

CHAPTER 10

PUBLIC UTILITIES DESIGN

10.0 GENERAL

The Public Utilities Franchise Area for water and sanitary sewer (sewer) is generally co-terminus with the urban and suburban overlay districts as identified in the City's COMPREHENSIVE PLAN. Contact Utilities the Planning Department for determination.

- A. A developer or subdivider will be required to design and construct public water and/or sewer facilities to serve proposed developments and subdivisions in accordance with the following criteria:
1. The total proposed development area, not individual sections, will be theoretically converted into equivalent residential units (ERU's), sized according to the approved COMPREHENSIVE PLAN current at the first submittal of the proposed development.
 2. Estimates will be made by Public Utilities for providing public water and/or sewer facilities and alternate sources (i.e. well and/or septic tank) to the area. The estimates will include off-site as well as on-site improvements.
 3. Public Utilities will compare the cost per ERU for each method of providing water and sewer systems. If the cost per ERU for the alternate water and sewer system when multiplied by 4 is less than the public system estimate per ERU, then the installation of public water and/or sewer facilities will not be required.
 4. This Four Times Rule is applicable to proposed developments and subdivisions which are not adjacent to existing public water and/or sewer facilities. The Four Times Rule will not apply to the development of unmanned utility facilities as defined in the Zoning Ordinance.
 5. The Four Times Rule is in accordance with Section 78-141 of the Chesapeake City Code and shall be applied by Public Utilities during the predesign process.
- B. Materials, testing, excavation, pipelaying, bedding, haunching, backfilling and tamping for all utility facilities which are to be dedicated to the City and become a part of the public water and/or sewer systems or which are private and to be connected to the public water and/or sewer systems, shall conform to the applicable sections of the Public Facilities Manual (PFM), Volumes - II & III. All materials furnished for a project shall be from the same manufacturer for each

type of material installed. Changes required by site constraints, such as depth or crossings, are acceptable if approved in advance by the City. All regulations, criteria, policies, standards and specifications referenced shall be the edition current at the time of plan approval by the City.

- C. In the event that the location of lot lines change after the plans have been approved, it is the responsibility of the developer or subdivider to relocate public water services and sewer laterals as necessary to meet design criteria requirements. Should the change in lot lines require abandonment of previously installed water and/or sewer facilities, it shall be the responsibility of the developer or subdivider to abandon such facilities as directed by Public Utilities.
- D. Transition easements are generally not permitted; however, in the event a transition easement is proposed or required, it shall run in a straight line between the two rights-of-way it connects. Transition easements are reviewed on a case-by-case basis and may be permitted when there is no route for water and/or sewer extensions in existing or proposed rights-of-way. The easement must be sized adequately for maintenance equipment access. The easement must not pose any Public Safety issues. Gravity sewers, force mains and water lines located in transition easements shall be ductile iron.
- E. Water or sewer lines shall not be placed underneath curb and gutter, driveways, or other similar obstructions. Crossings or parallel installations for a short length will be acceptable. Site conditions vary, so in design of utility improvements essential considerations are resilience, longevity, locatability, ease & cost of maintenance, and integrity of the systems. The guidelines stated below, in subparagraphs (E)1-3, are not intended to supersede or invalidate other Public Utilities standards, criteria, policy, specifications, regulations or City Code provisions.
 - 1. Watermains should generally align to one side of the roadway, opposite the stormwater system. The preferred locations for water mains are (in priority order):
 - a. In the green space between the sidewalk and back of curb.
 - b. Under the sidewalk.
 - c. In the pavement outside the wheel path, 1.5 to 2 feet from the edge of the gutter pan.Additional guidelines for water mains:
 - d. Water mains shall not jog back and forth across the road.
 - e. Limit use of bends to only those necessary.
 - f. Mains must be easily locatable.
 - 2. The preferred locations for sewer mains are (in priority order):
 - a. In the center of the roadway, so that manholes align with the pavement crown.
 - b. In one lane of the roadway, so that manholes align at the quarter point of the travel way, out of the vehicular wheel path.
 - c. In a grassed area in the right-of-way, locating manholes in areas free of inundation during stormwater and tidal events.
 - 3. The preferred location for sanitary cleanouts, valves and water meter boxes is in a grassed area in the right-of-way. Avoid locating the structures in:
 - a. Sidewalks, where they are a trip hazard.

b. Driveways & aprons, where subject to vehicular loading.

