTERFIELD COUNTY
DEPARTMENT OF UTILITIES

PLAN

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# CHESTERFIELD COUNTY
## DEPARTMENT OF UTILITIES

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<td>0.688”</td>
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<tr>
<td>42”</td>
<td>54”</td>
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STEEL CASING PIPE SHALL BE ASTM 1-139, GRADE B.

**NOTES:**

A. SLOPES THROUGH BORES SHALL NOT BE BASED ON MINIMUM GRADE UNLESS IT IS THE ONLY SLOPE AVAILABLE.

B. INCREASING THICKNESS OF CASING MUST BE CONSIDERED WHERE BORE LENGTHS EXCEED 125 FEET.

C. CONTRACTOR SHALL MAKE AN EFFORT TO BORE IN THE APPROPRIATE DIRECTION BASED ON EXISTING SOIL CONDITIONS. ENGINEER MUST SHOW LOCATION AND SIZE OF BORE AND RECEIVING PITS, AND LOCATION AND SIZE OF PERMANENT AND CONSTRUCTION EASEMENTS.

D. WHERE RESTRAINING DEVICES ARE REQUIRED FOR THE CARRIER PIPE, THE CASING PIPE SHALL BE INCREASED AS NECESSARY.
NOTES:
1. CASING SPACERS FOR GRAVITY SEWER LINES MAY BE USED ONLY WHEN THE SLOPE OF THE FINISHED WELDED CASING PIPE HAS BEEN COMPLETED AND CHECKED AND IS EQUAL TO THE SLOPE OF THE CARRIER PIPE.
2. THREE CASING SPACERS SHALL BE ATTACHED TO EACH JOINT OF CARRIER PIPE END OF CASING PIPE.
3. ONE CASING SPACER SHALL BE LOCATED NOT MORE THAN 1’-0” FROM EACH END OF CASING PIPE.
4. CARRIER PIPE SHALL BE POSITIONED AND RESTRAINED WITHIN CASING TO COMPLY WITH GRADE REQUIREMENTS BY AN APPROVED STAINLESS STEEL CASING SPACER.
5. STEEL CASING SHALL HAVE A MINIMUM YIELD STRENGTH OF 35,000 PSI AND SUFFICIENT CORROSION PROTECTION, AND SHALL BE ASTM 1-139, GRADE B.
6. LINES TO BE CASED UNDER STATE ROADS/RAILROADS WILL COMPLY WITH COUNTY AND ANY APPLICABLE VDOT/AMERICAN RAILROAD ENGINEERING SPECIFICATIONS, WHICHER IS MORE STRINGENT.
7. WHEN INSTALLING CARRIER PIPE, CONTRACTOR SHALL PUSH SO THAT PIPE JOINTS ARE ALWAYS BEING COMPRESSED.
8. CARRIER PIPE WITHIN BORES FOR SANITARY SEWER INSTALLATION MAY BE DUCTILE IRON (CLASS 52) OR PVC (C900) AND IS TO BE UNIFORM FROM MANHOLE TO MANHOLE.
9. CASING PIPE SHALL BE SEALED BY USE OF WRAPAROUND END SEALS.
10. MANHOLES SHALL BE LOCATED A MINIMUM OF THREE PIPE LENGTHS FROM THE END OF THE CASING, OR AS APPROVED BY THE COUNTY.
NOTES:

1. CARRIER PIPE SHALL BE CENTERED WITHIN CASING BY AN APPROVED STAINLESS STEEL CASING SPACER.
2. CASING PIPE SHALL BE SEALED BY USE OF WRAPAROUND END SEALS.
3. THREE CASING SPACERS SHALL BE ATTACHED TO EACH JOINT OF CARRIER PIPE WITH ONE AT THE CENTER AND ONE NOT MORE THAN 2’-0” FROM EACH END.
4. ONE CASING SPACER SHALL BE LOCATED NOT MORE THAN 1’-0” FROM EACH END OF CASING PIPE.
5. VALVES OR OTHER CONTROL/MAINTENANCE EQUIPMENT ATTACHED TO WATERLINE/SEWER FORCE MAINS SHALL BE LOCATED A MINIMUM OF FOUR PIPE LENGTHS FROM THE END OF THE CASING, OR AS APPROVED BY THE COUNTY.
6. STEEL CASING SHALL HAVE A MINIMUM YIELD STRENGTH OF 35,000 PSI AND SUFFICIENT CORROSION PROTECTION, AND SHALL BE ASTM 1-139, GRADE B.
7. LINES TO BE CASED UNDER STATE ROADS/RAILROADS WILL COMPLY WITH COUNTY AND ANY APPLICABLE VDOT/AMERICAN RAILROAD ENGINEERING SPECIFICATIONS, WHICHEVER IS MORE STRINGENT.
8. WHEN INSTALLING CARRIER PIPE, CONTRACTOR SHALL PUSH SO THAT PIPE JOINTS ARE ALWAYS BEING COMPRESSED.
9. ALL WATERLINES IN CASING SHALL BE A MINIMUM CLASS 51 DUCTILE IRON WITH M.J. BELLS AND AN APPROVED MECHANICAL JOINT RESTRAINT DEVICE AT EACH M.J. CONNECTION. MINIMUM OF 3 JOINTS OUTSIDE EACH END OF CASING SHALL BE M.J. DUCTILE IRON WITH RESTRAINED JOINTS. AS AN ALTERNATIVE, APPROVED RESTRAINED JOINT PIPE MAY BE USED.
PEAKING FORMULA (FROM AVERAGE FLOWS TO PEAK FLOWS)

A) 0–18 MGD: Qd = 3.5Qa
B) Over 18 MGD: Qd = 2Qa

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<tr>
<th>LOCATION</th>
<th>LINE NO.</th>
<th>MANHOLE NUMBER</th>
<th>AREA (ACRES)</th>
<th>POPULATION</th>
<th>NO. OF LOTS</th>
<th>AVERAGE DAILY FLOW M.G.D.</th>
<th>PEAK FLOW M.G.D.</th>
<th>AVG. PEAK M.G.D.</th>
<th>SLOPE %</th>
<th>CAPACITY OF PIPE (FULL) M.G.D.</th>
<th>CAPACITY OF PIPE (FAC) M.G.D.</th>
<th>DEPTH TO INVERT</th>
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SIZE: MIN. 11"x17" DISPLAYED AS PART OF PLANS ON A 24"x36" SHEET OF PAPER INDEXED AS PART OF PLANS.
NOTES:

1. ALL CONSTRUCTION AND MATERIALS FOR SEWER AND WATER SYSTEMS SHOWN SHALL BE SUPPLIED AND INSTALLED IN ACCORDANCE WITH THE LATEST SPECIFICATIONS OF CHESTERFIELD COUNTY APPLICABLE AT THE TIME OF RELEASE TO CONSTRUCTION.

2. FOR SEWER AND WATER INSTALLATION WITHIN EXISTING ROAD R/W, UTILITY CONTRACTORS MUST NOTIFY VDOT WHEN INSTALLATION BEGINS SO THAT DENSITY CAN BE TESTED ON TRENCH BACKFILL (95% ASTM. D-698 @ OPTIMUM MOISTURE +/-2%)

3. THE INSTALLATION OF A SEWER BACKWATER VALVE IS REQUIRED FOR ALL SERVICE CONNECTIONS WHERE THE MINIMUM FINISHED FLOOR ELEVATION OF THE HOUSE IS LOWER THAN THE NEAREST UPGRADE MANHOLE TOP ELEVATION. THIS DEVICE WILL BE INSPECTED BY THE BUILDING INSPECTION DEPARTMENT.

4. ALL WATER SERVICE CONNECTIONS AT OR BELOW THE (INSERT THE ELEVATION) CONTOUR OR WHERE THE PRESSURE IS GREATER THAN 80 P.S.I. WILL REQUIRE INDIVIDUAL PRESSURE REGULATORS AS REQUIRED BY THE APPLICABLE CURRENT BUILDING AND/OR PLUMBING CODE.

5. VERTICAL DATUM IS BASED (PROVIDE THE VERTICAL DATUM USED). HORIZONTAL CONTROLS ARE BASED ON VIRGINIA STATE PLANE COORDINATE GRID, SOUTH ZONE, NORTH AMERICAN DATUM OF 1983 (NAD 83).

6. CONTRACTOR SHALL PROPERLY NOTIFY ALL PROPERTY OWNERS TWO (2) WEEKS PRIOR TO THE START OF ANY CONSTRUCTION (INCLUDING LAND CLEARING). NOTIFICATION SHALL BE IN THE FORM OF A LETTER SIMILAR TO THE "SAMPLE" REFLECTED IN APPENDIX 4 OF THE COUNTY’S LATEST WATER AND SEWER SPECIFICATIONS.

7. THE INSTALLATION AND MAINTENANCE OF EROSION AND SEDIMENT CONTROL MEASURES FOR WATER AND SEWER LINE CONSTRUCTION SHALL COMPLY WITH THE VIRGINIA EROSION AND SEDIMENT CONTROL HANDBOOK, LATEST EDITION.

8. PRIOR TO CONNECTING THE PROPOSED WATER AND SEWER LINES TO THE EXISTING COUNTY SYSTEMS, ALL LINES MUST BE LOCATED WITHIN RECORDED WATER OR SEWER EASEMENTS OR WITHIN DEDICATED RIGHTS-OF-WAY; ALL TESTING HAS BEEN COMPLETED AND HAS SUCCESSFULLY PASSED; ALL ENVIRONMENTAL ENGINEERING AND/OR VDOT CONDITIONS APPLICABLE TO UTILITIES CONSTRUCTION HAVE BEEN MET; AND ROADS MUST BE READY FOR FINAL PAVING, WITH ALL CURB AND GUTTER AND THE SUBBASE INSTALLED.

9. ANY EXISTING UTILITIES IMPACTED BY THE PROPOSED GRADING AND/OR PAVING MUST BE ADJUSTED TO FINAL GRADE AFTER CONSTRUCTION.

10. NO STRUCTURES MAY BE PLACED WITHIN A WATER OR SEWER EASEMENT WITHOUT OBTAINING PRIOR WRITTEN APPROVAL FROM CHESTERFIELD COUNTY VIA LICENSE AGREEMENT PURSUANT TO 16-2 OF THE COUNTY CODE, AS AMENDED.

11. A PRE-CONSTRUCTION MEETING IS REQUIRED FOR ALL PROJECTS. PRIOR TO BEGINNING WORK, AT LEAST FORTY-EIGHT (48) HOURS ADVANCE NOTICE MUST BE GIVEN TO THE CONSTRUCTION INSPECTION SECTION. NOTIFICATION SHALL BE GIVEN TO THE INSPECTION SUPERVISOR AT (804) 751-4651.
NOTES:

A. ON ALL WATER MAINS WHERE FIRE LINES ARE PROPOSED, DEVELOPER SHALL HAVE THEIR UTILITY CONTRACTOR (ACCEPTABLE TO THE UTILITIES DEPARTMENT) INSTALL, UP THROUGH THE BALL TYPE CURB STOP AND WATER METER BOX, THE NECESSARY FIRE/DOMESTIC SERVICE COMBINATION, PLUS ANY OTHER REQUIRED SERVICES I.E., IRRIGATION, ETC.

B. WHERE FIRE LINE TO BUILDING IS 100 FEET OR LESS FROM THE DOMESTIC SERVICE LINE, THE FIRE LINE SYSTEM MAY BE INSTALLED ACCORDING TO THIS DETAIL. IF THE OWNER CHOOSES TO HAVE THE DOUBLE-CHECK ASSEMBLY INSTALLED IN A VAULT OUTSIDE OF BUILDING OR IF THE FIRE LINE EXCEEDS 100 FEET, FIR-3 DETAIL MUST BE USED.

C. ALL FIRE LINES MUST HAVE AT LEAST 3.5 FEET OF GROUND COVER.

D. USE BALL VALVES AS MANUFACTURED BY FORD, McDoNALD, OR APPROVED EQUAL.

E. WHERE THIS DETAIL FOR A 2” COMBINED FIRE/DOMESTIC WATER LINE DOES NOT PROVIDE ADEQUATE SERVICE BECAUSE OF THE METER SIZE AND/OR AVAILABLE WATER PRESSURE, THEN FIR-1A MAY BE USED.

F. CONNECTIONS FOR 1 1/2” AND 2” FIRE LINE SERVICES WILL BE APPROVED COMPRESSION FITTINGS OR A ProPress SYSTEM.

DATE: JAN. 1996
REVISION: MAY 2020

TYPICAL PLAN VIEW OF PROPOSED 2” OR SMALLER NON SINGLE FAMILY RESIDENTIAL FIRE LINE SYSTEMS (WITH DOMESTIC SERVICE LINE)

CHESTERFIELD COUNTY
DEPARTMENT OF UTILITIES

BUILDING

PRIVATE FIRE LINE AND DOMESTIC WATER LINE TO BE INSTALLED BY PLUMBER AND/OR SPRINKLER CO. PER NFPA STANDARDS AND APPLICABLE PLUMBING CODE.

DOMESTIC WATER METER AND SERVICE (USE APPROVED BOX AND SERVICE LINE MATERIAL).

BALL TYPE CURB STOP
1’-0” MAX.

SOFT COPPER (1”)
HARD COPPER (1 1/2” AND 2”) (TYPE K)

(1”, 1 1/2”, OR 2” TAP)

PUBLIC WATER LINE (MAIN)

RIGHT OF WAY OR EDGE OF WATER EASEMENT

1”, 1 1/2” OR 2” BALL VALVE AND BOX LOCATED WITHIN 1’-0” OF THE RIGHT OF WAY LINE OR EDGE OF EASEMENT BOUNDARY.

(100 FEET OR LESS)
NOTES:
A. ON ALL NEW WATER MAINS WHERE FIRE LINES ARE PROPOSED, DEVELOPER SHALL HAVE THEIR UTILITY CONTRACTOR (ACCEPTABLE TO THE UTILITIES DEPARTMENT) INSTALL A SINGLE FIRE LINE UP THROUGH THE BALL TYPE CURB STOP.
B. WHERE FIRE LINE TO BUILDING IS 100 FEET OR LESS FROM THE PUBLIC MAIN, THE FIRE LINE SYSTEM MAY BE INSTALLED ACCORDING TO THIS DETAIL. IF THE OWNER CHOOSES TO HAVE THE DOUBLE-CHECK ASSEMBLY INSTALLED IN A VAULT OUTSIDE OF BUILDING OR IF THE FIRE LINE EXCEEDS 100 FEET, FIR-3 DETAIL MUST BE USED.
C. ALL FIRE LINES MUST HAVE AT LEAST 3.5 FEET OF GROUND COVER.
D. USE BALL VALVES AS MANUFACTURED BY FORD, McDONALD, OR APPROVED EQUAL.
E. CONNECTIONS FOR 1 1/2” AND 2” FIRE LINE SERVICES WILL BE APPROVED COMPRESSION FITTINGS OR A ProPress SYSTEM.

100 FEET OR LESS
TYPICAL PLAN VIEW OF PROPOSED 2” OR SMALLER NON SINGLE FAMILY RESIDENTIAL FIRE LINE SYSTEMS (WITHOUT DOMESTIC SERVICE LINE)
NOTES:
A. TAPPING SLEEVE AND VALVE MAY BE USED ON EXISTING LINES WITH PRIOR APPROVAL.
B. WHERE THE FIR-1 DETAIL FOR A 2" COMBINED FIRE/DOMESTIC WATER LINE DOES NOT PROVIDE ADEQUATE SERVICE BECAUSE OF THE METER SIZE AND/OR AVAILABLE WATER PRESSURE, THE FIR-1A MAY BE USED.
CHESTERFIELD COUNTY
DEPARTMENT OF UTILITIES

BUILDING

PRIVATE FIRE LINE AND
DOMESTIC WATER LINE TO BE
INSTALLED BY PLUMBER AND/OR
SPRINKLER CO. PER NFPA
STANDARDS AND APPLICABLE
PLUMBING CODE.

DOMESTIC WATER METER AND
SERVICE (USE APPROVED BOX
AND SERVICE LINE MATERIAL).

BALL TYPE CURB STOP

CHECK VALVE (BURIED)

1'-0" MAX.

COPPER (TYPE K)

(1", 1 1/2", OR 2" TAP)

PUBLIC WATER LINE (MAIN)

RIGHT OF WAY OR EDGE
OF WATER EASEMENT

1", 1 1/2" OR 2" BALL VALVE
AND BOX LOCATED WITHIN
1'-0" OF THE RIGHT OF WAY
LINE OR EDGE OF EASEMENT
BOUNDARY.

THIS CONFIGURATION IS BASED ON
ASSUMING THE DISTANCE IS APPROX.
5'-0" OR GREATER. IF LESS THAN
5'-0", THE ENGINEER MUST CONSIDER
ADDITIONAL EASEMENT TO ALLOW FOR
PROPER INSTALLATION.

NOTES:

A. ON ALL WATER MAINS WHERE FIRE LINES ARE PROPOSED, DEVELOPER SHALL HAVE THEIR
UTILITY CONTRACTOR (ACCEPTABLE TO THE UTILITIES DEPARTMENT) INSTALL, UP THROUGH
THE BALL TYPE CURB STOP AND WATER METER BOX, THE NECESSARY FIRE/DOMESTIC
SERVICE COMBINATION, PLUS ANY OTHER REQUIRED SERVICES I.E., IRRIGATION, ETC.

B. WHERE FIRE LINE TO BUILDING IS 200 FEET OR LESS FROM THE DOMESTIC SERVICE LINE,
THE FIRE LINE SYSTEM MAY BE INSTALLED ACCORDING TO THIS DETAIL. IF THE OWNER
CHOSES TO HAVE THE DOUBLE-CHECK ASSEMBLY INSTALLED IN A VAULT OUTSIDE OF
BUILDING, FIR-3 DETAIL MUST BE USED.

C. ALL FIRE LINES MUST HAVE AT LEAST 3.5 FEET OF GROUND COVER.

D. USE BALL VALVES AS MANUFACTURED BY FORD, MCDONALD, OR APPROVED EQUAL.

E. USE CHECK VALVES AS MANUFACTURED BY W.O.G. JENKINS, GRINNELL, OR APPROVED
EQUAL.

F. CONNECTIONS FOR 1 1/2" AND 2" FIRE LINE SERVICES WILL BE APPROVED COMPRESSION
FITTINGS OR A ProPress SYSTEM.

G. IF A MULTIPURPOSE SYSTEM IS USED, SEE DETAIL FIR-1B NFPA 13D (5 OF 5) FOR
INSTALLATION CRITERIA.

(200 FEET OR LESS)

DATE: DEC. 2003
REVISION: MAY 2020

TYPICAL PLAN VIEW OF PROPOSED 2" OR SMALLER
SINGLE FAMILY RESIDENTIAL FIRE LINE SYSTEMS
(WITH DOMESTIC SERVICE LINE)
NOTES:

A. ON ALL WATER MAINS WHERE FIRE LINES ARE PROPOSED, DEVELOPER SHALL HAVE THEIR UTILITY CONTRACTOR (ACCEPTABLE TO THE UTILITIES DEPARTMENT) INSTALL A SINGLE FIRE LINE UP TO THE BALL TYPE CURB STOP.

B. WHERE FIRE LINE TO BUILDING IS 200 FEET OR LESS FROM THE PUBLIC MAIN, THE FIRE LINE SYSTEM MAY BE INSTALLED ACCORDING TO THIS DETAIL. IF THE OWNER CHOOSES TO HAVE THE DOUBLE-CHECK ASSEMBLY INSTALLED IN A VAULT OUTSIDE OF BUILDING, FIR-3 DETAIL MUST BE USED.

C. ALL FIRE LINES MUST HAVE AT LEAST 3.5 FEET OF GROUND COVER.

D. USE BALL VALVES AS MANUFACTURED BY FORD, MCDONALD, OR APPROVED EQUAL.

E. USE CHECK VALVES AS MANUFACTURED BY W.O.G. JENKINS, GRINNELL, OR APPROVED EQUAL.

F. CONNECTIONS FOR 1 1/2" AND 2" FIRE LINE SERVICES WILL BE APPROVED COMPRESSION FITTINGS OR A ProPress SYSTEM.

G. IF A MULTIPURPOSE SYSTEM IS USED, SEE DETAIL FIR-1B NFPA 13D (5 OF 5) FOR INSTALLATION CRITERIA.
CHESTERFIELD COUNTY
DEPARTMENT OF UTILITIES

PRIVATE FIRE LINE AND DOMESTIC WATER LINE TO BE INSTALLED BY PLUMBER AND/OR SPRINKLER CO. PER NFPA STANDARDS AND APPLICABLE PLUMBING CODE.

DOMESTIC WATER METER AND SERVICE (USE APPROVED BOX AND SERVICE LINE MATERIAL).

DOUBLE CHECK ASSEMBLY AND VAULT PER FIR-3 DETAIL

BALL TYPE CURB STOP
1'-0" MAX.

COPPER (TYPE K)

(1", 1 1/2", OR 2" TAP)

PUBLIC WATER LINE (MAIN)

RIGHT OF WAY OR EDGE OF WATER EASEMENT

1", 1 1/2", OR 2" BALL VALVE AND BOX LOCATED WITHIN 1'-0" OF THE RIGHT OF WAY LINE OR EDGE OF EASEMENT BOUNDARY.

THIS CONFIGURATION IS BASED ON ASSUMING THE DISTANCE IS APPROX. 5'-0" OR GREATER. IF LESS THAN 5'-0", THE ENGINEER MUST CONSIDER ADDITIONAL EASEMENT TO ALLOW FOR PROPER INSTALLATION.

NOTES:

A. ON ALL WATER MAINS WHERE FIRE LINES ARE PROPOSED, DEVELOPER SHALL HAVE THEIR UTILITY CONTRACTOR (ACCEPTABLE TO THE UTILITIES DEPARTMENT) INSTALL, UP TO THE BALL TYPE CURB STOP AND WATER METER BOX, THE NECESSARY FIRE/DOMESTIC SERVICE COMBINATION, PLUS ANY OTHER REQUIRED SERVICES I.E., IRRIGATION, ETC.

B. WHERE FIRE LINE TO BUILDING IS 200 FEET OR GREATER FROM THE DOMESTIC SERVICE LINE, THE FIRE LINE SYSTEM MAY BE INSTALLED ACCORDING TO THIS DETAIL AND THE DOUBLE-CHECK ASSEMBLY MUST BE INSTALLED IN A VAULT AT THE PROPERTY LINE OR EDGE OF EASEMENT.

C. ALL FIRE LINES MUST HAVE AT LEAST 3.5 FEET OF GROUND COVER.

D. USE BALL VALVES AS MANUFACTURED BY FORD, McDONALD, OR APPROVED EQUAL.

E. CONNECTIONS FOR 1 1/2" AND 2" FIRE LINE SERVICES WILL BE APPROVED COMPRESSION FITTINGS OR A ProPress SYSTEM.

F. IF A MULTIPURPOSE SYSTEM IS USED, SEE DETAIL FIR-1B NFPA 13D (5 OF 5) FOR INSTALLATION CRITERIA.

DATE: JAN. 2005
REVISION: MAY 2020

TYPICAL PLAN VIEW OF PROPOSED 2" OR SMALLER SINGLE FAMILY RESIDENTIAL FIRE LINE SYSTEMS (WITH DOMESTIC SERVICE LINE)

(200 FEET OR GREATER)

DWG. NO. FIR-1B
NFPA 13D (3 OF 5)
NOTES:
A. ON ALL WATER MAINS WHERE FIRE LINES ARE PROPOSED, DEVELOPER SHALL HAVE THEIR UTILITY CONTRACTOR (ACCEPTABLE TO THE UTILITIES DEPARTMENT) INSTALL A SINGLE FIRE LINE UP TO THE BALL TYPE CURB STOP.
B. WHERE FIRE LINE TO BUILDING IS 200 FEET OR GREATER FROM THE PUBLIC MAIN, THE FIRE LINE SYSTEM MUST BE INSTALLED ACCORDING TO THIS DETAIL AND THE DOUBLE-CHECK ASSEMBLY MUST BE INSTALLED IN A VAULT AT THE PROPERTY LINE OR EDGE OF EASEMENT.
C. ALL FIRE LINES MUST HAVE AT LEAST 3.5 FEET OF GROUND COVER.
D. USE BALL VALVES AS MANUFACTURED BY FORD, Mc DONALD, OR APPROVED EQUAL.
E. CONNECTIONS FOR 1 1/2" AND 2" FIRE LINE SERVICES WILL BE APPROVED COMPRESSION FITTINGS OR A PROPRESS SYSTEM.
F. IF A MULTIPURPOSE SYSTEM IS USED, SEE DETAIL FIR−1B NFPA 13D (5 OF 5) FOR INSTALLATION CRITERIA.

(200 FEET OR GREATER)
CHESTERFIELD COUNTY
DEPARTMENT OF UTILITIES

BUILDING

PRIVATE MULTIPURPOSE LINE TO BE INSTALLED BY PLUMBER AND/OR SPRINKLER CO. PER NFPA STANDARDS AND APPLICABLE PLUMBING CODE.

RIGHT OF WAY OR EDGE OF WATER EASEMENT

1" DOMESTIC WATER METER AND SERVICE (USE APPROVED BOX AND SERVICE LINE MATERIAL).

COPPER (TYPE K)

(1" OR 1 1/2" TAP)

PUBLIC WATER LINE (MAIN)

NOTES:

A. ON ALL NEW WATER MAINS WHERE MULTIPURPOSE SYSTEMS ARE PROPOSED, DEVELOPER SHALL HAVE THEIR UTILITY CONTRACTOR (ACCEPTABLE TO THE UTILITIES DEPARTMENT) INSTALL A SINGLE SERVICE LINE UP TO THE WATER METER BOX.

B. FOR ALL OTHER RESIDENTIAL FIRE LINE CONFIGURATIONS, SEE FIR-1B NFPA 13D (1 OF 5) THROUGH (4 OF 5).

DATE: JAN. 2005
REVISION: MAY 2020
TYPICAL PLAN VIEW OF PROPOSED 1" SINGLE FAMILY RESIDENTIAL MULTIPURPOSE SYSTEMS

DWG. NO. FIR-1B
NFPA 13D (5 OF 5)
NOTES:
A. WHERE FIRE LINE TO BUILDING IS 50 FEET OR LESS FROM THE PUBLIC MAIN, THE FIRE LINE SYSTEM MAY BE INSTALLED ACCORDING TO THIS DETAIL. IF THE OWNER Chooses TO HAVE THE DOUBLE-CHECK ASSEMBLY INSTALLED IN A VAULT OUTSIDE OF BUILDING OR IF THE FIRE LINE EXCEEDS 50 FEET, FIR-4 DETAIL MUST BE USED.
B. ALL FIRE LINES MUST HAVE AT LEAST 3.5 FEET OF GROUND COVER.
CHESTERFIELD COUNTY
DEPARTMENT OF UTILITIES

BUILDING

FIRE DEPT. CONNECTION TO
BE MOUNTED AS APPROVED
BY THE FIRE DEPT.
DEDICATED FIRE HYDRANT
MUST BE WITHIN 50’ OF
THE FDC.

50’ OR LESS

RIGHT OF WAY OR EDGE
OF WATER EASEMENT

G.V.

50’ OR LESS

F.H AND
G.V.

PRIVATE BACKFLOW

BF

IRRIGATION METER

6” OR GREATER.
LINE FROM MAIN TO
EASEMENT MUST BE DIP.

G.V. AND
BOX

1 1/2” AND 2” METERS
REQUIRE A CURB STOP
1”-0” IN FRONT OF BOX.
REFER TO MET-5 (2 OF 2)

PUBLIC WATER LINE (MAIN)

NOTES:

A. DOMESTIC METER AND OR FIRE HYDRANT CAN BE DELETED FROM THIS UNDER CERTAIN
DESIGN CONDITIONS.

B. WHERE FIRE LINE TO BUILDING IS 50 FEET OR LESS FROM THE DOMESTIC SERVICE LINE,
THE FIRE LINE SYSTEM MAY BE INSTALLED ACCORDING TO THIS DETAIL. IF THE OWNER
CHOSES TO HAVE THE DOUBLE-CHECK ASSEMBLY INSTALLED IN A VAULT OUTSIDE OF
BUILDING OR IF THE FIRE LINE EXCEEDS 50 FEET, FIR-4 DETAIL MUST BE USED.

C. ALL FIRE LINES MUST HAVE AT LEAST 3.5 FEET OF GROUND COVER.
CHESHTERFIELD COUNTY
DEPARTMENT OF UTILITIES

(A) OUTSIDE STEM AND YOKE GATE VALVE
(B) DOUBLE-CHECK VALVE ASSEMBLY

PLAN

TOP OF GROUND
VAULT SHALL BE AS MANUFACTURED BY OLDCASTLE ENCLOSURE, CARSON MODEL 3648-42 OR APPROVED EQUAL (SIZE NECESSARY TO MEET MINIMUM VAULT STANDARDS)

ELEVATION

(A)
(B)
SUPPORTS

NOTES:
1. DOUBLE-CHECK VALVE ASSEMBLY SHALL BE INSTALLED IN A BOX AS NEAR TO THE WATER MAIN AS POSSIBLE WITHOUT PLACING BOX IN AREAS SUBJECT TO VEHICULAR TRAFFIC.
2. DOUBLE-CHECK VALVE ASSEMBLY MUST BE U.L. LISTED OR F.M. APPROVED.
3. FIRE SUPPRESSION LINE SHALL BE INSTALLED IN ACCORDANCE WITH THE SERIES OF FIR-1 DETAILS.

DATE: JAN. 1996
REVISION: MAY 2020

2" OR SMALLER DOUBLE-CHECK VALVE ASSEMBLY AND VAULT

DWG. NO. FIR-3
CHESTERFIELD COUNTY
DEPARTMENT OF UTILITIES

BLOWUP DETAIL
FIR-4A TO BE
USED WHEN
DETECTION
REQUIRED

1'-0" MIN.

1'-6" MIN.

(D)

(E)

(F)

APPROVED LINK-SEAL
OR FLEXIBLE SEAL

1'-0" MIN.

1"-3" CLEARANCE

EXTERIOR MASTIC OR
BITUMINOUS COATING

PLAN

(A) OUTSIDE STEM AND YOKE GATE VALVE
(B) DOUBLE-CHECK VALVE ASSEMBLY
(C) 2 1/2" THREADED N.S.T. SIAMESE
   CONNECTION FOR FIRE DEPARTMENT
   W/AUTOMATIC BALL DRIP
   * (D) REQUIRED (MAIN LINE SIZE)"x4" TEE

* WHERE A TYPICAL 3" FIRE LINE DOES NOT REQUIRE A SIAMESE CONNECTION,
  ITEMS (C) THRU (F) DO NOT APPLY.

6" MIN.

3'-6" MIN.

1'-0" MIN./
2'-0" MAX.

TOP OF GROUND SLOPED TO
DRAIN AWAY FROM VAULT

4" DIP

RANGE 1'-6" TO 4'-0"

POWER SUPPLY TO
OUTLET FOR SUMP
PUMP SHALL BE
EQUIPPED WITH
INTERIOR GFCI
CIRCUIT BREAKER

POURED IN PLACE OR
PRECAST 5000 PSI
CONCRETE VAULT

APPROVED LINK-SEAL
OR FLEXIBLE SEAL

1"-3" CLEARANCE

POURED IN PLACE
CONCRETE PIPE SADDLES
OR METAL PIPE STANDS
COATED WITH RUST
RETARDANT COATING.

ELEVATION

3" OR LARGER DOUBLE-CHECK
VALVE ASSEMBLY AND VAULT
(ALTERNATE 1)

DATE:
JAN. 1996

REVISION:
MAY 2020

DWG. NO.
FIR-4

(1 OF 2)
CHESTERFIELD COUNTY
DEPARTMENT OF UTILITIES

PLAN

(A) OUTSIDE STEM AND YOKE GATE VALVE
(B) DOUBLE-CHECK VALVE ASSEMBLY
* (C) 2 1/2" THREADED N.S.T. SIAMESE CONNECTION FOR FIRE DEPARTMENT W/AUTOMATIC BALL DRIP
* (D) REQUIRED (MAIN LINE SIZE)"x4" TEE
* WHERE A TYPICAL 3" FIRE LINE DOES NOT REQUIRE A SIAMESE CONNECTION, ITEMS (C) THRU (E) DO NOT APPLY.

ELEVATION

3" OR LARGER DOUBLE-CHECK VALVE ASSEMBLY AND VAULT (ALTERNATE 2)
BLOWUP DETAIL A

BY-PASS LINE WITH LOW-FLOW METER, ISOLATION VALVE AND BACKFLOW PREVENTER. METER TO BE PURCHASED FROM THE COUNTY.

UNDER CERTAIN CONDITIONS, THE COUNTY WILL REQUIRE A DOUBLE DETECTOR CHECK ASSEMBLY AS OUTLINED BELOW:

1. WHEN THE ENGINEER IS PROPOSING PRIVATELY MAINTAINED FIRE HYDRANTS TO BE INSTALLED OFF A PRIVATELY MAINTAINED FIRE SUPPRESSION WATER LINE;

2. AFTER THOROUGH EVALUATION AND CONSULTATION WITH OTHER COUNTY DEPARTMENTS AND UTILITIES STAFF, THE ENGINEER MAY BE REQUESTED TO SHOW THAT CERTAIN FIRE HYDRANT LINES BE PRIVATELY MAINTAINED RATHER THAN PUBLICLY MAINTAINED; OR

3. UNDER UNUSUAL CIRCUMSTANCES, AND WHEN IT IS DEEMED APPROPRIATE BY COUNTY STAFF THAT A DOUBLE DETECTOR CHECK WOULD BE BENEFICIAL TO THE COUNTY. GENERALLY THIS WOULD BE A CASE WHERE THERE IS A POTENTIAL FOR ABOVE-AVERAGE WATER LOSS (UNACCOUNTABLE WATER).
OPTION 1: IF GRADE ADJUSTMENT IS NOT REQUIRED:
A. CONNECTOR PIPE MAY BE APPROVED D.I. OR P.V.C. PIPE AND MUST MATCH MATERIAL OF THE MAIN.
B. ALL JOINTS FROM HYDRANT TEE TO HYDRANT ARE TO BE RESTRAINED WITH AN APPROVED JOINT RESTRAINT DEVICE AS PART OF A JOINT RESTRAINT SYSTEM.

OPTION 2: IF GRADE ADJUSTMENT IS REQUIRED:
A. THE CONNECTOR PIPE SHALL BE OF THE OFFSET DESIGN SO THAT THE FIRE HYDRANT CAN BE ADJUSTED TO ENSURE PLACEMENT AT THE PROPER GRADE. WHEN THE CONNECTOR PIPE IS THE OFFSET DESIGN, IT SHALL HAVE AN ANCHORING FEATURE AT BOTH ENDS SO THAT WHEN USED WITH M.J. SPLIT GLANDS A RESTRAINED JOINT IS PROVIDED.
B. ALL JOINTS FROM HYDRANT TEE TO HYDRANT ARE TO BE RESTRAINED WITH AN APPROVED JOINT RESTRAINT DEVICE, AS PART OF A JOINT RESTRAINT SYSTEM.
C. THE CONNECTOR PIPE SHALL BE CEMENT LINED IN ACCORDANCE WITH AWWA C110-ANSI A214.
D. THE CONNECTOR PIPE SHALL BE DUCTILE IRON AWWA C153-ANSO A21.53 AND POSITIONED BETWEEN THE FIRE HYDRANT AND GATE VALVE.
E. HYDRANT BREAKAWAY FLANGE SHALL BE LOCATED NO MORE THAN 6" ABOVE FINISHED GRADE AND NOT BELOW FINISHED GRADE.

NOTES:
A. ON ROADWAYS WITHOUT CURB AND GUTTER, HYDRANT SHALL BE LOCATED BEHIND THE DITCH AND VALVE SHOULD BE IN SHOULDER OF ROAD OR BETWEEN PAVEMENT AND DITCH. MINIMUM COVER AT DITCH MUST BE 3"-6" OR GREATER.
B. WHEN A HYDRANT TEE IS USED, RESTRAINED JOINT IS NOT NEEDED TO RESTRAIN VALVE TO TEE.
C. WHEN A SIDEWALK IS ALONG THE SAME SIDE OF THE ROAD AS THE WATERLINE, FIRE HYDRANTS ARE TO BE LOCATED AT LEAST 3 FEET BEHIND THE SIDEWALK.
ENCLOSURE SHALL HAVE THE FOLLOWING FEATURES:

1. HEATED ENCLOSURE
2. CAPABLE OF WIND AND SNOW LOAD
3. ACCESSIBLE ENCLOSURES TO ALLOW MAINTENANCE ON BACKFLOW DEVICES
4. SECURE FROM VANDALISM
5. FLOOR OR SLAB FOR BOX

NOTE:
BUILDING MOUNTED OR REMOTE FDC PER FIR-7 REQUIRED.
# Chesterfield County Department of Utilities

## Manhole Sizing and Minimum Angle Table

### Pipe Size

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<th>Size</th>
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<th>12</th>
<th>15</th>
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<th>36</th>
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<tr>
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### Minimum Angle for Combinations

Minimum angle for combinations not given may be derived by:

\[
\text{MIN. ANGLE} = \frac{D_1 + D_2 + (7+W_1+W_2) \times W}{\pi \times \text{MH DIA.}}
\]

Where:
- \(D_1\) = Pipe Diameter
- \(D_2\) = Pipe Diameter
- \(W_1\) = Pipe Wall Thickness
- \(W_2\) = Pipe Wall Thickness
- \(\pi\) = Pi
- \(\text{MH DIA.}\) = Manhole Diameter

### Notes

- 42” Pipe will be allowed in 72” MH where the calculation allows it.
- For example: Straight thru or Min. Angle over 92° for two 42” pipes.
NOTES:
1. MINIMUM ANGLE BETWEEN INFLUENT AND EFFLUENT PIPES IS 90°, EXCEPT BY SPECIAL DESIGN.
2. EXCEPTIONS TO THE MINIMUM SEPARATION BETWEEN PIPES WILL BE CONSIDERED PER EACH, BY SPECIAL DESIGN.