- F. Soil borings may be required to determine the corrosiveness of the soil to ductile iron pipe (not required if ductile iron pipe or fittings are not used). Testing shall be in accordance with AWWA C-105 Appendix A.
- G. Water and sanitary sewer main extensions shall be to the midpoint of the last lot of the property being served if the main is intended to be further extended in the future. A valve with a kicker-joint and blow-off valve or fire hydrant, as required, shall be placed at the end of a pressure main for future extension. The kicker-joint shall not be less than 18 linear feet (lf) in length.
- H. Tracer wire shall be installed on all non-metallic pressure pipes and on gravity sewer laterals that are not installed perpendicular to the sewer main.
- I. Sub-surface utility warning tape will be placed not less than six inches nor more than twelve inches below the proposed finished grade and directly over pipe. In streets the warning tape shall be located immediately below the pavement section. For sewer, the tape will be bright green and have "Caution-Sewer Line Below" clearly printed on it. For water, the tape will be bright blue and have "Caution Water Line Below" clearly printed on it.
- J. For all pressure pipes, retainer glands shall be used at all tees, crosses, bends, offsets, or plugged ends. Designs of thrust restraint shall be based on a pressure of 150 psi, shall consider the characteristics of the soil and shall be sealed by a licensed professional engineer. Retainer glands and rods are required on valves.
- K. Restrained joint pipe will be used for bridge crossings and ball joint pipe will be used for buried river crossings. Valves shall be provided at each end of the crossing. Permanent sample taps shall be provided at each end for testing the main. HDPE and fused PVC pipe may be considered for use in horizontal directional drill (HDD) installations on a case-by-case basis.
- L. Unsuitable material (Class III, Type SM, SC, Class IV soils, per USCS ASTM D-2387) shall not be used for pipe bedding. When unsuitable material is encountered pipe bedding shall be VDOT size 57 smooth river rock. Flexible sewer pipeline design shall consider pipe depth, pipe material, soils, and dynamic loads.
- M. Deflection of pipe joints shall not exceed 80% of the manufacturer's allowable maximum or AWWA recommended maximum, whichever is less.
- N. Thermal expansion/contraction must be addressed in the design stage for all exposed pipelines.
- O. Casings, when used, shall terminate no less than four (4) feet beyond the edge of pavement or back of curb. Casings shall be designed to facilitate removal of a full joint of pipe from the casing from one end. A minimum 15' wide by 25' long easement and/or right-of-way must be provided on both ends of the casing for pipe removal. No fittings, structures, appurtenances, landscaping, or other similar

obstructions will be permitted within these areas at the ends of the casing. All pipelines (gravity sewers, force mains and water mains) within casings shall be ductile iron mechanical joint with retainer glands. Isolation valves are to be installed no closer than 25' from each end of the casing. A leak detector is to be installed at one end of the casing, and a pipeline marker installed at the opposite end, where practical.

- P. Sewer laterals and water service lines shall be provided to all proposed and existing lots along the route of the sewer and/or water extension. One sewer lateral and one water service line shall be provided to each existing premise. The sewer laterals and water service lines shall be installed 5' from the centerline of the lot, opposite each other, for proposed lots. The lateral and service line locations, both horizontal and vertical, for existing lots shall be coordinated with the property owners. Sewer laterals and water services must maintain a minimum 10' horizontal separation whenever possible.
- Q. An HRSD Flow Acceptance Letter is required (if applicable) prior to construction plan approval by the City. City approval will be conditional upon DEQ approval, if applicable.

10.1. SANITARY SEWER COLLECTION SYSTEM

All Sanitary Sewer Facilities, both public and private connecting to a public sewer system, shall be designed in accordance with the Commonwealth of Virginia Sewage Collection & Treatment (SCAT) Regulations, and the City of Chesapeake criteria, policy, standards and specifications. Design flow determination shall be in accordance with the SCAT Regulations, the Regional Technician Standards (RTS) and Appendix VIII.