EXAMPLE: 48" MANHOLE, EXISTING 24" IN, EXISITING 24" OUT, NEW 18" IN, ALL CONCRETE. MAN–1 TABLE INDICATES A MINIMUM ANGLE OF 80° BETWEEN THE EXISTING 24" (IN) AND THE NEW 18" (IN), RESULTING IN APPROXIMATE 6" OF INTERIOR MANHOLE WALL REMAINING BETWEEN THE 2 PIPES.
NOTES:

1. BENCH SHALL BE 3000# CONCRETE OR CINDER BRICK.
2. BENCH SHALL HAVE 3" PER FOOT SLOPE OR CAN HAVE 1" PER FOOT SLOPE IF CP&P PERFECT MONOLITHIC MANHOLE IS USED.
3. WHERE STUBS ARE PROVIDED FOR FUTURE CONNECTIONS, BENCH SHALL BE FORMED TO ACCOMMODATE FUTURE CONNECTIONS.
NOTES:
1. BENCH SHALL BE 3000# CONCRETE OR CINDER BRICK.
2. BENCH SHALL HAVE 3" PER FOOT SLOPE.
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CHESTERFIELD COUNTY
DEPARTMENT OF UTILITIES

C.I. FRAME AND COVER W/MANHOLE INSERT

2" OR 3" APPROVED ADJUSTING RINGS W/CONSEAL (NO PARGING)

M.H. STEP (TYP.)

4’-0" DIA.

60", 72", 84" AND 96" I.D. MANHOLE - III

NOTES:
1. BENCH SHALL BE 3000# CONCRETE OR CINDER BRICK.
2. BENCH SHALL HAVE 3" PER FOOT SLOPE.
3. WHERE STUBS ARE PROVIDED FOR FUTURE CONNECTIONS, BENCH SHALL BE FORMED TO ACCOMMODATE FUTURE CONNECTIONS.

DATE: JAN. 1996
REVISION: MAY 2020
NOTES:
1. CONE SHALL MEET REQUIREMENTS OF ASTM C-478. REQUIREMENTS OF ASTM C443.
2. CONCRETE SHALL MEET OR EXCEED THE TEST 4000 PSI MINIMUM COMPRESSIVE 28 DAY STRENGTH.
3. REINFORCING TO MEET ASTM A-185 FOR MESH AND ASTM A-615 FOR REBARS.
NOTES:
2. CONCRETE SHALL MEET OR EXCEED THE TEST 4000 PSI MINIMUM COMPRESSIVE 28 DAY STRENGTH.
3. APPROVED STEPS SHALL BE EQUAL, SPACED @ 1'-4" O.C.
4. REINFORCING SHALL BE A MINIMUM .12", 2/FT. (MINIMUM OF 8 EACH - 1/4" BARS ON BACK FACE; AND MINIMUM OF 4 EACH - #3 BARS ON FRONT FACE AND W3.4 [5 GAL.] WIRING.)
5. A MAXIMUM OF TWO LIFT HOLES PER SECTION.
1'–4" FLAT TOP CONE
(TYPE 2)
NOTES:
1. APPROXIMATE WEIGHTS FOR CAST IRON – FRAME: 239 ± 12 LBS.; COVER: 137 ± 7 LBS.
2. THE LETTERS ARE TO BE CAST IN THE DEPRESSION IN THE TOP OF COVER 1” WIDE RAISED 3/8” HIGH AS SHOWN.
NOTES:

1. INSTALL (4) 1/2”x1 1/2” STAINLESS STEEL 3/4” HEXGONAL HEAD BOLTS AT 90°. COUNTERBORE THE COVER SO THAT THE HEAD OF THE BOLT IS FLUSH OR JUST BELOW THE TOP OF THE COVER. PENTAGON HEAD BOLTS ARE OPTIONAL.

2. MANHOLE FRAMES LOCATED ABOVE GRADE SHALL BE ATTACHED TO MANHOLE BY USE OF (2) 1/2” STAINLESS STEEL ANCHOR BOLTS, WEDGE ANCHORS, OR STUD ANCHORS WITH STAINLESS STEEL WASHER AND NUT LOCATED ON OPPOSITE SIDES OF MANHOLE FRAME. HOLES IN MANHOLE FRAME SHALL BE NEATLY DRILLED TO ALIGN WITH ANCHORS.

3. SEALANT FOR MANHOLE FRAMES SHALL BE ONE-COMPONENT POLYURETHANE OR BITUMASTIC MATERIAL PER SECTION 3.2.2.G.
NOTE:
1. INSTALL (4) 1/2"x1 1/2" STAINLESS STEEL 3/4" HEXAGONAL HEAD BOLTS AT 90°. COUNTERBORE THE COVER SO THAT THE HEAD OF THE BOLT IS FLUSH OR JUST BELOW THE TOP OF THE COVER. PENTAGON HEAD BOLTS ARE OPTIONAL FOR VANDAL RESISTANT, WATERTIGHT OR NON-WATERTIGHT APPLICATIONS.
NOTE:
STEP SHALL BE MADE WITH 3/8" STEEL REINFORCING BAR ENCAPSULATED IN POLYPROPYLENE PLASTIC.
NOTE:

THE EFFLUENT ELEVATION SHOWN AT A MANHOLE IS ESTABLISHED FROM THE INFLUENT ELEVATION OF THE MANHOLE IMMEDIATELY DOWNSTREAM. ELEVATIONS SHOWN APPLY AT THE C. OF MANHOLES AND ARE BASED ON THE HORIZONTAL DISTANCE, C, TO C. M.H. USING PERCENT OF GRADE INDICATED.
CHESTERFIELD COUNTY
DEPARTMENT OF UTILITIES

NOTES:

A. ALL THRU PIPE SHALL BE FITTED WITH AN SDR 35 P.V.C. REMOVABLE CAP WHICH SHALL
   BE HELD IN PLACE BY THE INTERFERENCE (FRICTION) FIT BETWEEN THE PIPE AND CAP.
B. ALL CAPS SHALL BE SECURED TO THE DROP FITTING WITH 2 FEET OF GALVANIZED CHAIN
   SECURED WITH TWO STEEL MACHINE SCREWS, NUTS AND WASHERS.
C. CHAMFER ON ALL PIPE SIZES TO BE AT A 15 DEGREE ANGLE.
D. HEIGHT OF VERTICAL STACK WILL BE DETERMINED BY ENGINEER, BUT WILL NOT BE LESS
   THAN 2 FEET.
E. DROP STACK TO BE 6” OR 8” SDR 35 P.V.C. PIPE CONNECTED TO DROP FITTING WITH
   STANDARD GASKETED JOINT.
F. VERTICAL STACK WILL BE STRAPPED TO MANHOLE AT PIPE JOINTS. STRAPS SHALL BE
   MADE OF STAINLESS STEEL OR APPROVED MATERIAL NONCORROSIVE TO SEWER GASES.
G. SHAPE INVERT AS NEEDED TO PROVIDE SMOOTH TRANSITION FROM DROP CONNECTION
   DISCHARGE POINT TO SPRING LINE OF MANHOLE INVERT.
H. ELBOW AT BOTTOM OF THE STACK WILL BE A 90 DEGREE BEND POSITIONED IN THE
   DIRECTION OF THE FLOW IN MANHOLE WITH BENCH CONSTRUCTED TO CONFORM TO
   MANHOLE BENCH.
I. MANHOLE OPENING TO BE CORED AS DESCRIBED IN THE LATEST COUNTY WATER AND
   SEWER SPECIFICATIONS.
J. DROP STACK SHALL NOT BE INSTALLED WITHIN 60 DEGREES OF THE ACCESS STEPS.
K. ONLY ONE PER 4’—0” DIAMETER MANHOLE.

STANDARD DROP CONNECTION
(INSIDE)

DATE:
JAN. 1996

REVISION:
MAY 2020

DWG. NO.
MAN—14
NOTE:
1. OUTSIDE DROP TO BE USED WHEN LINE SIZE IS GREATER THAN 12” DIAMETER. CONCRETE ENCASEMENT MAY BE ELIMINATED IF DUCTILE IRON PIPE AND FITTINGS ARE USED FOR DROP CONNECTION.
A VERTICAL LINE EXTENDING FROM THE VALVE OPERATING NUT SHALL COME NO CLOSER THAN 2" FROM THE EDGE OF THE OPENING.

2" OR 3" APPROVED ADJUSTING RINGS.

2'-0" I.D.

4" MIN., 1'-0" MAX. W/ECCENTRIC CONE

8" TO 1'-4"

STD. MH. STEP

MIN. REINF. 0.12 IN. 2/FT.

MIN. COVER 3'-6"

MONOLITHIC DOGHOUSE, PARGE INSIDE AND OUT

UNDISTURBED EARTH

# 57 STONE

3000# CONC.

NOTE: BONNET NUT & BOLT TO BE FREE OF CONCRETE SO BONNET CAN BE READILY REMOVED.

STD. MH. FRAME AND WATER COVER

CONSEAL

APPROVED GASKET (TYPICAL)

RISER IF NECESSARY

BRICK SUPPORT

UNDISTURBED EARTH

NOTE: BONNET NUT & BOLT TO BE FREE OF CONCRETE SO BONNET CAN BE READILY REMOVED.

DATE: JAN. 1996
REVISION: MAY 2020

VALVE MANHOLE FOR TAPPING VALVES (16" AND LARGER)
CHESTERFIELD COUNTY
DEPARTMENT OF UTILITIES

COUNTY MAIN SEWER LINE

EASEMENT

PIECE

PROCESSED AND DOMESTIC WASTE LINE

THE UTILITY INSPECTOR WILL INSPECT THE SAMPLING MANHOLE.

SCHEMATIC LAYOUT

C.I. FRAME AND COVER

8" 8"

8'0" I.D.
(TOP STEP NOT INSTALLED)

M.H. STEP (TYP.)

5"

BENCH 3" SLOPE

MATCH CROWNS

1"0" MIN.

2" CLEARANCE (MAX.)

EXTENDED MONOLITHIC BASE (OPTIONAL)

8" OF #57 STONE BEDDING

SUPPORT PIPE ON 4" OF #57 STONE BEDDING

1"0" TO 1"6"

SEALANT

FLEXIBLE JOINT

NOTES:
1. BENCH SHALL BE 3000# CONCRETE OR CINDER BRICK.
2. STONE BEDDING SHALL EXTEND TO THE OUTER BOUNDARY OF ALL UNDISTURBED AREAS SURROUNDING THE MANHOLE.
3. SAMPLING MANHOLES SHOULD BE PLACED IN A LOCATION WHERE ACCESSIBLE, PREFERABLY OUTSIDE PAVED AREAS.

DATE: JAN. 1996

REVISION: MAY 2020

DWG. NO. MAN-17
8"x8"x1'-4" SOLID CONCRETE BLOCK CENTER W/RISER WALL (4 EACH)

EXISTING SANITARY SEWER PIPE

MIN 8" CLEAR BETWEEN EXISTING PIPE AND PROPOSED STONE

12" THICK VDOT #57 STONE

BASE ISOMETRIC VIEW

SET DOG HOUSE BASE ON CONCRETE BLOCKS

DOGHOUSE OPENING SHALL BE PREFORMED BY MANUFACTURER OR SAW CUT TO FIT PIPE OUTSIDE DIAMETER PLUS 6"

SEE PLANS FOR PROPOSED INVERT(S) LOCATION & ELEVATION

RISER ISOMETRIC VIEW

ALLOW CONCRETE TO FLOW A MIN. OF 1'-0" BEYOND BASE OF STRUCTURE

FILL DOGHOUSE OPENING AROUND EXISTING PIPE WITH CONCRETE.

CONTRACTOR TO APPLY WATER PROOFING SEALANT AT JOINT (TYP.)

8" MIN CAST-IN PLACE CONCRETE BASE

FOUNDATION SECTION VIEW

DATE:
NOV. 2018

REVISION:
MAY 2020

DOGHOUSE MANHOLE

MAN-18
NOTE:
ALL Poured-IN-PLACE CONCRETE SHALL BE 3,000 PSI, A-4 CONCRETE.
CHESTERFIELD COUNTY
DEPARTMENT OF UTILITIES

SECTION

HAND TAMPAED UP TO SERVICE TUBING

ADAPTER

CORP. STOP

WATER MAIN

CRIMP END

ENLARGED VIEW

NOTES:
1. METERSETTER SHALL BE CENTERED IN METER BOX AND COPPER TUBING ON OUTLET SIDE OF SETTER SHALL EXTEND 1’-6” OUTSIDE OF BOX ON CUSTOMER’S SIDE. THIS COPPER TUBING SHALL BE CRIMPED ON THE END TO KEEP DIRT FROM ENTERING LINE.
2. COPPER TUBING TO THE CORPORATION STOP MUST BE FLARED OR COMPRESSION.
3. METER BOX SHALL BE LOCATED 1’-0” INSIDE OF PROPERTY LINE. METER BOX MAY BE MOVED A REASONABLE DISTANCE INSIDE PROPERTY LINE IN ORDER TO INSTALL ON REASONABLY LEVEL GROUND.
4. SERVICES SHALL BE INSTALLED PRIOR TO TESTING.
5. BYPASS SHALL NOT BE ALLOWED FOR 5/8” OR 1” RESIDENTIAL AND IRRIGATION METERS.

DATE: JAN. 1996
REVISION: MAY 2020

TYPICAL WATER METER CONNECTION
FOR 3/4” AND 1” SERVICES
(5/8” AND 1” METERS)
CHESAPEAKE COUNTY
DEPARTMENT OF UTILITIES

DUCTILE IRON 65-45-12

CARS

N
MSF

WATER

NOTE:
ALL THE EDGES MUST BE ROUNDED WITH A RADIUS VALUE EQUAL TO 3/16".
AS LONG AS THE THICKNESS OF THE WALL ALLOWS IT.
OTHERWISE THIS VALUE SHOULD BE ADJUSTED TO THE SPECIFIED THICKNESS.

SECTION A-A

TOP

11 1/4"

1'–4 3/4"

3"

4"

LONG SIDE SECTION

1'–11 1/8"

1 1/2"

1'–6 1/8"

1'–6" 1/8"

SHORT SIDE SECTION

2'–2"

PLASTIC METER BOX

(1" METERS)

DATE: JAN. 1998
REVISION: MAY 2020

DWG. NO. MET-3
CAST IRON METER BOX
(TYPE 1)
(FOR 5/8" AND 1" METERS)

NOTE:
CAST IRON METER BOXES SHALL BE USED WHEN METER IS LOCATED IN AN AREA SUBJECT TO VEHICULAR TRAFFIC

DATE: JAN. 1996
REVISION: MAY 2020

CHESTERFIELD COUNTY
DEPARTMENT OF UTILITIES

MET-4
CHESTERFIELD COUNTY
DEPARTMENT OF UTILITIES

HEAVY DUTY PLASTIC COVER
W/CAST IRON READER LID.

LID DETAIL

TOP

LONG SIDE ELEVATION

SHORT SIDE ELEVATION

1730-24 CARSON SPEC. GRADE BODY METER VAULT

WATER METER VAULT

(FOR 1 1/2” AND 2” METERS)

DATE: FEB. 2012

REVISION: MAY 2020

DWG. NO.

MET-5

(1 OF 2)
CHESTERFIELD COUNTY
DEPARTMENT OF UTILITIES

GROUND LEVEL

COVER

1 1/2” OR 2” METER

FLOW

VALVE

SEE NOTE #6

BYPASS

MIN. 1’-6” BEYOND EDGE OF BRASS OR COPPER PIPE

FLANGED ANGLE VALVE

METER VAULT SEE MET-5
(1 OF 2)

NO VALVE BOX REQUIRED, EXCEPT UNDER PAVEMENT/CONCRETE. CURB STOP OUTSIDE OF BOX MUST BE LOCATED WITHIN 1 FOOT EDGE OF METER BOX

NOTES:
1. SADDLES SHALL BE USED IN ACCORDANCE WITH SPECIFICATIONS PART 1, SECTION 3.2.8.
2. WATER SERVICE LATERALS FOR 1 1/2” AND 2” SERVICES WILL BE TYPE-K COPPER. CONNECTIONS FOR 1 1/2” AND 2” SERVICES WILL BE SWEAT 95/5 (LEADLESS) SOLDER AND A SUITABLE FLUX, APPROVED COMPRESSION FITTINGS OR A ProPress SYSTEM. ALL CONNECTIONS AT CORPORATION STOPS WILL BE APPROVED COMPRESSION FITTINGS.
3. TAPS SHOULD BE MADE AT THE SPRING LINE OF THE MAIN LINE.
4. FOR DETAIL OF VAULT, SEE MET-5 (1 OF 2).
5. YOKE MUST BE INSTALLED WITH A METER SPACER THAT WILL BE FURNISHED TO THE CONTRACTOR BY THE UTILITIES DEPARTMENT INSPECTOR. THE SPACER WILL BE REMOVED BY THE UTILITIES DEPARTMENT WHEN THE METER IS SET.
6. BY-PASS SHALL NOT BE ALLOWED FOR IRRIGATION OR RESIDENTIAL SERVICES. ALL 1 1/2” AND 2” METER SETTERS FOR DOMESTIC USE AT RESIDENTIAL HOMES, CONDOMINIUMS, APARTMENTS, TOWNHOUSES, ECT. SHALL NOT BE EQUIPPED WITH A BYPASS VALVE. SETTERS FOR IRRIGATION USES SHALL NOT BE EQUIPPED WITH A BYPASS VALVE. ALL OTHER 1 1/2” AND 2” METER SETTERS SHALL BE EQUIPPED WITH A BYPASS.

DATE: FEB. 2012
REVISION: JUL. 2020

TYPICAL WATER METER VAULT
(HPDE)
(1 1/2” OR 2” METER SETTING)

DWG. NO. MET-5
(2 OF 2)
CHESTERFIELD COUNTY
DEPARTMENT OF UTILITIES

MJ TEE THREADED
FOR SERVICE CONNECTION

SECTION A–A

WATER MAIN

2" F.I.P. THREADS

CURB AND GUTTER

APPROVED CURB STOP
(WITHIN 1' OF BOX)

METER BOX

IF SIDEWALK IS TO BE
CONSTRUCTED THEN
METER BOX AND
CURB STOP SHALL BE
2 FEET BEHIND THE
SIDEWALK

ALL TEES MUST HAVE
F.I.P. OUTLET

MIP THREAD

TYPE K HARD COPPER

2" CORPORATION STOP

WATER MAIN

PLAN

NOTES:
1. CONCRETE BLOCKING NOT REQUIRED BEHIND THE TEE
2. ALL TEES SHALL HAVE A 2" FEMALE I.P. THREAD OUTLET
3. USE A 2"x1 1/2" BUSHING TO REDUCE DOWN OUTLET SIDE OF
   CORP. STOP FOR 1 1/2" SERVICES
4. CORP. STOPS SHALL BE 2" M.I.P.x2" F.I.P. OR 2" M.I.P.x2"
   COMPRESSION FITTING
5. APPROVED COMPRESSION COUPLINGS SHALL BE THE ONLY ACCEPTABLE
   METHOD FOR CONNECTING PIPE TO CORP. STOP.

DATE:
FEB. 2009

REVISION:
MAY 2020

MJ TEE THREADED FOR 1 1/2"
AND 2" SERVICE CONNECTION

DWG. NO.
MET–6
CHESTERFIELD COUNTY
DEPARTMENT OF UTILITIES

FLOW

3" OR 4"
N.C.

3" OR 4"
MECH. JOINT
G.V. WITH
OPERATING
NUT (TYP.)

6'-0"

3'-0"
MIN

6'-0"

4" MIN. (TYP.)

3" OR 4"
SPOOL PEXFL

(A) 3" TURBINE METER W/TEST TEE
(B) 3" COMPOUND METER W/ SPOOL
(C) 4" TURBINE METER W/TEST TEE
(D) 4" COMPOUND METER W/ SPOOL
* DIMENSIONS ARE APPROXIMATE,
BUILD TO FIT PER NOTE 4.

PLAN

EX. GRADE.
SLOPE FOR
POSITIVE
DRAINAGE.

4'-0"x4'-0"
ACCESS HATCH

6" MIN. TOP
OF GROUND

4'-9"

1'-6"
3" OR 4"
D.I.P

1'-2" DIA.x4"
DEEP SUMP

SECTION

ALUMINUM
ACCESS
LADDER

STEEL PIPE
SUPPORTS

NOTES:
1. COUNTY TO PROVIDE METER, STRAINER, AND NECESSARY SPOOL PIECES TO FIT.
2. ALL JOINTS TO BE RESTRAINED AS PART OF A JOINT RESTRAINT SYSTEM.
3. SEE MET–8 FOR VAULT CONSTRUCTION DETAILS.
4. THE CONTRACTOR IS REQUIRED TO COORDINATE WITH THE UTILITY DEPARTMENT OPERATIONS CENTER FOR PURCHASING A COUNTY SUPPLIED METER AND ASSOCIATED APPURTENANCES. ALL CONNECTION AND/OR OTHER APPLICABLE FEES MUST BE PAID PRIOR TO ACQUIRING THE METER AND ASSOCIATED APPURTENANCES. THE CONTRACTOR SHALL NOT INSTALL THE PIPING UNTIL THE METER AND ASSOCIATED APPURTENANCES ARE ON THE PROJECT SITE SO THAT THE CORRECT LENGTH OF PIPE IS INSTALLED TO FIT.

DATE:
JAN. 2017

REVISION:
JUL. 2020

3" & 4" METER SETTING
WITH BYPASS

DWG. NO.
MET–7
CHESTERFIELD COUNTY
DEPARTMENT OF UTILITIES

PLAN

8" BLOCKOUT W/FLEXIBLE SEAL FOR 3" OR 4" PIPE (TYP.)

SECTION

4'-0"x4'-0" WATERTIGHT ACCESS HATCH (BILCO OR APPROVED EQUAL)

ALUMINUM ACCESS LADDER

5,000 PSI REINFORCED CONCRETE

1'-2" DIA.x4" DEEP SUMP

VAULT DETAIL

(FOR 3" AND 4" METERS)
6" OR 8" MASTER METER VAULT WITH BYPASS

NOTES:
1. COUNTY TO PROVIDE METER, STRAINER, AND NECESSARY SPOOL PIECES TO FIT.
2. ALL JOINTS TO BE RESTRAINED AS PART OF A JOINT RESTRAINT SYSTEM.
3. THE CONTRACTOR IS REQUIRED TO COORDINATE WITH THE UTILITY DEPARTMENT OPERATIONS CENTER FOR PURCHASING A COUNTY SUPPLIED METER AND ASSOCIATED APPURTENANCES.
ALL CONNECTION AND/OR OTHER APPLICABLE FEES MUST BE PAID PRIOR TO ACQUIRING THE METER AND ASSOCIATED APPURTENANCES. THE CONTRACTOR SHALL NOT INSTALL THE PIPING UNTIL THE METER AND ASSOCIATED APPURTENANCES ARE ON THE PROJECT SITE SO THAT THE CORRECT LENGTH OF PIPE IS INSTALLED TO FIT.
CHESTERFIELD COUNTY
DEPARTMENT OF UTILITIES

NOTES:
1. 1 1/2" - 2" TAPS SHOULD BE MADE AT THE SPRING LINE OF THE MAIN LINE.
2. SADDLE MUST BE USED IN ACCORDANCE WITH SPECIFICATION PART I, SECTION 3.2.8.
3. WHERE SIDEWALKS ARE PROVIDED, WATER METER BOX TO BE LOCATED 3 FEET BEYOND THE SIDEWALK.
4. RESIDENTIAL SERVICES 60 FEET OR GREATER IN LENGTH SHALL BE 1" COPPER.

WATER SERVICE INSTALLATION DETAIL
NOTE:
UNLESS OTHERWISE APPROVED, COMPANION METER SHALL BE INSTALLED CLOSER TO PROPERTY LINE AND DOMESTIC METER INSTALLED CLOSEST TO BUILDING.
NOTES:
1. INITIAL BACKFILL TO BE THOROUGHLY COMPACTED AND FREE OF CLODS, DEBRIS, ETC.
2. CONTRACTOR MUST INSURE THE STONE IS PROPERLY COMPACTED, ESPECIALLY UNDER THE HAUNCHES OF THE PIPE.
3. FOR PVC PIPE AT DEPTHS IN EXCESS OF 14 FEET, STONE TO EXTEND TO 1'-0" ABOVE PIPE.
CHESTERFIELD COUNTY
DEPARTMENT OF UTILITIES

SECTION

ASPHALT OR CONCRETE AS DETERMINED BY TRAFFIC SURFACE

10" DIA. C.I./D.I. CLEANOUT COVER

FINISHED GRADE

ASPHALT OR CONCRETE

4" MAX.

PROVIDE RUBBER GASKET

4" SEWER SERVICE TYPE BRASS CLEANOUT CAP W/COUNTERSUNK HEAD

3000 P.S.I. CONCRETE

10 1/4"

9 1/4"

4" PVC OR DUCTILE IRON PIPE

PIPE SEAL GASKET

6" MIN.

6" PVC ENCASEMENT PIPE

SAND CUSHION

PLAN

CAST IRON/DUCTILE IRON CLEANOUT COVER

18" SQUARE ENCASEMENT

1'-6"

PRIVATE CLEANOUT DETAIL IN TRAFFIC AREAS

DATE: NOV. 2018
REVISION: MAY 2020

DWG. NO. SEW-10
## CHESTERFIELD COUNTY
DEPARTMENT OF UTILITIES

MINIMUM SPECIFIED TIME REQUIRED FOR A 1.0 PSIG PRESSURE DROP FOR SIZE AND LENGTH OF PIPE INDICATED
PRESSURE DROP FROM 3.5 PSIF TO 2.5 PSIC*
(BASED ON FORMULAS FROM UNI–B–6–90)*

<table>
<thead>
<tr>
<th>PIPE DIAMETER (IN.)</th>
<th>MINIMUM TIME (MIN:SEC)</th>
<th>TIME FOR LENGTH (L) (SEC)</th>
<th>SPECIFICATION TIME FOR LENGTH (L) SHOWN (MIN:SEC)</th>
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<tr>
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* THE 3.5 PSIG TEST PRESSURE SHALL BE INCREASED BY ADDING THE AVERAGE VERTICAL HEIGHT IN FEET OF GROUND WATER ABOVE THE SEWER PIPE INVERT DIVIDED BY 2.31, BUT THE MAXIMUM STARTING TEST PRESSURE SHALL NOT EXCEED 9 PSIG.

DATE: JAN. 1996

REVISION: MAY 2020

PVC PIPE AIR TEST TABLE

DWG. NO. SEW–12
2", 4" & 6" VENT W/BIRD SCREEN (1/4" GALVANIZED IRON MESH)

PLAN

FLANGED D.I. PIPE

1'-6" MIN.

3'-6"

PLACE 3000 PSI CONCRETE ON UNDISTURBED EARTH

8″ MIN.

SECTION

NOTES:
1. PAINT EXPOSED PORTION OF PIPE WITH GREEN RUST INHIBITIVE PAINT.
2. WHERE MANHOLE IS LOCATED IN FLOOD PLAIN, AIR VENT SHALL BE SET AT LEAST 1'-0" ABOVE 100 YEAR FLOOD ELEVATION.

DATE: JAN. 1996
REVISION: MAY 2020

AIR VENT FOR WATERTIGHT MANHOLE

DWG. NO. SEW-2
CHESHERFIELD COUNTY
DEPARTMENT OF UTILITIES

STD. HOUSE CONNECTION

DITCH CROSSING

NOTES:
1. HOUSE CONNECTION SHALL BE LAYED AT AN ANGLE NOT GREATER THAN 45° FROM HORIZONTAL.
2. WHERE MAIN LINE DEPTH IS GREATER THAN 12'-0", CONTRACTOR SHALL LAY CONNECTION AS SHOWN PROVIDED THE ELEVATION OF CONNECTION AT THE PROPERTY LINE IS SUCH THAT THE LOT IS SERVED PROPERLY.
3. WHERE MAIN LINE DEPTH IS GREATER THAN 12'-0", HOUSE CONNECTIONS SHALL BE MADE AS TEES AND NOT AT MANHOLES.
CHESTERFIELD COUNTY
DEPARTMENT OF UTILITIES

3000 PSI CONCRETE

1'-0"

PLAN

GROUND SURFACE

1'-0"

3'-6"

MIN.

BOTTOM OF TRENCH

3'-0"

MIN.

NOTES:
1. CONCRETE TO BE Poured AGAINST UNDISTURBED EARTH.
2. SPACING OF ANCHORS:
   SLOPES: 20%–30% – EVERY 2 LENGTHS OF PIPE
   30%–50% – EVERY 1 1/2 LENGTHS OF PIPE
   OVER 50% – EVERY LENGTH OF PIPE

SEWER ANCHORAGE IN SLOPES
GREATER THAN OR EQUAL TO 20%

DATE: JAN. 1996

REVISION: MAY 2020
NOTES:

1. INSERTA TEE CAN BE CONNECTED TO PVC, PERMA-LOC, SPIROLITE, SLIP LINER, DUCTILE IRON, THIN WALL MAIN LINES, CONCRETE (MAINLINES AND MANHOLES), CLAY AND ALL THICK WALLED MAIN LINES. IT IS A THREE PIECE CONNECTION THAT IS COMPRESSION-FIT INTO THE CORED WALL OF THE MAIN LINE. IT CONSISTS OF SIDE SERVICES OF 4” THROUGH 12” AND FITS ALL MAIN LINE DIAMETER.

2. THIS METHOD OF CONNECTION SHALL NOT TAKE PRECEDENT OVER USING TEES. THE APPLICATION SHOWN HERE IS FOR TAPPING EXISTING MAINS.
NOTE:

1. IT CAN BE USED FOR INCOMING PIPE SIZES 3.5" O.D. TO 9.875" O.D. THE EXTERNAL SHOULDER PREVENTS THE CONNECTOR FROM PROTRUDING INTO THE TRUNK OR MAIN LINE. THE INTERNAL SHOULDER IN THE CONNECTOR PREVENTS THE INCOMING PIPE OR LATERAL FROM BEING PUSHED THROUGH THE KOR-N-TEE CONNECTOR AND PROTRUDING INTO THE TRUNK OR MAIN LINE. IT MAKES A PERMANENT CONNECTION FOR ALL MATERIALS INCLUDING PVC, FIBERGLASS, ETC.
FILL 2'-0" ABOVE TOP OF PIPE

** DAM

SEWER PIPE

6"

1'-0" (UNLESS ROCK IS ENCLOSED)

2'-0" MIN.

NOTE:

** CLAY DAM SHALL BE BENTONITE CLAY
CLAY DAM DETAIL  
PLAN VIEW

DATE:  
JAN. 1996

REVISION:  
MAY 2020

CHESTERFIELD COUNTY  
DEPARTMENT OF UTILITIES

TO BE DETERMINED  
BY ENGINEER/INSPECTOR

1'-0" MIN.

SEWER PIPE

TRENCH LIMITS

CLAY DAM

1'-0" MIN.
CHESTERFIELD COUNTY
DEPARTMENT OF UTILITIES

MINIMUM TEST TIMES FOR VARIOUS MANHOLE DIAMETERS

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NOTES:

1. THE TEST HEAD SHALL BE PLACED AT THE TOP OF THE MANHOLE IN ACCORDANCE WITH THE MANUFACTURER’S RECOMMENDATIONS.


3. THE MANHOLE SHALL PASS IF THE TIME FOR THE VACUUM READING TO DROP FROM 10 IN. OF MERCURY TO 9 IN. OF MERCURY MEETS OR EXCEEDS THE VALUES INDICATED IN TABLE 1.

4. IF THE MANHOLE FAILS THE INITIAL TEST, NECESSARY REPAIRS SHALL BE MADE BY AN APPROVED METHOD. THE MANHOLE SHALL THEN BE RETESTED UNTIL A SATISFACTORY TEST IS OBTAINED.
NOTES:

#57 STONE BEDDING REQUIRED TO TOP OF PIPE (PVC).

1. CLEANOUTS TO BE INSTALLED EVERY 100 FEET AND AT EVERY 90° BEND OR AS SPECIFIED BY LATEST PLUMBING CODES.
2. SEE DETAIL SEW-10 FOR CLEAN-OUTS IN TRAFFIC AREAS.
3. PLASTIC SCREW PLUG SHOULD BE FLUSH WITH FINISHED GRADE.
4. PIPING BEYOND CLEANOUT TO BE INSTALLED PER LATEST PLUMBING CODES.
1. IT IS THE RESPONSIBILITY OF THE DESIGN ENGINEER TO DESIGN THE PUBLIC WATER SYSTEM TO MINIMIZE THE NUMBER OF AIR RELEASE VALVES BY ELIMINATING HIGH POINTS WHERE REASONABLY FEASIBLE AND TO PROPERLY SIZE THE AIR RELEASE VALVE TAKING INTO CONSIDERATION ALL THE DESIGN FACTORS, AND KEEPING IN MIND THAT A 1" AIR RELEASE VALVE FOR 16" WATER LINES IS DESIRABLE. ORIFICE SIZE SHALL BE NOTED ON PLANS.

2. ALL COPPER FITTINGS WILL BE FLARE OR COMPRESSION TYPE.

3. AIR RELEASE VALVE TO BE PLACED WHERE NOT SUBJECT TO FLOODING. THERE MUST BE CONTINUOUS RISE IN THE COPPER SUPPLY LINE TO THE AIR RELEASE VALVE AND NO TRAP SHALL BE PERMITTED.

4. AIR RELEASE VALVE TO BE PLACED WHERE NOT SUBJECT TO FLOODING AND OUTSIDE TRAFFIC AREAS.
2" AIR RELEASE VALVE ASSEMBLY
CHESTERFIELD COUNTY
DEPARTMENT OF UTILITIES

PROPOSED GRADE

1'-0" MIN.

2'-0" MAX.

COMPACTED BACKFILL

METER BOX (SEE MET-2;
OR MET-4 IN TRAFFIC AREAS)

GROUND LINE

1'-0" MIN.

2'-0" MAX.

CHESTERFIELD TYPE
2" FIPTx2 1/2" MSFT
BRASS BUSHING WITH
CAP AND CHAIN

2" BLACK IRON
NIPPLE - 6" LONG
MIPTxMIPT

1/2" BLACK IRON
VALVE STEM WITH
3/4" PVC SLEEVE
SCH. 20

MAINGUARD 2"
BLOW OFF HYDRANT
(SPECIFY DEPTH OF
BURY)

UNDISTURBED EARTH
OR THRUST BLOCK

#57 STONE

2" COPPER
STREET "L"

CORR STOP

AQUARIUS 103 CHESTERFIELD 2"
FLUSHING HYDRANT PART #CHSFLD30

MAINGUARD #78 BLOW OFF
HYDRANT (MODIFIED)

1'-0" ± (DISTANCE FROM
HYDRANT TO PROPERTY LINE
(R/W LINE)

2" HARD COPPER

APPROVED FLUSHING HYDRANT

APPROVED BLOCKING

PLUG

8"x6" TEE OR
6"x6"x2" TEE

8"x6" TEE OR
6"x6"x2" TEE

2" HARD COPPER

CORP STOP

WATER MAIN

WATER MAIN

DATE:
JAN. 1996

REVISION:
MAY 2020

DWG. NO.
WAT-3

2" FLUSHING HYDRANT
BLOW OFF
(FOR 6" AND 8" WATERLINES)
CHESTERFIELD COUNTY
DEPARTMENT OF UTILITIES

FLG. 90° BEND

BLIND FLANGE

3'—0"

VALVE AND
VALVE BOX

45° BEND

ONE 1/4" WEEP HOLE

90° BEND

#57 STONE

GROUN

TEE TURNED
DOWN 45°

NOTES:
1. THE LARGE BLOW—OFF SHALL BE DRAINED TO PREVENT FREEZING.
2. ALL PIPE AND FITTINGS SHALL BE FLANGED OR M.J. RESTRRAIN JOINTS.
3. WEEP HOLE TO BE DRILLED 2'—0" BELOW GROUND LEVEL TO SUFFICIENTLY ALLOW STAND PIPE TO DRAIN. BACKFILL WITH AT LEAST 1/2 CUBIC YARD OF #57 CLEAN STONE.
4. WAT—3 MAY BE USED WHEN THE BLOW—OFF IS TEMPORARY AND WATERLINE WILL BE EXTENDED, SUBJECT TO UTILITIES APPROVAL.
5. PROVIDE ADEQUATE EROSION CONTROL MEASURES TO PROTECT PROPERTY DURING OPERATION. ADDITIONAL EASEMENT MAY BE NECESSARY IN SOME CASES.