- A. Gravity Sewer Mains
 - 1. Gravity sewer mains shall be sized in accordance with the SCAT regulations, the RTS and Appendix VIII. The flows generated by the served property shall be based on the approved COMPREHENSIVE PLAN. Minimum main size shall be 8".

Gravity sewer mains within public rights-of-way shall not be oversized to accommodate the required sanitary sewer storage volumes of proposed developments.
 - 2. Slope of the gravity sewer main shall be kept to a minimum in order to allow the largest service area possible. (Manning n = 0.013)

<u>Sewer Size</u>	<u>Min. Slope in Feet Per 100 Feet</u>
8"	0.40 (0.30 for PVC pipe only)*
10"	0.28 (0.25 for PVC pipe only)*
12"	0.22 (0.19 for PVC pipe only)*

- * The Department of Environmental Quality (DEQ) approval is required for the flatter slopes used with PVC Pipe if the development generates more than 40,000 gallons per day (gpd).
- 3. Manholes shall be placed at the quarter point or mid-point of the road. Pipe location shall not pass under drainage structures or curb and gutter except for crossings. Setback from the edge of an easement or right-of-way line shall be at least one half of the distance calculated under Section 10.4.J.
- 4. Special consideration must be given when locating manholes to ensure that they will not be subject to flooding in parking areas, streets or when erosion and sediment controls are installed. Sanitary sewer crossings of streams, estuaries, lakes and reservoirs shall be in accordance with the SCAT regulations and City requirements. Inverted siphons shall not be used.
- 5. Changes in pipe size, slope, and/or material are permitted only at manholes. Where a small sewer joins a larger one, the invert of the larger sewer shall be lowered sufficiently to maintain the same energy gradient. An approximate method for securing these results is to place the 0.8 depth point of both sewers at the same elevation.
- 6. Maximum distance between manholes for pipe sizes of less than 15" diameter shall not exceed 400 lf.
- 7. For gravity sewers with less than 3' of cover, calculations shall be provided to show that the pipe design will adequately handle both static and dynamic loads.
- 8. Truss pipe or ductile iron pipe shall be used for sewers with greater than 12' of cover.
- 9. Gravity sewer mains shall not be installed deeper than 15' from the invert to the final grade unless approved a variance has been obtained by Public Utilities in the predesign process.
- 10. Gravity sewer mains shall be laid at sufficient depth to serve all drains in existing buildings. The engineer shall check for the existence of basement drains prior to the design of the gravity sewer system.
- 11. Ventilation shall be provided for any continuous watertight gravity sewer in excess of 1,000 lf.
- 12. All trunk-line sewer mains shall terminate in a manhole. Gravity sewer that is subject to extension shall terminate in a manhole. A sufficient length of gravity sewer pipe shall be stubbed out of the manhole in such a manner that a future connection can be made without cutting the pavement. The sewer stub shall be plugged at both ends.

13. For existing sanitary sewer services to sites, the contractor shall verify the invert elevation of the service prior to construction of the on-site sewer. Installation of the on-site sewer shall be from the existing service at the right-of-way line, up-slope, to the proposed building and structures.
14. All manholes shall be equipped with watertight manhole inserts.
15. Curved sewers are not permitted.

B. Sewer Laterals

1. Sewer laterals shall extend from the gravity main to the right-of-way line and shall be perpendicular to the gravity main except on cul-de-sac lots where the laterals may originate from the manhole.
2. Sewer laterals shall be sized in accordance with the SCAT regulations, the RTS and Appendix VIII based on the rates of flow generated by the served property. Minimum lateral size will be 4”.
3. Sewer laterals shall terminate in cleanouts or manholes at the right-of-way line. If the depth of the lateral at the right-of-way is greater than or equal to 5’, a manhole shall be used.
4. Sewer laterals shall, whenever possible, terminate in unpaved areas.
5. No laterals will be permitted on transition gravity mains. (i.e. lines not included in city-maintained rights-of-way)
6. Sewer laterals from sewers more than 12’ deep shall originate from a manhole in lieu of the main trunk line whenever possible.
7. Sewer laterals shall be installed from the sewer main or manhole to the site in a continuous, positive slope. The lateral shall maintain the minimum slope required for the lateral size. The number of bends shall be minimized.

C. Force Mains

1. Force main sizing will be in accordance with the City's Master Sewer Plan, SCAT regulations, the RTS and Appendix VIII to carry the flows generated by the design area.
2. Air release valves are required at all high points on force main lines. Where possible, force mains shall be designed with smooth positive and negative gradients to minimize both high and low points.
3. Whenever a new force main is tied into an existing force main, it shall be installed in such a manner that a valve will be placed on the upstream side of the connection.

10.2 WATER DISTRIBUTION SYSTEM

All water facilities, both public and private connecting to a public water system, shall be designed in accordance with the Safe Drinking Water Act, Virginia Department of Health (VDH) Waterworks Regulations, International Plumbing Code and the City of Chesapeake criteria, policy, standards and specifications.

A. Water Mains

1. Water main sizing shall be in accordance with the City's Master Plan and VDH Waterworks regulations, to provide for domestic and fire flow demands, (i.e. 25 psi, residual pressure with 1,000 gpm fire flows) and water quality considerations. The minimum line size shall be 4" except short cul-de-sacs and courts (less than or equal to six (6) units), may be permitted to use a 2" looped line. Hydraulic analyses shall be submitted to size the proposed water mains. The analysis shall include existing City mains to ensure that service to existing customers is not adversely affected.

If fire demands greater than those noted above are required by the Fire Department, then alternate facilities (e.g. on-site storage) shall be provided to meet the fire demands.

2. The water source for the analysis shall be an existing line at least 10" diameter.
3. Minimum allowable pressure for design purposes shall be 40 psi at the point of connection (customer side of the water meter) for non-fire flow conditions.
4. Headloss in any unlooped mains shall not exceed 20' between tie-ins to a looped main.
5. Velocity shall not exceed 5 feet per second (fps) in any water main 12" or larger diameter and 8 fps in water mains 10" or smaller diameter.
6. If fire hydrant flow tests are used as a basis for existing pressures then the residual pressure shall be used as the basis. The pressure shall then be adjusted to the design flow of the project.
7. For Residential Subdivisions, water system improvements shall be designed to provide a fire flow demand of 1,000 gpm plus 3 gpm per ERU. The minimum pressure shall be 25 psi.
8. Sound engineering judgment should be used during the determination of the flows and pressures in the distribution system to design for fire flow conditions. Factors such as normal daily pressure fluctuations, system maintenance and repairs, future changes in system demands, and modifications to system operation must be considered.

9. Minimum water main size serving fire hydrants shall be 8" except for hydrant branch lines unless otherwise approved by Public Utilities.
10. Placement of water line within right-of-way shall be in such a manner that operation and maintenance can be performed with relative ease and without requiring encroachment on private property. Water lines normally are to be located between the back of curb and sidewalk. Setback from the edge of an easement or right-of-way line shall be at least one half of the distance calculated under Section 10.4.J.
11. Dead ends shall be kept to a minimum. Where dead ends occur, they shall be provided with a fire hydrant or a blow-off valve assembly. Eight-inch and smaller lines shall be equipped with a 2" blow off. Ten-inch and larger lines shall be equipped with a permanent hydrant. All proposed dead ends will be reviewed on a case-by-case basis. To ensure water quality, self-flushing devices on dead ends may be required. Additional loops may be required to ensure water quality and provide adequate fire flow and pressure.
12. Valves shall be placed on each intersecting line and be located approximately 3' from each fitting. Typically, the number of valves shall be no less than 1 less than the number of pipes, however all lines may be required to have valves installed for operational or maintenance reasons. Valve spacing on long straight runs of pipe will be determined by Public Utilities. Valve location can be affected by site specific conditions.
13. No air vent, meter or blow off chamber shall be connected directly to a storm or sanitary sewer.

B. Water Service Lines

1. Materials presently acceptable for use are copper type "K" tubing for up to 2" O.D.; for over 2" use same material as acceptable for the water main.
2. Normally, meter boxes will be placed in the right-of-way between the back of curb and the sidewalk. If there is no sidewalk, then immediately behind the back of curb. If there is no curb, then adjacent to the right-of-way line with the end of service line inside the box. (See standard detail WD-02 in the PFM, Volume II).
3. Service lines shall be sized and installed in accordance with VDH Waterworks regulations and the City of Chesapeake criteria, policy, standards and specifications to provide adequate water flow and pressure to the property being served. Minimum service line size shall be 3/4 in. Water service lines shall be perpendicular to the water main.
4. Master meters shall be sized to handle the range and frequency of flows anticipated for the project.