DATE:
JAN. 1996

REVISION:
MAY 2020

4" AND LARGER BLOW OFF

(DR WATERLINES 12" AND LARGER)

DWG. NO.
WAT—4
1. WHERE A DITCH EXISTS OR IS PROPOSED, THE FLUSHING HYDRANT IS TO BE PLACED BETWEEN THE DITCH AND EDGE OF PAVEMENT ON LEVEL GROUND. IF THIS IS NOT POSSIBLE, THE UTILITY CONSTRUCTION INSPECTOR MUST BE CONSULTED.

2. IN THE EVENT THAT THE WATER SERVICES AND BOXES CANNOT BE ARRANGED AS REFLECTED IN THIS DETAIL, AT LEAST 10 FEET HORIZONTAL SEPARATION IS REQUIRED BETWEEN THE WATER METER BOX/SERVICE LINE AND FLUSHING HYDRANT.
NOTE:
CONTRACTOR SHALL USE IN ACCORDANCE WITH FLUSHING SCHEDULE: SEE SECTIONS ENTITLED "DISINFECTION", "SUPPLEMENTAL PROCEDURES FOR DISINFECTING, TESTING, AND FLUSHING" AND TABLE 1 ENTITLED "FLUSHING SCHEDULE."

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<td>36&quot;</td>
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</table>

A = MAIN SIZE
B = CHECK VALVE AND GATE VALVE SIZE
* = TO BE DESIGNED BY CONSULTANT
NOTE:
USE STANDARD DESIGNED VALVE BOX OF THE APPROPRIATE LENGTH (HEIGHT) UTILIZING APPROVED MANUFACTURERS OF VALVE BOX APPURtenances.
CHESTERFIELD COUNTY
DEPARTMENT OF UTILITIES

AS REQUIRED

AS REQUIRED

FINISHED ROAD GRADE

3'-6"

MIN.

3'-6"

MIN.

CULVERT

EXISTING MAIN

MAX. DEFLECTION PER JOINT

= 1/2 MFRS. RECOMMENDED

AMOUNT, AS PER WAT-10.

1'-6" MIN.

CLEAR

LOWERED NEW INSTALLATION BY DEFLECTION METHOD.

ALLOWED FOR DUCTILE IRON PIPE ONLY.

OR

PVC

OR

D.I.

L

D.I.

M.J.

10'-0"

10'-0"

MEGA-LUG FOR

PVC OR D.I.

WHERE EXISTING LINE

IS A/C, A TRANSITIONAL

COUPLING MUST BE

USED AND CONTRACTOR

FOLLOW NOTE 3.

EXISTING MAIN

1'-6" MIN.

MEGA-LUG FOR

PVC OR D.I.

10'-0"

MIN.

NOTES:

1. LOWERED SECTION TO BE OF DUCTILE IRON MECHANICAL JOINT PIPE WITH RESTRAINED

JOINTS AT ANY INCLUDED JOINTS. THE ENGINEER SHALL CALCULATE LENGTH OF

RESTRAINED SECTION.

2. THRUST BLOCKS FOR VERTICAL BENDS MAY BE DELETED WITH RESTRAINED JOINTS.

3. 4"x4" SALT TREATED TIMBER SUPPORT MUST BE LEFT AS A PERMANENT STABILIZATION

UNDER VOIDS AND AROUND THE COUPLING OR THE ENDS OF THE A/C PIPE TO SUPPORT

ENDS WHILE INSTALLING THE SUPPORT COUPLINGS ONTO ENDS.

DATE:
JAN. 1996

REVISION:
MAY 2020

LOWERING WATER MAIN
OR NEW INSTALLATION

DWG. NO.
WAT—8
## Discharge Table for Hydrants*

### Outlet Pressure Measured by Pitot Gage.

<table>
<thead>
<tr>
<th>Flowing Pressure in lb/in²</th>
<th>Outlet Diameter in Inches</th>
<th>U.S. Gallons Per Minute</th>
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<tr>
<td></td>
<td>2 3/8&quot; 2 1/2&quot; 2 5/8&quot; 2 3/4&quot; 2 7/8&quot; 3&quot; 3 1/8&quot; 3 7/8&quot; 4&quot; 4 3/8&quot; 4 1/2&quot; 4 5/8&quot;</td>
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<td>1040</td>
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<tr>
<td>30</td>
<td>960</td>
<td>1060</td>
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</tbody>
</table>

*COMPUTED WITH COEFFICIENT, C = 0.90, TO NEAREST 10 GALS. PER MIN.

**Equipment for Approximating Hydrant Flows (Per R.C. Dennett, Engr. Natl. Bd. of Fire Underwriters):**

The equipment necessary consists of either a standard Pitot tube or a hydrant cap tapped to take a pressure gage. If the hydrant used as a discharge point for flushing has two or more outlets, a pressure gage on one outlet while another outlet is flowing will give approximately the same results as the use of a Pitot tube.
## CHESTERFIELD COUNTY
DEPARTMENT OF UTILITIES

<table>
<thead>
<tr>
<th>PIPE MATERIAL TYPE AND SIZE</th>
<th>MAXIMUM DEFLECTION AT EACH JOINT ((\theta))</th>
<th>DEFLECTIONS (INCHES EACH JOINT) 18’ LAYING LENGTH (S)</th>
<th>RADIUS (MINIMUM) (R)</th>
</tr>
</thead>
<tbody>
<tr>
<td>DUCTILE IRON (PUSH-ON JOINT)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6” TO 12”</td>
<td>2.5’</td>
<td>9.5”</td>
<td>412’</td>
</tr>
<tr>
<td>16”+</td>
<td>1.5’</td>
<td>5.5”</td>
<td>688’</td>
</tr>
<tr>
<td>DUCTILE IRON (MECHANICAL JOINT)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6”</td>
<td>3.5’</td>
<td>13.5”</td>
<td>294’</td>
</tr>
<tr>
<td>8” TO 12”</td>
<td>2.5’</td>
<td>9.5”</td>
<td>412’</td>
</tr>
<tr>
<td>16” TO 20”</td>
<td>1.5’</td>
<td>5.5”</td>
<td>688’</td>
</tr>
<tr>
<td>24”</td>
<td>1.0’</td>
<td>3.5”</td>
<td>1031’</td>
</tr>
</tbody>
</table>

**NOTE:**
ANY DEFLECTION NOT LISTED FOR IRON PIPE MAY BE DERIVED BY:

\[
\begin{align*}
R &= \frac{L}{2 \tan \theta/2} \\
S &= \tan(\theta) \times L \times 12
\end{align*}
\]

R = RADIUS OF CURVE  
L = LAY LENGTH OF PIPE  
\(\theta\) = DEFLECTION ANGLE  
S = JOINT DEFLECTION OFFSET
CHESTERFIELD COUNTY
DEPARTMENT OF UTILITIES

NOTES:
A. WATERLINE PIPE AT CREEK CROSSINGS, RIVERS, SWALES, ETC. SHALL BE DUCTILE IRON (CLASS 51 OR HIGHER). IF WATERLINE IS OFFSET AROUND CREEK CULVERTS, ENTIRE RUN OF OFFSET SHALL BE DUCTILE IRON. ALL FITTINGS SHALL BE INSTALLED WITH AN APPROVED MECHANICAL joint RESTRAINT SYSTEM.
B. NO JOINTS ARE TO BE INSTALLED UNDER THE CREEK, WHERE POSSIBLE.

DATE:
JAN. 1996

REVISION:
MAY 2020
NOTES:
A. WHEN CROSSING UNDER AN EXISTING ASBESTOS CEMENT (A/C) OR CAST IRON (CI) WATER MAIN WITH A NEW PIPELINE OR STRUCTURE, WHERE SUCH CROSSING MAY RESULT IN A STRESS FAILURE TO THE EXISTING LINE, THE EXISTING LINE SHALL BE REPLACED WITH A SECTION OF DUCTILE IRON PIPE PRIOR TO CONSTRUCTION OF THE PROPOSED PIPELINE OR STRUCTURE.
B. WHenever A PROPOSED PIPELINE CROSSES UNDER AN EXISTING WATER MAIN, THE NEW TRENCH SHALL BE BACK FILLED COMPLETELY WITH CRUSHED STONE AND COMPACTED AS REQUIRED.
C. REPLACEMENT GUIDELINES BASED UPON TRENCH WIDTH CRITERIA: CONTRACTOR SHALL USE EXTREME CAUTION WHEN CROSSING EXISTING WATER LINES. WHERE CROSSINGS CANNOT BE ACCOMPLISHED WITHOUT EXCEEDING TRENCH WIDTH AS SPECIFIED BELOW, CONTRACTOR, AT HIS EXPENSE, SHALL REPLACE THE EXISTING A/C OR CI WATER LINE AS DEPICTED BELOW.
1. REPLACE EXISTING 4” TO 6” A/C OR CI PIPE WHERE WIDTH OF NEW TRENCH CROSSING IS GREATER THAN 2 FEET.
2. REPLACE EXISTING 8” A/C OR CI PIPE WHERE WIDTH OF NEW TRENCH CROSSING IS GREATER THAN 4 FEET.
3. REPLACE EXISTING 10” TO 16” A/C OR CI PIPE WHERE WIDTH OF NEW TRENCH CROSSING IS GREATER THAN 6 FEET.
D. PIPELINE TO BE REPLACED SHALL EXTEND A MINIMUM OF 3 FEET BEYOND THE EDGES OF THE NEW TRENCH OR TO SUCH A POINT AS TO PROVIDE A MINIMUM OF 3 FEET OF UNDISTURBED EARTH BENEATH THE EXISTING PIPELINE.
E. 4”x4” SALT TREATED TIMBER SUPPORT MUST BE LEFT AS A PERMANENT STABILIZATION UNDER Voids AND AROUND THE COUPLING OR THE ENDS OF THE A/C PIPE TO SUPPORT ENDS WHILE INSTALLING THE SUPPORT COUPLINGS ONTO ENDS.
F. WHEN CONNECTING TO A/C WATERLINE, THE MACHINED END OF THE NEW PIPE MUST BE REMOVED PRIOR TO INSTALLATION OF THE CAST COUPLINGS.
CHECK VALVE MATERIALS KEY

(A) CLASS 52 D.I. PIPE
(B) SWING CHECK VALVE (MJxMJ)
(C) 12” AND LESS – RESILIENT SEAT GATE VALVE AND BOX
   16” AND LARGER – BUTTERFLY VALVE AND BOX
   (MJxMJ)
(D) 90° BEND (MJxMJ)
(E) ANCHORING TEE (MJxMJ)

NOTES:

1. PROVIDE APPROVED RETAINER GLANDS ON ALL M.J. FITTINGS AND VALVES.
   ALL PIPE AND FITTINGS FROM MAINLINE TEE TO CHECK VALVE TO MAINLINE TEE
   TO BE RESTRAINED. ALL PIPE AND FITTINGS ON MAINLINE TO BE RESTRAINED.
2. ALL FITTINGS SHALL BE ASA A21.10 (AWWA C110).
3. ALL GATE VALVES SHALL BE NON RISING STEM.
4. MJ = MECHANICAL JOINT.
CHESTERFIELD COUNTY
DEPARTMENT OF UTILITIES

1 1/2" SCH. 80 PVC TO GRADE. TERMINATE WITH FLAP VALVE.

1 1/2" GATE VALVE
1 1/2" CHECK VALVE
UNION (TYP.)
1 1/2"x1 1/4" REDUCER
ATTACH TO VAULT WALL
1/2"x6" LG. WEJ-IT ANCHORS AT 6" SPACING (TYP.)

REMOVABLE GRATE W/1" OPENINGS

3"x2 1/2"x5/16"x2'-0" LG. CLIP (2 REQ'D) AT ADJOINING END

NOTES:

1. A SUMP PUMP WILL BE REQUIRED IF THE VAULT OR CHAMBER IS UNABLE TO BE KEPT FREE OF STANDING WATER. SUMP PUMPS MUST DISCHARGE TO LANDSCAPE. CONNECTIONS TO SEWERS (STORM OR SANITARY) OR CATCH BASINS ARE NOT PERMITTED.

2. VAULTS THAT CONTAIN SCADA SYSTEM INSTRUMENTATION AND CONTROLS WILL BE REQUIRED TO HAVE A DUPLICATE SUMP PUMP ARRANGEMENT INSTALLED ON THE VAULT FLOOR. THE TWO SUMP SYSTEMS WILL CONNECT USING A SCH. 80 PVC REDUCER AND 2"x1 1/2" WYE PRIOR TO PENETRATION OF THE VAULT WALL.

DATE: JUN. 2007
REVISION: MAY 2020

SUMP PUMP

DWG. NO. WAT-14
CHESTERFIELD COUNTY
DEPARTMENT OF UTILITIES

SPRING LOADED SAMPLING
VALVE WITH PVC/O-RING
COVER PER SPECIFICATIONS

ANGLE VALVE SHALL
BE VERTICAL AND
ACCESSIBLE.

1'-0" TO 1'-4"

1'-10"

METER BOX

THREADED S.S.
90° BEND

METER SETTER

UTILITIES SERVICE LINE

SECTION

HAND TAMMED UP TO
SERVICE TUBING

3/4"

ADAPTER

CORP. STOP

WATER MAIN

45° PIPE

ENLARGED VIEW

NOTES:

1. COPPER TUBING TO THE CORPORATION STOP MUST BE FLARED OR COMPRESSION.
2. SERVICES SHALL BE INSTALLED PRIOR TO TESTING.
CHESTERFIELD COUNTY
DEPARTMENT OF UTILITIES

WATERLINE BEDDING IN
GOOD SOIL CONDITIONS

SAND, GRAVEL, OR
CRUSHED STONE:
4” FOR PIPE DIAMETERS
THROUGH 24”.
6” FOR PIPE DIAMETERS
30” AND LARGER.

WATERLINE BEDDING FOR
ROCK OR UNSUITABLE
SOIL CONDITIONS

DATE: MAY 2019
REVISION: MAY 2020
BEDDING DETAIL
FOR WATERLINES

DATE: MAY 2019
REVISION: MAY 2020
BEDDING DETAIL
FOR WATERLINES
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<td>Standard Procedures for the County’s Acceptance of Newly Constructed Pump Stations</td>
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<td>Procedure for Installing Water Meters in Commercial and Industrial Developments.</td>
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<td>Water Flow Test Submittal and Approval Procedures</td>
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<td>Site Utilization Survey Form</td>
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<td>Appendix 15</td>
<td>Sizing Water Service Lines and Meters</td>
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<td>Appendix 16</td>
<td>Procedures for Installing 6-Inch Laterals to Existing Sanitary Sewer Lines</td>
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<td>Appendix 17</td>
<td>Blasting Requirements</td>
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</tbody>
</table>


APPENDIX 1

OVERALL WATER & WASTEWATER SYSTEM PLAN REQUIREMENTS

Checklist for overall water/wastewater system plan submission requirements.

1. General plan requirements for both water and wastewater systems:
   - The location of all existing water and wastewater lines with the size, material and reference distance identified. Also, the nearest appurtenance such as a manhole or valve are shown.
   - The accurate locations of all existing utility easements with recordation information. The easements denote the proper width and permanent/temporary status.
   - Existing and proposed storm sewer, gas, or other lines (which may cause a conflict with proposed water and wastewater lines at a time of installation) are shown.
   - All existing and proposed roadways with the name, state route number, and right-of-way widths are shown.
   - Adjacent property owners’ names and GPINs are shown.
   - Proposed, existing, and original ground elevations are shown at 5-foot vertical contour intervals, and includes permanent or established benchmarks within the area.
   - All plans have a north directional arrow, oriented towards the top of the sheet.

2. Wastewater system: Plan includes the following design information:
   - The routing and size of all proposed wastewater lines.
   - All proposed/future connection points and the associated easements for all adjacent properties.
   - A detailed hydraulic analysis for the proposed system, including the overall service area for all trunks and/or sub-trunks, are included with the plans. Also, all the appropriate land use densities for each area are shown. The analysis covers any upstream/adjacent properties and, as deemed necessary, any portions of the downstream system.

3. Water System: Plan includes the following design information:
   - The proposed size and routing of all water lines.
   - The location of stubs and easements (if necessary) for future service too adjacent properties.
   - The location of the closest existing valve(s) from the proposed tie.
   - Development densities for each area within the proposed development.
APPENDIX 2

DEVELOPERS CHECKLIST FOR UTILITIES CONSTRUCTION

The following steps must be completed before the County will permit the Utilities Contractor to start construction:

☐ The project plan has been approved by the appropriate agencies and written verification has been furnished to the Department of Utilities.

☐ The developer has submitted the “Information Required For Utilities Contract” form and a copy of the “accepted” unit price bid proposal between the owner and the utilities contractor to the Utilities Department plan reviewer.

☐ Two copies of the utilities contract have been executed and returned to the County.

☐ All off-site and on-site easements, not included in a subdivision plat for the project, have been dedicated to the County.

☐ The Utilities Contractor has obtained the highway permit, if required, and sent a copy of the permit to the Utilities Department, Construction Section.

☐ The erosion control measures for utility construction have been installed and approved by the County Environmental Engineering Department.

☐ Prior to the installation of water mains, the Developer’s engineer has submitted his certification that:
  1. All pavement and shoulder areas within the right-of-way are graded to within 6” of sub grade.
  2. All ditches and slopes to 1 foot outside the right-of-way have been graded to final grade.
  3. Markers for the sewer laterals are visible.
  4. All necessary property pins have been installed.
APPENDIX 3

INFORMATION REQUIRED FOR UTILITIES CONTRACT
(PLEASE TYPE OR PRINT)

Project Name: ___________________________________________________________

Project Address: __________________________________________________________

Agent’s Name: ___________________________ Phone: __________________________

Mailing Address: __________________________________________________________________

Property Owner: ___________________________ Phone: __________________________
(Must be owner of property for which utilities are being extended to serve)

Mailing Address: __________________________________________________________________

Email Address: __________________________________________________________________

Name of Person Signing: ______________________________________________________

  ☐ Corporation:
    Signer’s Title _____________________________________________________________
    State where Corporation Organized __________________________________________

  ☐ Partnership
    State where Partnership Organized __________________________________________

  ☐ Limited Liability Partnership

  ☐ Individual

Note: If person signing the contract is not an officer of the corporation or partnership, a certified copy of the Corporate/Partnership Resolution authorizing that person to sign such documents must be attached to the County/Developer contract.