5. Meter and service line requirements shall also be in accordance with the Fire Protection policy.
6.
 - a. Splicing of water service lines, other than copper in good condition, as determined by Public Utilities, is prohibited. If a non-copper service line or a copper service line in poor condition is cut or needs to be extended, the service line must be replaced from the water main to the water meter in accordance with the requirements for new service.
 - b. The following requirements apply to splicing copper water service lines only:
 - i. The splice is to be made using a flared fitting. Compression fittings are not permitted.
 - ii. The copper service line is not to be bent causing kinks or crimps.
 - iii. Proper tools made specifically for this purpose must be used.
 - iv. The splice must be left exposed under pressure and checked by the inspector to ensure that there are no leaks. Record of this inspection shall be kept in the inspector's records for the project.
 - v. All necessary precautions must be used to prevent contamination of the city's water system. Flushing of the spliced water service will be required.
 - vi. The record drawings (or photographs for site plans) shall identify all spliced water services and the location of the splice.

10.3 DEPTH REQUIREMENTS, EASEMENTS, HORIZONTAL/VERTICAL CLEARANCES & UTILITY LOCATION

- A. Cover shall be defined as the depth from the top of the pipe to the finished grade.
- B. Force mains and water mains shall have a cover of 36" in new streets and 48" in existing streets without curb and gutter unless they conflict with existing or proposed utilities or storm drain. Every attempt shall be made to prevent the installation of pressure mains below gravity mains. Minimum depth of gravity sewer shall be 36".
- C. Water service lines, 2" and smaller, shall have a cover of 24" to 30". Water service lines, greater than 2" shall have a cover of 30" to 36".
- D. Sewer laterals shall have a minimum cover of 24" at the right-of-way line. Maximum cover shall be 48" at the right-of-way line. Minimum 24" cover is required under the pavement section. The sewer lateral depth

may be reduced to 18" provided this depth is adequate to serve the entire property by gravity. Deeper laterals may be allowed if approved by Public Utilities. Adequate justification must be provided. For non-residential sites the depth may be increased to the depth required to adequately serve the site by gravity.

- E. Horizontal distance between water mains and sewer mains and services shall be a minimum of 10'. When local conditions prevent a horizontal distance of 10', Public Utilities will consider a closer spacing on a case-by-case basis. If approved, the water main or service may be laid closer to the sewer main, service or manhole provided that the bottom of the water main is 18" above the top of the sewer main. Where this vertical separation cannot be obtained, the sewer pipe shall be constructed of water pipe meeting AWWA standards, pressure tested in place without leakage prior to backfilling. Horizontal distance between water mains and other utilities, except sewer, shall be a minimum of 5'.
- F. Vertical clearance between water mains crossing over sewer mains shall be 18". When local conditions prevent a minimum 18" vertical separation between water and sewer, the following construction shall be used:
 - 1. Water lines shall pass under sewers only if approved by Public Utilities.
 - 2. Sewer passing over or under water lines shall be constructed as described in Section 10.4.E.
 - 3. Water lines passing under sewers shall, in addition, be protected by providing:
 - i. A vertical separation of at least 18" between the bottom of the sewer and the top of the water line.
 - ii. Adequate structural support for the sewers to prevent excessive deflection of the joints and the settling on and breaking of the water line.
 - iii. The length of water line be centered at the point of the crossing so that joints shall be equidistant and as far as possible from the sewer.
- G. Vertical clearance between water mains and/or sewer mains and open ditches shall be 18", minimum. Vertical clearance between sewer mains and water mains and other utilities shall be a minimum of 12". Consideration shall be given to the City's Master Drainage Plan so that future offsets can be avoided.
- H. All water mains and sewer mains belonging to the City shall be located within the City's right-of-way unless an alternate location in an easement parallel and adjacent to the right-of-way are approved by Public Utilities.

I. The tops of all sewers entering or crossing streams or major drainage features shall be in accordance with the SCAT Regulations. The Departments of Public Works and Development and Permits shall be consulted to determine future inverts, or improvements to streams and flood elevations. Inverted siphons shall not be used.

J. Easements shall be determined as follows:

$$W = 2d + D + 2 \text{ (rounded up to the nearest 5')}$$

d = depth of pipe (from invert)

D = diameter of pipe (I.D.)

W = width of easement

Minimum easement width shall be 15' for a single line.

K. Where large meters are installed, the easement shall extend at least 5' from all facilities to be owned by the City. The easement dimensions shall be rounded up to the nearest 5'. Minimum easement size for a large meter assembly is 20' x 20'.

10.4 SEWAGE PUMP STATIONS

All sewage pump stations shall be designed in accordance with the SCAT regulations, the RTS, the City of Chesapeake standards, specifications, policy, criteria and OSHA Regulations.

A. Horizontal (wet well-dry well, flooded suction) and Vertical (suction-lift) type pump stations are permitted for any application. Submersible type pump stations are permitted only if approved by Public Utilities.

B. All below ground structures will be constructed with reinforced concrete and sized in accordance with the SCAT regulations and the RTS for the ultimate design flows.

C. All above ground structures will be constructed of block with brick veneer and sized in accordance with City Standards so that the ultimate designed pumps, motors, controls, piping, etc., are readily accessible for maintenance and protected from the weather; structural design subject to approval by City of Chesapeake.

D. Outside features must include an emergency pump connection, emergency electrical connection and a driveway of 7" Class A3, concrete with minimum W5 x W5 wire reinforcing. All pump station driveways are to be a minimum 12 ft wide.

E. Architecture of the pump station which deviates from the Public Utilities standard shall be compatible with the neighborhood and is subject to Public Utilities' approval.

F. A hydraulic analysis shall be performed to determine the effect of the new

facilities on existing City facilities. The analysis shall include as a minimum, all existing City facilities which may be affected up to the discharge point into HRSD.

- G. Consideration shall be given in the station design to operational and maintenance concerns which occur when initial flows are substantially below ultimate design flow or when prolonged periods of low flow are anticipated.
- H. Pump stations shall not discharge into an existing gravity system unless approved by Public Utilities.
- I. A portable equipment form shall be submitted along with the construction plans and provide the following:
 - 1. Overflow time. Minimum overflow time for the pump station shall be as directed by Public Utilities.
 - 2. Dominion Virginia Power circuit type (looped or radial) and identification number.
- J. The design shall consider following criteria:
 - 1. Initial operating speed shall not exceed 1500 RPM.
 - 2. Ultimate operating speed shall not exceed 1850 RPM.
 - 3. Maximum reprime time shall be 5 minutes.
 - 4. Ensure the net positive suction head (NPSH) and priming lift are adequate.
 - 5. Detention volume = 10 minute fill time x average flow/7.48 gal/cu. ft.
 - 6. Wet well volume based on geometric shape.
 - 7. Head calculations for suction and discharge piping shall consider the total dynamic head (TDH) at the design flow. Pump selection shall consider minimum and maximum TDH conditions at initial and ultimate design; the effects of other pump stations on the line; pump runout conditions; NPSH required and HRSD interceptor policy.
 - 8. Minimum velocities as set forth by the SCAT regulations.
 - 9. Siphon head if applicable.
 - 10. Pumps must alternate.
 - 11. Ventilation Requirements as set forth by the SCAT regulations.
 - 12. Fillets shall terminate no more than 18" ~~inches~~ from the outside of the suction pipe or inlet.

K. Service Area and Site Location:

1. The pump station service area should have approximately a 3,000' radius centered at the pump station. The service area shall be proposed and shown on a real estate map and a topographic map and approved by Public Utilities prior to station design. The pump station shall also be located to take advantage of topography so as to maximize the reach of the system. The engineer must provide information on a City topographic map to ensure that the entire proposed service area can be served.
2. The pump station site location will be in accordance with the Public Utilities' Master Sewer Plan and subject to Public Utilities approval and coordinated with the Department of Planning.
3. The site has to be purchased and plat deeded to the City. The lot size shall be appropriate to allow for proper operation and maintenance of the station, including space for the installation of a generator, and it must be adjacent to City maintained right-of-way.