Legal Description: (Lot and Block Number and GPIN as property exists):

________________________________________________________________________

Magisterial District: _______________________________________________________

Deed Book: ___________________________, Page: _____________________________
Utility Contractor: __________________________________________

Phone No.: __________________________ Fax No.: __________________________

E-Mail Address: _________________________________________________

If the utilities work is subcontracted:

General Contractor: ____________________________________________

Phone Number: ________________________________________________

E-Mail Address: ________________________________________________

Subcontractor (Utility Contractor): _________________________________

Phone Number: ________________________________________________

E-Mail Address: ________________________________________________

I certify that the above information is true and correct.

Signed:

________________________________________
Owner/Agent

________________________________________
Date

Return to: Development Section
Department of Utilities
Post Office Box 608
Chesterfield, VA 23832-0009
APPENDIX 4

CONTACTING PROPERTY OWNERS – SAMPLE LETTER

(ENGINEER’S/SURVEYOR’S LETTERHEAD)

(Date)

(Property Owner’s Name)
(Address)

Re: County Project #____________

Dear (Property Owner’s Name),

Our firm has been retained to design a water/sewer line to become a part of Chesterfield County’s overall utility system. In conjunction with this, surveying is the first phase of work that must be completed.

Information obtained by this survey will allow our firm to recommend a location taking into consideration existing trees, shrubs, creeks, etc. Should you have any trees or topographic features you wish preserved, we would appreciate being advised so that we may consider these in our design.

After surveys and design are complete, you will be contacted should it become necessary to obtain easements for construction.

We propose to start survey work on or near your property within ten days to two weeks. Should you have any questions concerning either the survey or utility line, please contact this office at (Engineer’s phone number) to discuss this matter.

Your cooperation in this matter is greatly appreciated.

Sincerely,

___________________________________

cc: Chesterfield County Department of Utilities
## APPENDIX 5

**UTILITIES DEPARTMENT**

**ENGINEER’S CHECKLIST FOR WATER AND SEWER PLANS**

Project Name: 

Project Number: 

Planning Case #: 

### General Plan Items – Title Page:

<table>
<thead>
<tr>
<th>Item #</th>
<th>Yes, No or N/A</th>
</tr>
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<tbody>
<tr>
<td>1</td>
<td>Project Name</td>
</tr>
<tr>
<td>2</td>
<td>Engineer’s or Class B Surveyor’s Seal and Signature</td>
</tr>
<tr>
<td>3</td>
<td>Vicinity Sketch (complete in detail)</td>
</tr>
<tr>
<td>4</td>
<td>Index of Drawings matches each sheet</td>
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<tr>
<td>5</td>
<td>GPIN and/or Tax Map and Parcel Number</td>
</tr>
<tr>
<td>6</td>
<td>Magisterial District</td>
</tr>
<tr>
<td>7</td>
<td>Name, Address, Phone Number and Email Address of Developer/Owner</td>
</tr>
<tr>
<td>8</td>
<td>Legend of sanitary sewer and water mains, other utilities, structures, existing and proposed ground, and pavement profile.</td>
</tr>
<tr>
<td>9</td>
<td>“Miss Utility” note</td>
</tr>
<tr>
<td>10</td>
<td>Utilities Project Number</td>
</tr>
<tr>
<td>11</td>
<td>Materials List with Public and Private Utilities delineated</td>
</tr>
</tbody>
</table>

### General Plan Items – All Projects:

<table>
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<th>Item #</th>
<th>Yes, No or N/A</th>
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</thead>
<tbody>
<tr>
<td>12</td>
<td>Chesterfield Utilities Standard Notes (DES-2) are shown. Acceptable locations are on the cover sheet, utility sheet or notes &amp; details sheet.</td>
</tr>
<tr>
<td>13</td>
<td>The plan includes an overall project view sheet(s) including water and sewer layout to verify appurtenance spacing and/or sequencing of multi-phase developments.</td>
</tr>
<tr>
<td>14</td>
<td>All sheets in set bear an appropriate signed and dated seal.</td>
</tr>
<tr>
<td>15</td>
<td>Vertical scale is 1” = 5’ or 1” = 10’; horizontal scale is no greater than 1” = 50’, unless otherwise approved by the Department. A “bar” scale is shown on each sheet.</td>
</tr>
<tr>
<td>16</td>
<td>No structures are proposed in a water or sewer easement. This includes retaining walls and masonry dumpster enclosures.</td>
</tr>
<tr>
<td>17</td>
<td>Vertical benchmarks (BM) are shown on the plan. A minimum of one BM is required.</td>
</tr>
<tr>
<td>18</td>
<td>Coordinate system NAD 83 is used.</td>
</tr>
<tr>
<td>19</td>
<td>All existing water and/or sewer lines are properly labeled with size and material and County Project Number. Applicable horizontal and vertical distances are referenced on the plan.</td>
</tr>
<tr>
<td>20</td>
<td>Adjacent property owner name(s) and all property lines and property markers (stones, rods, pins, pipes, monuments, etc.) are shown.</td>
</tr>
<tr>
<td>21</td>
<td>All existing easements are shown accurately and reflect the appropriate recordation information. Proposed water and/or sewer easements are shown on the plans with the appropriate width based on the location and depth of the utility located within it. Note that larger lines and/or depth exceeding 15’ may require and easement wider than the minimum or 16’ for future maintenance.</td>
</tr>
<tr>
<td>22</td>
<td>Road names, state route numbers and right-of-way widths are shown.</td>
</tr>
<tr>
<td>23</td>
<td>All existing and proposed storm sewer lines, gas, telephone, power, and other utility lines, which cross or run parallel to the sewer or water mains, are shown with horizontal and vertical separations given, where applicable. Verify proposed utilities do not conflict with sediment ponds or BMPs.</td>
</tr>
<tr>
<td>24</td>
<td>All water, sewer, road, and drainage structures are shown on same plan sheet to verify crossings and potential conflicts.</td>
</tr>
<tr>
<td>25</td>
<td>Location of existing houses, buildings, fences, wells and other structures are shown on plans. In lawn or kept areas, trees and shrubs in the easements are shown (size and type).</td>
</tr>
<tr>
<td>26</td>
<td>All existing water and/or sanitary sewer that is proposed to be demolished or abandoned are so labeled. This includes existing wells that are “To be abandoned per VDH requirements” and so labeled. Manholes to be abandoned have appropriate detail and are filled with sand with holes punched in the bottom.</td>
</tr>
<tr>
<td>27</td>
<td>North Arrow is reflected on all plan sheets.</td>
</tr>
<tr>
<td>28</td>
<td>Proposed, and original ground elevations are shown on profiles.</td>
</tr>
<tr>
<td>29</td>
<td>If horizontal bore is required, bore location, length and thickness of casing pipe, and pit location are shown. This should be reflected on the plan and profile.</td>
</tr>
<tr>
<td>30</td>
<td>Proposed water and/or sewer lines are shown with reference distances from right of way, boundary, buildings, other utility lines, face of curbing, etc.</td>
</tr>
<tr>
<td>31</td>
<td>Detail drawings of all stream crossings and storm sewer outlets, with elevations of the stream bed and high (100-year flood elevation) and normal water elevations.</td>
</tr>
<tr>
<td>32</td>
<td>Location and dimensions of all existing (if applicable) and proposed water and sewer service connections are shown. A</td>
</tr>
</tbody>
</table>
typical (TYP) of each may be labeled per sheet in-lieu of labeling each individual service for residential subdivisions.

33  All “private” water and sewer lines or facilities are to be so labeled in both plan and profile.

34  Water & sewer lines installed by open cut method (in lieu of bores or directional drilling methods) within roadways or shoulders use 100% select backfill (stone) per VDOT specifications.

<table>
<thead>
<tr>
<th>Item #</th>
<th>Yes, No or N/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>35</td>
<td>Plans show all fittings, fire hydrants, and valves including sizes. Each appurtenance is properly labeled in plan view and profile.</td>
</tr>
<tr>
<td>36</td>
<td>Profiles are provided for all main water lines.</td>
</tr>
<tr>
<td>37</td>
<td>All conflicts with storm sewers and other utility lines are shown with appropriate design changes shown. A minimum of eighteen (18) inches of vertical clearance has been designed and obtained at all crossings of other utilities, or as specified by other utility agencies, or otherwise approved by the Department.</td>
</tr>
<tr>
<td>38</td>
<td>All water mains have a minimum of 3.5 feet of cover, unless otherwise approved by the Department. Additionally, waterlines along roads with the potential for “cut-in” entrances should be installed at least 4’ (to top of pipe) below the E/P.</td>
</tr>
<tr>
<td>39</td>
<td>Fire hydrants and air relief valves are shown on plans and profile (generally required at high points on larger diameter mains). All fire hydrants are located on &gt; 8&quot; lines.</td>
</tr>
<tr>
<td>40</td>
<td>All water services are shown. Each lot in a residential development must have one shown on the plan. Typical (TYP) text labeling may be used.</td>
</tr>
<tr>
<td>41</td>
<td>Plans show all connections to existing mains and clarifies tapping sleeve and valve or cut-in tee. If a cut-in tee is proposed, ensure this can be accomplished with minimal disruption of service to existing customers.</td>
</tr>
<tr>
<td>42</td>
<td>Water main stubs for future extensions are designed to be installed beyond the edge of pavement and an easement provided where applicable. Provide a valve and a full &quot;stick&quot; of pipe to minimize water service outage when the line is extended in the future.</td>
</tr>
<tr>
<td>43</td>
<td>For water main tie-ins, the plans show and denote the valve(s) to be used for cut off during the tie-in.</td>
</tr>
<tr>
<td>44</td>
<td>Lines are looped where feasible and cross-country lines are minimized or avoided.</td>
</tr>
<tr>
<td>45</td>
<td>Subdivisions with more than 50 lots shall have a second supply point for water that is generally independent of the first connection.</td>
</tr>
<tr>
<td>Item</td>
<td>Description</td>
</tr>
<tr>
<td>------</td>
<td>-------------</td>
</tr>
<tr>
<td>46</td>
<td>All service lines below the elevation that will result in pressure greater than 80 psi must be noted to have PRVs on the customer side of the meter.</td>
</tr>
<tr>
<td>47</td>
<td>Do all water stub-outs for future extensions have an appropriate easement?</td>
</tr>
<tr>
<td>48</td>
<td>Backflow prevention device is shown as required for the commercial service for the type of use.</td>
</tr>
<tr>
<td>49</td>
<td>A valve is provided on the fire line upstream of the DC but downstream of the WM and/or dedicated fire hydrant to isolate the DC.</td>
</tr>
<tr>
<td>50</td>
<td>Water meter sizing forms for commercial meters are included for review.</td>
</tr>
<tr>
<td>51</td>
<td>Water meter sizing forms for irrigation meters are included for review.</td>
</tr>
</tbody>
</table>

### Sewer:

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>52</td>
<td>All sanitary sewer plans are labeled with size, grade, length, type, and class of pipe (with backup calculations on the type &amp; class pipe needed, where applicable). Note from 14-20’ deep requires an extra foot of stone over the top of the pipe and over 20’ deep generally requires ductile iron pipe.</td>
</tr>
<tr>
<td>53</td>
<td>Manholes are labeled with top and invert elevations, and locations, size and inverts of drop stacks when a vertical drop exceeds 2 feet.</td>
</tr>
<tr>
<td>54</td>
<td>Deflection angles at all manholes are shown on the plans.</td>
</tr>
<tr>
<td>55</td>
<td>Minimum finished floor elevations and basement elevations are to be shown on plans, where applicable. If gravity sewer service cannot be provided to a lot it should be noted on the plans.</td>
</tr>
<tr>
<td>56</td>
<td>All manholes are designed to an elevation 6” above the 100-year floodplain elevation as set forth in the design standards, unless otherwise approved by the Department.</td>
</tr>
<tr>
<td>57</td>
<td>All pipes between manholes are of like material and class.</td>
</tr>
<tr>
<td>58</td>
<td>All temporary and/or permanent silt basins or BMP facilities are shown and the sewer lines and manholes have been designed around these structures.</td>
</tr>
<tr>
<td>59</td>
<td>All proposed sewer laterals are shown on the plans. Each lot in a residential development shall have one. Typical (TYP) text labeling may be used. Each commercial building which is metered separately shall have its own lateral.</td>
</tr>
<tr>
<td>60</td>
<td>All sewer lines are designed with the entry into the manhole by the proposed sewer lines at an angle of 90 degrees or greater to the downstream line, unless an exception is given. Provide additional drop across MH if less than 90 degrees.</td>
</tr>
<tr>
<td></td>
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<tr>
<td>---</td>
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</tr>
<tr>
<td>61</td>
<td>Where new manholes are proposed over existing lines, distance from the new manhole to the two existing manholes is shown; inverts of the manhole and each existing manhole are shown; slope of existing line from new manhole to upstream and downstream existing manholes is shown.</td>
</tr>
<tr>
<td>62</td>
<td>Locations of special features (concrete encasement, rip-rap stabilization at creek crossings, clay dams, etc.) are shown on the plans. Details have been provided as appropriate or reference is made to standard details.</td>
</tr>
<tr>
<td>63</td>
<td>Match pipe crown elevations at manholes where main sewer line diameter increases.</td>
</tr>
<tr>
<td>64</td>
<td>Manhole spacing does not exceed 400 linear feet.</td>
</tr>
<tr>
<td>65</td>
<td>All sanitary sewers constructed in fill shall be of ductile iron sewer pipe (Class 52 minimum) with manholes founded on original ground. This may require a false bottom.</td>
</tr>
<tr>
<td>66</td>
<td>Manhole inserts are required for all manholes that are flush with grade.</td>
</tr>
<tr>
<td>67</td>
<td>Where sewer lines are located between lots, sewer services to the lots on either side shall be placed near either the front or rear building set-back line, depending on at which set-back line the sewer is closer. In no case shall services be installed within the building envelope unless a detailed house location plan is provided showing the service will not be located immediately adjacent to the house.</td>
</tr>
<tr>
<td>68</td>
<td>A site utilization form has been submitted.</td>
</tr>
<tr>
<td>69</td>
<td>If necessary, a sampling manhole has been provided.</td>
</tr>
<tr>
<td>70</td>
<td>The domestic waste line has been plumbed in downstream of the grease trap or oil &amp; grit separator.</td>
</tr>
</tbody>
</table>

I certify that the above items related to water and sewer construction with this project have been addressed accordingly.

Date:  

Engineering Firm:  

Engineer’s Name:  

(Printed Name)  

(Signature)
APPENDIX 6
REVIEW PROCEDURE FOR WATER AND/OR SEWER PLANS
(Developer Projects)

Prior to construction of public water and/or sewer facilities and issuance of any building permits, water and/or sewer plans must be submitted to and approved by the Department of Utilities.

A. A Professional Engineer must design the water and sewer plans, in Civil Engineering or Professional Surveyor with a Class B license who is registered by the State of Virginia. The plans must conform to the County’s latest overall water and sewer master plan and the Engineers Checklist for Water and Sewer Plans (see Appendix 5).

B. The engineer shall coordinate the location of all proposed water and/or sewer lines within all existing and proposed road rights-of-way with regard to existing and proposed roads and drainage structures. In addition, coordination shall be made with other appropriate utility companies and agencies, i.e., Virginia Power, Verizon, Comcast, gas companies, railroad rights-of-way, VDOT, State Health Department, etc. with regard to their existing easements, rights-of-way, and facilities.

C. The engineer must submit a copy of the checklist with his/her certification that the plans reflect all applicable items on the checklist. The plans will be reviewed and a review comments will be provided to the engineer. When the revisions are made, the engineer must resubmit the plans for final review. A letter of approval will be sent when all the County criteria are met. Four sets of additional plans shall be sent once all the approvals are granted for construction purposes.

D. Prior to the beginning of construction, all water and/or sewer easements outside the boundaries of the new subdivision and/or within a complex not recorded by a subdivision plat, must be dedicated to the County. The developer is to provide a check payable to the Clerk of the Circuit Court in the amount of the recordation costs when the executed easements are returned to the Chesterfield County’s Right-of-Way Section. The Right-of-Way Section will calculate the charge and inform the developer. When a VDOT permit is required to install the water and/or sewer line, the engineer must follow the “Review Process for Water and Sewer Lines in VDOT’s Right-of-Way” (see Appendix 7). A letter from VDOT accepting the location of the water and sewer lines in the right-of-way and design of the pavement replacement is required prior to approval of the water and sewer plans. The developer is responsible to have a copy of the highway permit sent to the Department of Utilities prior to the start of construction within the VDOT highway.

E. The developer must enter a Contract with the Department. A copy of the accepted bid proposal and a completed copy of “Information for Utilities Contract form” are required to prepare the Contract. The unit price bid
proposals shall be based on the approved water and sewer plans and all work must be performed by an acceptable licensed utilities contractor. Where County refunds are in the contract, the developer is required to adhere in strict accordance with the current policies and ordinance. The Board of Supervisors must approve the contracts where refunds are involved, prior to the contractor beginning construction. The developer must allow sufficient time (2-3 weeks) for the contracts with refunds to be approved by the Board of Supervisors.

F. Before the utilities contractor can start work, all requirements outlined in Appendix 2 must be met. Also, prior to the release of any on-site work, County Environmental Engineering Department must approve the erosion control devices for the subdivision.

G. Upon meeting all the above criteria, plans will be turned over to the Construction Section for the issuance of notice to proceed. The contractor must give the Inspection Section at least 48 hours’ notice before construction may begin. At such time, a pre-construction meeting may be required and if so, shall be arranged by the contractor and the Inspection Section. Notification shall be given to the Inspection Supervisor at (804) 751-4651.
APPENDIX 7

REVIEW PROCESS FOR WATER AND SEWER LINES IN VIRGINIA DEPARTMENT OF TRANSPORTATION’S RIGHT-OF-WAY

1. Horizontal location of proposed water and/or sewer lines within the existing VDOT right-of-way will be reviewed and approved by VDOT. In addition, the pavement replacement detail must be approved by VDOT.

2. The Engineer and/or his agent will be required, with VDOT’s assistance, to determine the type of existing pavement. **To determine the type of existing pavement, VDOT shall require coring’s to be taken every 1,000 feet +/-.**

3. The Engineer will be required to submit to the VDOT the applicable sheets of the proposed water and/or sewer plans which reflect the proposed lines in relation to the existing right-of-way plus show and identify the type of pavement that exists along with any sample pavement coring’s.

4. VDOT and the County will discuss any pavement replacement requirements that do not conform to the “Description of Water and Sewer Lines in the Right-of-Way” last dated or any requested shift in the alignment.

5. Prior to the water and/or sewer plans being approved by the Department of Utilities, VDOT will send a written response (with a copy being sent to the Utilities Department) to the Engineer within 15 days with their comments and/or approval of the water and/or sewer line(s) location and pavement replacement detail.

6. Prior to the release of water and sewer work, County’s Environmental Engineering Department shall approve the erosion control measures proposed within State Right of Way.
Commercial/Industrial

All fire sprinkler system services may be un-metered and shall be equipped with an approved backflow preventer to assure protection of the public water supply from contamination. Backflow prevention devices will be installed in an approved vault or above-ground structure as near to the property line as possible or inside the building when conditions permit. The Utilities Department maintenance responsibility will end at the outside edge of the vault or above-ground structure or the isolation valve if the backflow prevention device is located inside the building.

1. The Department of Utilities will perform plan review of the proposed water line extension up to the outside edge of the vault or above-ground structure and the plan review of the backflow assembly itself to assure the proper device is installed per regulations. For all pipe runs, a gate valve shall be installed at the tee to the main. In all cases, the Engineer shall provide details illustrating what type of anchoring will be used on the inlet side of the assembly, so that the OS&Y valve (inlet side) of the backflow preventer will not blow off when the device is removed.

2. The Chesterfield County Fire and EMS Fire & Life Safety Division will review from the OS&Y gate valve located on the inlet side of the backflow preventer up to and including the building. The Chesterfield County Fire and EMS Fire & Life Safety Division will also review the vault or above-ground structure for compliance. A separate plan submission is required for Chesterfield County Fire and EMS Fire & Life Safety Division approval. In addition, the submittal to the Chesterfield County Fire and EMS Fire & Life Safety Division shall include underground pipe size, length, location, materials, point of connection to County main, vault details, and what type of restraining devices (thrust blocks, retainer glands, flanged pipe & fittings, etc.) will be installed.

3. An auxiliary fire permit issued by the Building Inspector’s Office, along with four (4) sets of plans, is required for the work from the vault to the building and shall be applied for by the installing contractor from the Building Inspector’s office and plans submitted to and reviewed by the Chesterfield County Fire and EMS Fire & Life Safety Division.

4. The Chesterfield County Fire and EMS Fire & Life Safety Division will review the location of the vault or above-ground structure for the backflow preventer at such time a utilities plan is submitted to the Department of Utilities.

5. The vault or above-ground structure shall be located at or as near to the property line as possible and out of the main flow of traffic.

6. The vault or above-ground structure shall be designed and constructed in accordance with Utilities Department Specifications and Standard Details.
The location will be reviewed by both the Department of Utilities and Chesterfield County Fire and EMS Fire & Life Safety Division for optimum placement. The review of the site plan is not a detailed review of the water and sewer design when it involves the relocation and/or extension of the public system. However, the site plan (the applicable sheets of the site plan) must reflect the approved water and sewer design and show the exact location of the existing facilities. Therefore, it is important that the Engineer submit utilities plans directly to the Department of Utilities at the same time or as near that time to avoid any unnecessary delays in the approval of the site plan and release of the building permit.

Installation of backflow preventer assemblies other than at the property line shall be approved by the Chesterfield County Fire and EMS Fire & Life Safety Division. In these instances, a gate valve will be installed at the property line and/or edge of water line easement to designate the point at which Utilities Department responsibility ends.

Under any circumstances where a Siamese connection is required, it will be installed on the outlet side of the backflow preventer assembly. Where internal fire pump is installed, the Siamese connection shall be installed downstream of the pump.

Upon making application for water service, applicants who wish to separate their fire line service must have this reflected on the site plan and the Utility plan (Engineer is required to submit for review and approval a separate utility plan to the Utilities Department’s Review and Design Section) indicating the size line needed for the fire demand and the size water meter and service line for the domestic use. The installation of 2” and smaller fire line and water meter service line and box must comply with the applicable details in the Standard Details Section. The applicant must indicate clearly on the water meter sizing form his desire to separate the fire service, otherwise, the water meter and appurtenances will be installed without regard to fire service and applicant will be subject to additional expense to correct the situation.

Where the applicant cannot accomplish combining the fire/domestic services in the manner described above and/or a separate fire line is needed where there already exists a water meter service, all work must be performed by a licensed utilities contractor approved by the Department of Utilities.

**RESIDENTIAL**

This section is intended for use exclusively to meet the requirements for NFPA 13D- *Standard for the Installation of Sprinkler Systems in One & Two-Family Dwellings and Manufactured Homes.*

Water services for all other residential fire sprinkler systems are handled in accordance with the Commercial/Industrial section of this requirement.
1. Each lot intended for a single-family residence will be supplied through a maximum of a one-inch (1”) water service and a maximum of a one-inch (1”) water meter.
2. Companion meters used for outside irrigation will not be allowed to be connected to the water service line for a meter serving a residence equipped with a sprinkler system.
3. The fire sprinkler system design engineer shall use the same water pressure data that was used for the design of the public water system for that residential development.
4. The Chesterfield County Fire and EMS Fire & Life Safety Division will be the sole approving authority for the design of all residential sprinkler systems and they must approve the type of system (multi-purpose or separated) to be installed.
5. If a residential unit is equipped with a multi-purpose system, the Chesterfield County Fire and EMS Fire & Life Safety Division will notify the Utilities Department-New Construction Supervisor in writing, to tag the water service account as such and state this on the meter application. When the water meter is installed, a water-resistant tag will be attached to the lock ring on the meter yoke stating “Fire sprinkler system supply.”
6. If a residential unit is equipped with a separate sprinkler system, the Chesterfield County Fire and EMS Fire & Life Safety Division will notify the Utilities Department – Cross Connection Coordinator in writing and advise us of the type of system installed and the location. This type of installation will require an approved backflow prevention device to be installed and maintained in accordance with the Utilities Department Cross Connection Control and Backflow Prevention Program.
7. The cost associated with retrofitting the water service to accommodate a separated fire sprinkler system will be the responsibility of the builder.
8. To eliminate the potential for water theft the Utilities Department highly recommends the installation of a flow switch with an audible alarm to be mandatory on all separated residential sprinkler systems. The flow switch shall be installed downstream of the backflow device.
APPENDIX 9

STANDARD PROCEDURES FOR THE COUNTY’S ACCEPTANCE
OF NEWLY CONSTRUCTED SPECIAL PROJECTS

I. Pre-Construction Phase

A. A pre-construction meeting is set up by the construction inspector.
   1. This meeting will include the design engineer, inspector, contractor, developer, and plan reviewer.
   2. The contractor will furnish to the inspector a detailed construction schedule.
   3. Discuss preparation of operations and maintenance manual and subsequent application for certificate to operate issued by the Virginia Department of Health (water) or Virginia Department of Environmental Quality (wastewater).
   4. The design engineer will furnish minutes.

B. A notice to proceed is issued by Construction Inspection Section to the contractor.

II. Construction Phase

A. Daily, thorough inspection of construction carried out by the inspector.
   1. The inspector will be responsible for daily reports addressing project status and construction problems.
   2. In the case that the project is not progressing on schedule, the inspector is to send a written notification to the developer, with a copy to the contractor, the Development Section, and the design engineer advising them of the delay.

B. Monthly meetings will be set up by the inspector which will include the design engineer, contractor, inspector, and plan reviewer with the minutes supplied by the design engineer.

C. Once the construction is complete, the developer shall submit a letter of completion insuring that all work has been completed. This will include electrical work, water services, telecommunication work, SCADA, etc. This letter will include the Building Inspectors Office approval and will request a startup inspection ten days in advance. This letter is to be sent to the construction inspector.

III. Start Up Inspection

A. The inspector schedules a startup inspection by sending a written notification to the design engineer, contractor, Operation and Maintenance Section, the Development Section, and the developer where applicable.
B. An extensive inspection is carried out by the Development Section, Operations and Maintenance, Inspection, and the design engineer.

1. All equipment is to be operated.
2. All other facilities per plans and contract documents are inspected.
3. The inspector develops the punch list.

C. Inspection will write a letter addressing all deficiencies and send it to the developer with a copy to the contractor, design engineer, the Operations and Maintenance Section, and the Development Section. This letter will also request a time frame for repairs.

1. The developer must submit in writing, to the inspector, a period, and a date that repairs will be finished, with a copy of the letter sent to: Operations and Maintenance, the Development Section, the design engineer, and the contractor.
2. The contractor shall notify the inspector 24 hours prior to making any repairs or additions regarding the punch list.
3. The developer is required to respond, in writing, to the inspector certifying the completion of the punch list with a copy sent to the design engineer.
4. The developer shall request in writing from the inspector a pre-final inspection within ten days after completion of the punch list.

IV. Interim –Start Up – Pre-Final

A. The inspector is responsible for keeping lines of communication open between Inspection and all parties. He is to keep the job progressing.

B. Through-out this period no service connections will be allowed. The county will not be held responsible for the cost of the associated utilities, or operation and maintenance of the facility.

V. Pre-Final Inspection

A. Inspection sets up a pre-final inspection by sending a written notification to the design engineer, the contractor, the Development Section, Operations and Maintenance and the developer.

B. Re-inspecting the facility

1. All equipment is to be operated.
2. All punch list items must be complete to the satisfaction of the inspector.

C. If facility deficiencies are still noted, repeat procedures detailed in Start Up Inspection.

VI. If Facility Passes Pre-Final Inspection
A. A letter will be required from the design engineer indicating that the project has reached a stage of substantial completion. In this letter a statement that all requirements for the facility have been fulfilled will be included.

B. The design engineer must submit three copies of the operations and maintenance manual to the Operations and Maintenance Section and send enough copies to the Virginia Department of Health (water) or Virginia Department of Environmental Quality (wastewater).

C. The design engineer is responsible to obtain the Certificate to Operate prior to putting the facility into operation, with a copy of the certificate being sent to Inspection, Operations and Maintenance, the developer, and the contractor.
   1. The Engineer sends a letter to the Virginia Department of Health (water) or Virginia Department of Environmental Quality (wastewater) certifying that the facility has been built in accordance with the approved plans and specifications.

D. The Virginia Department of Health will issue the Certificate to Operate.

E. The inspector is required to notify the Development Section in writing that the facility is acceptable.

F. Upon receipt of the completion statement, the Development Section will issue a letter to the developer stating the acceptance of the facility.

G. Connections will be allowed to the facility at this point in time.

H. The operational costs (power, telephone, etc.) are assumed by the county at this time.

I. Equipment warranties and yearly acceptance begin at this time.

J. The contractor is responsible for furnishing evidence of sufficient bonding during the warranty period.

K. County operations and maintenance begin at this time.

L. Procedure for handling equipment failures that are covered by warranty are carried out if necessary.
   1. Operation and Maintenance contacts the inspector in writing.
   2. The inspector notifies the developer in writing indicating the degree of the problem and when the repairs must be completed.
   3. The developer will make the necessary repairs and will send a letter to the Development Section indicating that the necessary repairs are complete with a copy sent to the design engineer, the inspector, and the Operations Maintenance Section.

VII. Final Inspection

A. The inspector sets up a final inspection by sending a written notification to the design engineer, the contractor, the Operation and Maintenance Section, the Development Section, and the developer. This inspection will take place during the final month of the warranty period.
B. All remaining equipment problems should be resolved. The punch list created by Operation and Maintenance throughout the year should be used as the checklist.

C. After the facility passes the final inspection
   1. The Development Section will send a written statement stating that the county accepts full responsibility of the facility to the developer with a copy to the design engineer, the inspector and the Operations and Maintenance Section.
   2. Operation and Maintenance Section assumes full responsibility for the station.

VIII. General

A. Full open communication between Development, Inspection, design engineer and Operation and Maintenance is mandatory.

B. All correspondence, being written, verbal, or by telephone, etc., must be appropriately documented by all parties.

C. The Inspection Supervisor is responsible for making sure all inspection duties are carried out properly.
APPENDIX 10

PROCEDURE FOR INSTALLING WATER METERS
IN COMMERCIAL AND INDUSTRIAL DEVELOPMENTS

1. All commercial and industrial developments (Shopping centers, Sites, etc.) will be treated the same as residential development where New Water Lines are being installed.

2. Developer or his agent will be required to complete the water meter sizing forms and submit them to the Utilities Department’s Development Section at the same time plans are submitted for review.

3. A map clearly depicting location of buildings, etc., must be submitted by the Developer or his agent. Same information must be shown on the water plans.

4. Engineer is required to incorporate with his plans a detail of the method to installing meters.

5. All appropriate notes, details, etc. are to be shown on plan.

6. Contract between the developer and contractor shall include the installation of the water meter services and boxes.

7. Developer shall be responsible for informing all builders that the water and sewer connections fees must be paid prior to the County forces setting water meters.

8. Connection fees shall be as stated in ordinance.

9. Engineer and contractor shall refer to the County Standard Detail Drawings and the latest revised “Approved List of Manufacturers, Materials and Specifications” for approved method for designing and constructing the water meter assemblies.

EXCEPTIONS:

On projects where utility contractors are involved in any new construction, the contractor shall perform all service taps and install services, including taps on existing lines. Where no utility contractor is assigned to project, county shall perform all service taps 2” and smaller on existing waterlines. Contractors shall perform all taps larger than 2”.
APPENDIX 11

PROCEDURES FOR COORDINATING
PROPOSED WATER LINE DESIGNS WITH
EXISTING SEPTIC TANK AND DRAIN FIELD SYSTEMS

A. Investigation during preliminary design

1. Coordination by the County’s and/or Developer’s Design Engineer should be initiated through the Utilities Department reviewer, and once the local Health Department has assigned appropriate staff to handle the request, then the Engineer is to work directly with their staff.

2. Design Engineer is to contact the local Health Department and work closely with their staff to determine location of existing septic tank and drain field lines; condition of septic tank and drain field systems; etc.

   If repairs are determined to be needed, the local Health Department must issue a repair permit.

3. Design Engineer is to obtain information, advice, etc. from local Health Department regarding the alteration of existing system, i.e., design criteria; and to find out if it is even possible to alter system.

B. Design Engineer shall identify areas where conflicts will occur or may likely occur.

C. Design of the proposed water line must be done to avoid conflicts, or where it is not practical to do so, the septic tank and drain field system shall be altered or redesigned to avoid proposed water line.

D. In cases where alterations of the drain field systems are likely to occur, the Design Engineer shall have bid proposal reflect a bid item to include such work.

E. The alteration work must be done prior to start of water line in the area of the conflict and this reflected in the bid documents.

F. The Utilities Construction Section’s inspector shall work closely with the local Health Department to ensure that the contractor obtains appropriate inspections.
APPENDIX 12

WATER FLOW TEST SUBMITTAL AND APPROVAL PROCEDURES

The following procedures must be adhered to by the developer or his agent to insure and verify that public water is available to meet the fire flows and domestic demands as required to serve an existing and/or proposed development:

I. Start Point
   The developer’s engineer must request a hydraulic modeled flow test at the start of design for their project. This “start point” request must be submitted in writing (faxes and emails are accepted) and must include the following information:

   A. A sketch, map, or section of plan sheet that clearly shows the location of the proposed tie-in point(s) or the hydrant(s) nearest to the proposed tie-in point (s) where the start point test(s) are to be run.
   B. A fax number or email address to return the results to the engineer.

II. Site Plan Process
   Once the engineer has the “start point” results and completes their design of the project, results of hand written or modeled flow calculations supporting their design must be submitted directly to the Utilities Department for review and approval. These results shall include the following information:

   A. Static pressures at all on-site hydrants and the sprinkler system connection (the hydrant, tee, reducer, or other fitting nearest to the public side of the double check assembly).
   B. Verification that the required ISO total flow requirements can be supported by the on-site hydrants. The ISO calculation sheet must be included in the submittal. The ISO total flow requirements must be divided between the on-site hydrants and the test run simultaneously. The ISO calculation sheet will indicate the required flow and the number of hydrants required for the site.

   1. If the number of hydrants on the site plan matches the number of hydrants indicated as needed on the ISO calculation sheet, each hydrant is first tested at 1500 gpm and then the flow test is run by dividing the ISO required flow evenly among the new hydrants and running the hydrants simultaneously.

   2. If the number of hydrants on the site plan exceeds the number of hydrants indicated as needed on the ISO calculation sheet (this may occur due to spacing or other considerations), then an additional test must be performed prior to performing the ISO test. Each hydrant on the site plan must be tested at 1500 gpm each individually and the residual pressure for each hydrant recorded. The ISO test is then performed by flowing several hydrants equal to the amount
indicated as needed on the ISO calculation sheet, and by dividing the ISO required flow evenly among the ISO required hydrants and run simultaneously. The hydrants to be flowed in this test are determined by using the hydrants with the lowest residual pressures in the individual test. The remaining hydrants will not be used in the simultaneous test.

C. A mailing address, fax number and email address for the engineer.

The flow test information must be submitted in the form of a sketch and table and may be done by hand if they are legible. Hydraulic model printouts are unacceptable for review.

Once the results are submitted in the proper format, the submittal will be reviewed by County staff. Should there be any discrepancy, the engineer shall be contacted and the discrepancy resolved. If any of the aforementioned standards cannot be met, the Chesterfield County Fire and EMS Fire & Life Safety Division shall be contacted. The engineer is required to modify the project to accommodate the standard and submit revised flow test results, unless an exception is approved by the Chesterfield County Fire and EMS Fire & Life Safety Division. Any significant changes in the site plan layout required by the Utilities Department site plan review staff or by the Chesterfield County Fire and EMS Fire & Life Safety Division will require that revised flow test results be submitted for review.

Once the project flows are approved, the “start point” curve and cover letter is to be included on the plans. This data/information must be put on the Utility plan sheet or Overall Utility plan sheet along with the ISO calculation sheet. If the static pressures are such that an individual PRV or booster pump (greater than 80 or less than 40 psi,) is needed, this information will be indicated on the cover page of the response letter to the engineer.