L. Pump station drawings shall be drawn to scale in all views.

M. A copy of the geotechnical report used to design the pump station shall be submitted with the plans.

N. Controls

1. Controls shall conform to all local building, electrical and fire codes, N.E.C. Standard Rules of American Institute of Electrical Engineers, Service Rules and Regulations of Dominion Virginia Power, N.E.M.A. and state fire safety regulations.
2. Electrical service riser diagram shall show all connections and sizes.
3. Control panels shall be constructed in accordance with the City's standards, specifications, policy and criteria with details shown on the plans.
4. Control panels within a building shall be mounted with the top of the panel 72" to 60" from the floor.
5. Control panel for submersible or grinder type pumping stations shall be in a weather-tight exterior enclosure mounted on a concrete pad in accordance with City Standards.
6. Control circuitry shall be 110 volts.
7. Transducers, pursuant to Public Utilities' specifications, shall be installed for control of the pumps and for signaling alarms. The modular control units must have separate wiring for each alarm & control set points.

8. All electrical items shall be placed inside the pump house except for the emergency electrical connection and meter.
9. An electrical floor plan shall be submitted.
10. All new pump stations will be required to make provisions for the installation of ISCO 4501 Dataloggers in the control panel. The approximate dimensions of the unit are 4"x4"x8". A serial port connection shall also be provided on the front of the cabinet to allow for connection for downloading.

O. Piping and Appurtenances

1. All interior piping shall be ductile iron flanged pipe. Ventilation ducts shall be PVC except vent pipe above slab, which must be ductile iron.
2. Gate valves shall be non-rising stem, wheel-operated (except for influent valve), resilient seat. Influent valve shall have operating nut. Ensure a gate valve is provided between the emergency pump connection and wall.
3. Check valves shall be horizontal swing type with counter-weight.
4. Each pump shall have separate air release lines that run along wall, and extend 3" below low water level. An inverted check valve is required for wet well-dry well application.
5. The wet well, control panel and piping shall be sized for the ultimate design flows.
6. The last run of pipe on gravity sewer line entering the station shall be ductile iron. There shall be 2' minimum between outside wall and first joint of the ductile iron for both effluent and influent lines.
7. Submergence of the pump intake shall be adequate to prevent vortexing.
8. An approved back flow preventer shall be provided for the water service.

P. Miscellaneous

1. Air bubbler lines shall be encased with PVC tubing and run along the wall in an accessible location.
2. Heaters shall be forced air heat type with thermostat (for vertical and horizontal pumping station applications) directed on pumps.

Dehumidifiers are required in the drywell of horizontal pump stations.

3. System control gauges shall be connected with type K copper tubing.
 4. Junction boxes for submersible pump station shall be installed inside the valve pit.
 5. Pressure and vacuum gauges shall be provided on both the suction and discharge sides of each pump.
 6. Float hangers and all miscellaneous metal shall be either 6061-T6 aluminum or 316 stainless steel.
 7. The pumps shall operate at or below the rated horsepower for the motor, for the entire range of operating conditions.
 8. Ventilation system is provided with calculations to ensure 30 air changes per hour. Cycle of air must be such that fresh air is made available at area where maintenance crews would be working.
 9. The high water alarm shall be placed along the wall and in an accessible location.
 10. A removable bar screen shall be installed at the influent line with the horizontal portion 6" below the influent invert. A minimum of 24", horizontally, shall be provided from the influent line and the rising portion of the bar screen
 11. Interior of the pump station wetwell shall be treated to prevent corrosion. (Sikacoat basecoat Sika 124 and finish coat Sika 62 or approved equal)
 12. All pump stations shall be equipped with 3-phase power.
 13. Soft start motors shall be used on all pumps above 20 hp.
 14. 480 volt, 3 phase motors shall be used for 40 hp. and above.
 15. A calibrated static pressure gauge suitable for sewer service (with intermediate oil filled diaphragm) shall be installed on the downstream side of the check valve on a piping tree. Provision shall be made for the connection of a pressure transducer to this tree.
- Q. All necessary drawings to insure a complete pump station project shall be included with the plans.
- R. All new pump stations shall be designed in such a manner as to allow for the installation of a fixed generator. A generator is not required as part of the initial installation unless adequate response times are not available as required by Section 10.6.I.