III. Residential Subdivision Construction Plan Process

Once the engineer has the “start point” results and completes their design of the project, results of hand written or modeled flow calculations supporting their design must be submitted directly to the Utilities Department for review and approval. These results shall include the following information:

A. Static pressures at all proposed hydrants.
B. Verification that the proposed hydrants meet flow test requirements of 1000 gpm at 20 psi residual for each hydrant. Hydrants are to be tested individually.
C. A mailing address, fax number and email for the engineer.
   The flow test information must be submitted in the form of a sketch and table and may be done by hand if they are legible. Hydraulic model printouts are unacceptable for review.
Once the results are submitted in the proper format, the submittal will be reviewed by County staff. Should there be any discrepancy, the engineer shall be contacted and the discrepancy resolved. If any of the aforementioned standards cannot be met, the Chesterfield County Fire and EMS Fire & Life Safety Division shall be contacted. The engineer is required to modify the project to accommodate the standard and submit revised flow test results, unless an exception is approved by the Chesterfield County Fire and EMS Fire & Life Safety Division. Any significant changes in the subdivision layout required by the Utilities Department review staff or by the Chesterfield County Fire and EMS Fire & Life Safety Division will require that revised flow test results be submitted for review.

If the static pressures are such that individual PRV’s or booster pumps (greater than 80 or less than 40 psi,) are needed, this information will be indicated on the cover page of the response letter to the engineer.

IV. Preliminary Plat Process

For preliminary plats, the rules for Residential Subdivision Construction Plans (III) apply with the following exceptions:

A. For preliminary plats where the entire development is shown, the engineer must submit a flow test for the entire subdivision. If the subdivision is to be phased, a water phasing plan must be submitted that demonstrates the ability of each phase to achieve the required fire flows independently of any future phases.

B. For preliminary plats where only part of the entire development is shown, the engineer must submit a flow test for the entire development and for the individual preliminary plat. A water phasing plan must also be submitted that demonstrates the ability of each phase to achieve the required fire flows independently of any future phases. An overall development water/wastewater master plan may be required depending on the complexity of the development.

C. All preliminary plats must show individual fire hydrants in a layout approved by the Chesterfield County Fire and EMS Fire & Life Safety Division and flows are to be tested for each hydrant. Preliminary plats should also take high and low elevations into account for static pressure tests for fire flow tests.

V. Overall Development Water/Wastewater Master Plan Process

For Overall Master plans, the rules for Residential Subdivision Construction Plans (III) apply with the following exception:

A. The overall plan must demonstrate the ability of the proposed system to achieve the required fire flows. In lieu of individual fire hydrants, tees,
reducers, ends of lines, and selected high and low points should be calculated for static pressure and fire flows.
APPENDIX 13

CHESTERFIELD COUNTY
DEPARTMENT OF UTILITIES
RIGHT OF WAY OFFICE
P. O. BOX 608, CHESTERFIELD, VA 23832-9998

PLAT CHECKLIST

TO:

THE ATTACHED PLAT(S) REQUIRE REVISIONS FOR THE FOLLOWING REASONS:

- CURRENT OWNER(S) NAMES
- DEED/WILL BOOK AND PAGE NUMBERS
- PARCEL IDENTIFICATION NUMBER (15 DIGITS)
- PARCEL STREET ADDRESS
- SUBDIVISION NAME, SECTION, BLOCK, LOT, AND PLAT BOOK AND PAGE NUMBERS
- DEED/PLAT BOOK AND PAGE NUMBERS ON EXISTING EASEMENTS
- ADJACENT PROPERTY OWNERS, WITH SUBDIVISION NAME, SECTION, BLOCK, LOT AND PLAT BOOK AND PAGE NUMBERS (IF APPLICABLE)
- ROAD WIDTHS, ROAD NAMES, ROUTE NUMBERS DEED/PLAT BOOK AND PAGE NUMBERS
- TYPE OF EASEMENT
- METES AND BOUNDS OF VARIABLE WIDTH EASEMENTS AND ALL PARCELS TO BE CONVEYED BASED ON THE VIRGINIA STATE PLANE COORDINATE SYSTEM, SOUTH ZONE NAD83 (CENTERLINE DATA IS ACCEPTABLE FOR STANDARD WIDTH EASEMENTS)

CURVE DATA AND CHORD BEARING AND DISTANCE
2 COORDINATE POINTS ON EACH EASEMENT OR PARCEL TO BE CONVEYED
TIE TO PROPERTY CORNERS AND AN EXISTING PHYSICAL INTERSECTION
PROJECT NUMBER
SITE PLAN/CASE NUMBER
NORTH ARROW (NAD83 NOTED)
MAGISTERIAL DISTRICT, COUNTY, STATE
SIGNED SURVEYOR'S/ENGINEER'S SEAL
DATE/REVISED DATES
STANDARD ENGINEER'S SCALE AND BAR GRAPH
(METRIC 1:100, 200, 250, 300, 400, 500)
SIZE (BETWEEN 8 ½" x 11" AND 18" X 24")
TITLE
SEE PLAT

COMMENTS:

PLEASE MAKE THE INDICATED REVISIONS AND SUBMIT THE REVISED PLATS TO THIS OFFICE FOR PROCESSING.

FROM: ____________________________
TITLE: __________________________
PHONE: _________________________

Revised 1/2010

Published: May 2020
Revised: APP-13-1
Chesterfield County WSSP
Fourth Edition
# SITE UTILIZATION SURVEY FORM

Chesterfield County
Industrial Waste Pretreatment Program
Department of Utilities
1200 Coxendale Rd Bldg B
Chester, VA 23836

## APPENDIX 14

### SITE UTILIZATION SURVEY FORM

<table>
<thead>
<tr>
<th>Business Name</th>
<th>Site Plan #</th>
<th>Utilities Account #</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Contact Person (owner/operator)</th>
<th>Phone #</th>
<th>SIC Code (Standard Industrial Classification)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>e-Mail Address</th>
<th>NAICS Code (North America Industry Classification System)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| Service Address | |
|-----------------||
|                 | |

## CERTIFICATION STATEMENT

I am the owner or operator of the above referenced facility or the most qualified person to assess the operations of this business. I certify that the information provided is true and correct to the best of my knowledge.

<table>
<thead>
<tr>
<th>Service Address</th>
<th>City, State</th>
<th>Zip Code</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Signature / Date</th>
<th>Name and phone (if different from the contact person above)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## QUESTIONS

<table>
<thead>
<tr>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Does the facility utilize Chesterfield County’s Sewer System?**

If YES, please answer the following:

- Estimated average wastewater discharge in gallons per day (GPD): ________________
- Total number of employees: __________________

**Is this facility located in a strip mall or other multi-unit building?**

**Does your business discharge or have the potential to discharge a waste product to the sewer system OTHER THAN normal sanitary wastewater?**

**Are hauled waste services utilized at any time of the year?**

If YES, please check all that apply:

- Septic Tank
- Grease Trap
- Grit Trap
- Oil / Water Separator
- Amalgam Separator
- Other (describe): ____________________________

**Is this a Dental Facility?**

If YES, the facility has to comply with 40CFR 441 which requires the installation of amalgam separators compliant with the ISO 11143 standard (or its equivalent) and a one time reporting requirement through DEQ’s website

**Does the facility store chemicals in quantities of 50 gal or more?**

If YES, list all chemicals and raw materials that are used/stored at the site (attach a list if necessary)

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>Quantity Stored Onsite</th>
<th>Chemical Use</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Published: May 2020

Chesterfield County WSSP

Revised: APP-14-1

Fourth Edition
Please check all that apply to the site:

<table>
<thead>
<tr>
<th>NATURE OF THE BUSINESS</th>
<th>INDUSTRIAL CATEGORY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Offsoles only</td>
<td>Airport Deicing</td>
</tr>
<tr>
<td>Retail</td>
<td>Aluminum Forming</td>
</tr>
<tr>
<td>Medical/Dental</td>
<td>Asbestos Manufacturing</td>
</tr>
<tr>
<td></td>
<td>Battery Manufacturing</td>
</tr>
<tr>
<td></td>
<td>Canned and Preserved Fruits and Vegetable Processing</td>
</tr>
<tr>
<td></td>
<td>Canned and Preserved Seafood</td>
</tr>
<tr>
<td></td>
<td>Carbon Black Manufacturing</td>
</tr>
<tr>
<td></td>
<td>Cement Manufacturing</td>
</tr>
<tr>
<td></td>
<td>Coal Mining</td>
</tr>
<tr>
<td></td>
<td>Centralized Waste Treatment</td>
</tr>
<tr>
<td></td>
<td>Coal Coating</td>
</tr>
<tr>
<td></td>
<td>Concentrated Animal Feeding Operations</td>
</tr>
<tr>
<td></td>
<td>Concentrated Aquatic Animal Production</td>
</tr>
<tr>
<td></td>
<td>Construction and Development</td>
</tr>
<tr>
<td></td>
<td>Copper Forming</td>
</tr>
<tr>
<td></td>
<td>Dairy Products Processing</td>
</tr>
<tr>
<td></td>
<td>Dental Office</td>
</tr>
<tr>
<td></td>
<td>Electrical and Electronic Components</td>
</tr>
<tr>
<td></td>
<td>Electroplating</td>
</tr>
<tr>
<td></td>
<td>Explosives Manufacturing</td>
</tr>
<tr>
<td></td>
<td>Ferroalloy Manufacturing</td>
</tr>
<tr>
<td></td>
<td>Fertilizer Manufacturing</td>
</tr>
<tr>
<td></td>
<td>Glass Manufacturing</td>
</tr>
<tr>
<td></td>
<td>Grain Mills</td>
</tr>
<tr>
<td></td>
<td>Gum and Wood Chemicals Manufacturing</td>
</tr>
<tr>
<td></td>
<td>Hospital</td>
</tr>
<tr>
<td></td>
<td>Ink Formulating</td>
</tr>
<tr>
<td></td>
<td>Inorganic Chemicals Manufacturing</td>
</tr>
<tr>
<td></td>
<td>Iron and Steel Manufacturing</td>
</tr>
<tr>
<td></td>
<td>Landfills</td>
</tr>
<tr>
<td></td>
<td>Leather Tanning and Finishing</td>
</tr>
<tr>
<td></td>
<td>Meat and Poultry Products</td>
</tr>
<tr>
<td></td>
<td>Metal Finishing</td>
</tr>
<tr>
<td></td>
<td>Metal Molding and Casting</td>
</tr>
<tr>
<td></td>
<td>Metal Products and Machinery</td>
</tr>
<tr>
<td></td>
<td>Mineral Mining and Processing</td>
</tr>
<tr>
<td></td>
<td>Nonferrous Metals Forming and Metal Powders</td>
</tr>
<tr>
<td></td>
<td>Nonferrous Metals Manufacturing</td>
</tr>
<tr>
<td></td>
<td>Oil and Gas Extraction</td>
</tr>
<tr>
<td></td>
<td>Ore Mining and Dressing</td>
</tr>
<tr>
<td></td>
<td>Organic Chemicals Plastics and Synthetic Fibers</td>
</tr>
<tr>
<td></td>
<td>Paint Formulating</td>
</tr>
<tr>
<td></td>
<td>Paving and Roofing Materials (Tars and Asphalt)</td>
</tr>
<tr>
<td></td>
<td>Pesticide Chemicals</td>
</tr>
<tr>
<td></td>
<td>Petroleum Refining</td>
</tr>
<tr>
<td></td>
<td>Pharmaceutical Manufacturing</td>
</tr>
<tr>
<td></td>
<td>Phosphate Manufacturing</td>
</tr>
<tr>
<td></td>
<td>Photographic</td>
</tr>
<tr>
<td></td>
<td>Plastics Molding and Forming</td>
</tr>
<tr>
<td></td>
<td>Porcelain Enameling</td>
</tr>
<tr>
<td></td>
<td>Pulp, Paper and Paperboard</td>
</tr>
<tr>
<td></td>
<td>Rubber Manufacturing</td>
</tr>
<tr>
<td></td>
<td>Soap and Detergent Manufacturing</td>
</tr>
<tr>
<td></td>
<td>Steam Electric Power Generating</td>
</tr>
<tr>
<td></td>
<td>Sugar Processing</td>
</tr>
<tr>
<td></td>
<td>Textile Mills</td>
</tr>
<tr>
<td></td>
<td>Timber Products Processing</td>
</tr>
<tr>
<td></td>
<td>Transportation Equipment Cleaning</td>
</tr>
<tr>
<td></td>
<td>Waste Combustors</td>
</tr>
</tbody>
</table>

Provide a brief description of the business(es) at this address and list any operations or processes which may be associated with this address.

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

For questions regarding this form, please contact the Industrial Waste Pretreatment Section at pretreatment@chesterfield.gov

Revised: 2/20/18
APPENDIX 15

METER SIZING FORM
DEPARTMENT OF UTILITIES - CHESTERFIELD COUNTY, VIRGINIA

(Rev 06/08/18)

<table>
<thead>
<tr>
<th>Business Name</th>
<th>Address of Building</th>
</tr>
</thead>
<tbody>
<tr>
<td>Development Name</td>
<td>Co. Project No:</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Apartments (Y/N):</th>
<th>If Y, Number of Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Service Type:</td>
<td>Service Installed by:</td>
</tr>
</tbody>
</table>

I certify the the information on this form is true and correct

Applicant name (Print) | Phone #
|-----------------------|----------|
(Signature) | Email |

**PART A**

<table>
<thead>
<tr>
<th>Fixture</th>
<th>Fixtures Value</th>
<th>No. of Fixtures</th>
<th>Fixture Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bathtub</td>
<td>8 psi</td>
<td>X</td>
<td>=</td>
</tr>
<tr>
<td>Bedpan Washer</td>
<td>10</td>
<td>X</td>
<td>=</td>
</tr>
<tr>
<td>Bidet</td>
<td>2</td>
<td>X</td>
<td>=</td>
</tr>
<tr>
<td>Dental Unit</td>
<td>2</td>
<td>X</td>
<td>=</td>
</tr>
<tr>
<td>Drinking Fountain - Public</td>
<td>2</td>
<td>X</td>
<td>=</td>
</tr>
<tr>
<td>Kitchen Sink</td>
<td>1.8</td>
<td>X</td>
<td>=</td>
</tr>
<tr>
<td>Lavatory (bathroom sink)</td>
<td>1.5</td>
<td>X</td>
<td>=</td>
</tr>
<tr>
<td>Showerhead (shower only)</td>
<td>2</td>
<td>X</td>
<td>=</td>
</tr>
<tr>
<td>Service Sink</td>
<td>4</td>
<td>X</td>
<td>=</td>
</tr>
<tr>
<td>Toilet - Flush Valve</td>
<td>24</td>
<td>X</td>
<td>=</td>
</tr>
<tr>
<td>Tank Type</td>
<td>6</td>
<td>X</td>
<td>=</td>
</tr>
<tr>
<td>Urinal - Wall Flush Valve</td>
<td>10</td>
<td>X</td>
<td>=</td>
</tr>
<tr>
<td>Wash Sink (each set of faucets)</td>
<td>4</td>
<td>X</td>
<td>=</td>
</tr>
<tr>
<td>Dishwasher (residential)</td>
<td>2</td>
<td>X</td>
<td>=</td>
</tr>
<tr>
<td>Washing Machine (residential)</td>
<td>6</td>
<td>X</td>
<td>=</td>
</tr>
<tr>
<td>Hose (50 ft Wash)</td>
<td>1/2 in.</td>
<td>8</td>
<td>X</td>
</tr>
<tr>
<td>Down</td>
<td>5/8 in.</td>
<td>12</td>
<td>X</td>
</tr>
<tr>
<td>Down</td>
<td>3/4 in.</td>
<td>16</td>
<td>X</td>
</tr>
<tr>
<td>Other (Description)</td>
<td></td>
<td>X</td>
<td>=</td>
</tr>
<tr>
<td>Other (Description)</td>
<td></td>
<td>X</td>
<td>=</td>
</tr>
<tr>
<td>Other (Description)</td>
<td></td>
<td>X</td>
<td>=</td>
</tr>
</tbody>
</table>

Combined Fixture Value Total (rounded to nearest whole number): 

**PART B**

1. Domestic Demand based on Fixture Value (see Attachment C) gpm
2. Fixed Demand (includes all demands except domestic and irrigation) gpm
3. Irrigation Demand (from Engineer)* gpm
4. Total Demand (rounded) gpm
5. Actual Meter Size based on Total Demand (verification by Co. Staff - Use Water Meter Sizing Table Attachment B)
   Meter size 3" and greater consult Development Section
   inch
6. Owner Requested upsize of the meter (cannot get Virtual Meter Credit) inch

**COUNTY USE ONLY**

Actual Meter Size | Virtual Meter Size | inch
Sized by | Date: |
Treatment Plant
If service is an upgrade, enter existing service no. 

APPENDIX 16

PROCEDURES FOR INSTALLING 6-INCH LATERALS TO EXISTING SANITARY SEWER LINES

When it is necessary to tap the main sewer line and install a 6-inch sewer connection, the following guidelines shall be adhered to:

1. The work shall be done by an approved utilities contractor specializing in the installation of public water and sewer lines. Upon request, the county will furnish a list of known utilities contractors acceptable to the county to perform such work.

2. If a waterline is to be crossed, the tap must be made on Monday through Thursday.

3. The contractor shall notify the Utilities Department Inspection Supervisor 48 hours prior to beginning construction.

4. When tapping the sewer line, a mechanical hole cutter and an approved saddle must be used. The tap must be made so that the 6-inch connection will enter the main line on a slope no greater than 45°. No connection shall be cut into the top of a sewer line.

5. When tapping into a manhole, bring the 6-inch connection in above the shelf, but no higher than two feet above the lowest invert. A channel to carry the flow from the connection must be built inside the manhole.

6. The 6-inch connection is to be constructed only to the property line and/or the edge of the easement in which the main sewer line lies, or as directed by the inspector.

7. The contractor is responsible for damages to any existing utilities and shall have in his possession and/or furnish evidence upon request of having sufficient insurance to cover any damages that may occur.

8. Work in the state maintained right-of-way:
   a. VDOT must grant permission to install a sewer lateral within the state maintained right-of-way. The utilities contractor is responsible for making application to VDOT for permission to install a 6-inch connection within the state maintained right-of-way and for providing the Inspection Supervisor a copy of the VDOT Land Use Permit before commencing work.
   b. Use the necessary signs and barricades to divert traffic.
   c. One-way traffic must be maintained at all times.
   d. The trench must be backfilled with 21A stone and compacted as required.
   e. Pavement should be replaced within 24 hours. All paving is to be done in accordance with VDOT specifications.
   f. On streets subject to school bus traffic, work should be done only between 9:00 AM and 3:00 PM.
9. Prior to connecting sewer lines from a home or business to the 6-inch connection, a sewer connection fee must be paid and all the above requirements must be met. The Building Inspection Office must be notified for a final inspection.

10. Any deviations from these guidelines must be approved by the Chesterfield County Utilities Department.