1. Adequate space shall be provided to insure that any necessary control cabinets (e.g. transfer switches, switchgears, etc.) can be installed with the pump station in accordance with applicable laws, codes, and regulations without the relocation of any existing equipment.
 2. The construction of the pump station shall be made for any necessary connecting conduits for the future installation of the generator with necessary caps or closures placed over the ends of the conduit.
 3. The pump station lot shall be sized and laid out to allow for the installation of an external generator in accordance with all applicable laws, codes, and regulations
- S. The pump station floor slab shall be 1-foot above the 100 year storm flood elevation (NAVD 88).
- T. A City of Chesapeake survey monument disk (provided by the City Surveyor) shall be installed on the top of the wetwell for all new City pump stations. Recovery sheets and other necessary data shall be provided to the City Surveyor. Horizontal and vertical data shall be recorded. The benchmark shall conform to A.C.S.M. standards of accuracy for Second Order, Class II vertical control (0.04' $\sqrt{\text{miles}}$).

10.5 WATER METERS

- A. All continuous demands should not exceed 30% of the AWWA recommended maximum rate capacity for the size and type of meter to be used.
- B. Peak design demands for domestic meters shall not exceed 80% of the AWWA maximum rated capacity for the size and type of single meters to be used. This allows for future minor increases without increasing meter size.
- C. All water meters shall be sized to ensure that the expected range of flow conditions will be measured. Acceptable flow ranges are identified in AWWA standards.
- D. Detector check meters may be used for fire systems only. For combined fire and domestic water systems, approved combination meters shall be used. The large meter of a combination meter (used for fire suppression) shall not exceed 100% of the AWWA maximum recommended capacity of the meter.

10.6 UTILITY ACTIVATIONS

Prior to utility activation, the following items must be provided to Public Utilities. Upon receipt of these items, the new facilities will be incorporated into the public systems following an inspection of the facilities showing no defects.

- A. One (1) Year Defect Bond
- B. Deed of Dedication of Utilities (if not in right-of-way)

- C. Cost of Utility Improvements
- D. Telemetry, Standby Pump and Flow Monitor Deposit
- E. Construction Record Drawings (Electronic, compatible with AutoCAD 2004)
- F. Statement of Completion from Development and Permits
- G. Certificate To Operate (CTO) from DEQ (sewer only)
- H. All required easements and plats recorded
- I. On-site bacteriological test results between the water meter and the backflow preventer
- J. Cross-connection inspection and backflow preventer test report
- K. Utility Pro Rata Payment
- L. Statement of Responsibility
- M. VDH/DEQ Approval
- N. City/HRSD Connection Fees Payment
- O. Completion of all offsite improvements as identified in the flow acceptance letter(s)

10.7 UTILITIES PRO-RATA

Any off-site City utility improvements installed by a Subdivider or Developer that satisfy the conditions set forth in the Chesapeake City Code, Section 70-123, may qualify the Subdivider or Developer for pro rata participation. In addition, a Subdivider or Developer may be required to pay their pro rata share of the cost of utility improvements installed by previous Subdividers or Developers in accordance with Chesapeake City Code, Section 70-123

It is suggested that Public Utilities be contacted during the predesign process if more information is desired.

10.8 CROSS-CONNECTION CONTROL & BACKFLOW PREVENTION

VDH Waterworks Regulations and City ordinances require that the public water system be protected from contamination through control of cross-connections and the prevention of backflow from the Customer's on premise plumbing fixtures, and/or industrial piping systems, and the Chesapeake water system. In order to comply with these requirements, Public Utilities has adopted a policy for controlling cross-connections and preventing backflow. For information on potential requirements for a project, contact the City's Cross-Connection Inspector, Department of Public Utilities.

Backflow preventers must be installed before any takeoffs are made from the customer's on-premises piping systems, to include private fire hydrants. Backflow preventers shall be installed in easily accessible locations for testing and repairs, on the customer's property

outside of any existing or proposed Public Utility easements. Backflow preventers should be installed on the water service line immediately downstream of the water meter. All backflow preventers shall be installed a minimum of 12" above grade in a structure to protect the devices from weather, submergence and vandalism.