

CHAPTER 1 - GENERAL DESIGN STANDARDS
Latest Revision July 2017

1. GENERAL

- A. The design of all utility systems and extensions or modifications thereto shall be performed under the direction of a registered professional engineer with a current registration in the Commonwealth of Virginia in accordance with Title 54, Chapter 3 of the Code of Virginia, 1950, as amended. Where applicable, design may be performed under the direction of a certified land surveyor in accordance with Sec. 54-17.1 (3) (b) of the above cited code. All plans shall be stamped by the engineer and have an original signature.
- B. All design shall conform to the latest revision of Commonwealth of Virginia "Sewerage Regulations," the "Waterworks Regulations," VDOT Road and Bridge Specifications and Standards, VDOT's Access Management Design Standards and Subdivision Street Standards and to the requirements of other State and Federal Agencies having jurisdiction.
- C. Additionally, all design shall conform to the requirements of the City of Staunton Division of Engineering (hereinafter referred to as "Division"). When the requirements of the State and City are in conflict, the more restrictive requirements shall govern as determined by the City Engineer.

1.2 ENGINEERING REPORT

If deemed necessary for larger or complex projects, an engineering report shall be submitted to and approved by the Division before preparing drawings and specifications except for minor water and sewer extensions. The report shall contain an overall plan which shall incorporate all of the proposed construction together with a sufficient amount of the surrounding area in order to clearly outline the interrelationship of the two. Existing and proposed development shall be shown as well as existing and proposed utilities. Where phase development is contemplated, the extent of each phase shall be clearly delineated. Additional requirements shall be imposed as detailed in other divisions of these standards and as required by the City.

1.3 SYSTEM LAYOUT

A Layout Map shall be prepared which delineates water shed area boundaries or pressure zone boundaries for sewer projects and water projects, respectively and street layout. The map shall clearly define the areas pertinent to interim and ultimate development of the area proposed

to be served. The Layout map shall show present and future development, proposed, interim, and future utilities as well as those existing utilities that will be affected by or have an effect on the proposed utilities and streets.

1.4 WATER AND SEWER SYSTEM DESIGN

- A. An analysis shall be prepared that will tabulate the numbers of people served or proposed to be served as determined from the City Land Use Map or existing Zoning. The tabulation shall be by incremental areas for evaluation purposes.
- B. Minimum, average and maximum flows shall be developed for areas and subareas and tabulated in the report as deemed necessary or appropriate.
- C. The design shall address overall present and future flows and system capacities of existing and proposed utilities as they may be affected by or may affect the facilities involved and shall develop proposed water main and sewer line sizes. All water systems design shall tie to the City's hydraulic model. Cost for such interface shall be borne by the applicant.
- D. The Design shall be based on ultimate development and shall present such factors as deemed necessary for a sound evaluation of the several factors used in development of the report.
- E. Where an alternate design is proposed that would incorporate interim or staged construction, the report shall develop the alternate design and shall present a thorough investigation and justification for consideration of the alternate.
- F. Public water or sewer lines crossing under retaining walls shall be protected from point loads from the wall by ferrous casing of minimum 0.375" wall thickness. Casings shall extend beyond the wall far enough to allow repair without extensive impacts to the wall.
- G. Encased utilities under roadways shall be designed to facilitate removal and reinstallation of utilities with minimal disruption to traffic. The design should provide enough detail to demonstrate that the casing will serve the intent.

1.4.01 SEPARATION OF WATER LINES AND SANITARY SEWERS

A. Follow State Health Department Standards for separation of water mains and sewer lines.

B. Parallel Installation

(1) Normal Conditions - Water lines shall be constructed at least 10 feet horizontally from a sewer or sewer manhole whenever possible. The distance shall be measured edge-to-edge.

(2) Unusual Conditions - When local conditions prevent a horizontal separation of at least 10 feet, the water line may be laid closer to a sewer or sewer manhole provided that:

a. The bottom of the water line is at least 18 inches above the top of the sewer.

b. Where this vertical separation cannot be obtained, the sewer shall be constructed of AWWA approved water pipe pressure-tested in place without leakage prior to backfilling.

c. The sewer manhole shall be of watertight construction and tested in place.

C. Crossing

(1) Normal Conditions - Water lines crossing over sewer shall be laid to provide a separation of at least 18 inches between the bottom of the water and the top of the sewer whenever possible.

(2) Unusual Conditions - When local conditions prevent a vertical separation described in "Crossing, Normal Conditions," the following construction shall be used:

a. Sewers passing over or under water lines shall be constructed of the materials described in parallel installation, unusual conditions - paragraph 1.1.05 B.(2).

b. Water lines passing under sewers shall, in addition, be protected by providing:

- (1) A vertical separation of at least 18 inches between the bottom of the sewer and the top of the water lines.
- (2) Adequate structural support for the sewers to prevent excessive deflection of the joints and the settling on and breaking of the water line.
- (3) That the length of the water line be centered at the point of the crossings so that joints shall be equidistant and as far as possible from the sewer.

D. Sanitary and/or combined sewers or sewer manholes - no water pipes shall pass through or come in contact with any part of a sewer or sewer manhole.

1.4.02 SEWER IN RELATION TO STREAMS, ESTUARIES, LAKES, RESERVOIRS

A. Location of Sewer in Relation to Streams, Estuaries, Lakes, Reservoirs. The tops of all sewer lines entering or crossing streams shall be at a sufficient depth below the natural bottom of the stream bed to protect the sewer line. In general, one foot of suitable cover shall be provided where the stream is located in rock, and three feet of suitable cover in other material. Less cover will be considered if the proposed sewer crossing is encased in concrete and will not interfere with future improvements to the stream channel. Reasons for requesting less cover shall be given in the application. In paved channels, the top of the sewer lines should be placed below the bottom of channel pavement. Sewers shall remain fully operational during 25-year flood/wave action. 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/wave action. Sewers located along streams shall be located outside the stream bed where possible and sufficiently removed there from to provide for future possible channel widening. Reasons for requesting sewer lines to be located within stream beds shall be given in the application.

B. Sewers Crossing Streams, Estuaries, Lakes, Reservoirs Sewers entering or crossing the streams shall be constructed of watertight pipe. The pipe and joints shall be tested in place, shall exhibit "0" infiltration, and shall be designed, constructed and protected against anticipated hydraulic and physical, longitudinal, vertical

and horizontal loads and erosion and impact. 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 constructed in accordance with the requirements for sewers entering or crossing under streams. Construction methods and materials of construction shall be such that sewers will remain watertight and free from change in alignment or grade.

1.4.03 PROTECTION OF WATER SUPPLIES

A. Water Supply Interconnections

There shall be no physical connection between a drinking water supply and a sewer, or appurtenance thereto.

B. Relation to Water Works Structures

No general statement can be made to cover all conditions; however, for public wells or other public water supply sources and structures, sewers shall meet the requirements of the Virginia Waterworks Regulations with respect to minimum distances from water supply wells or other water supply sources and structures. Sewers should meet the requirements of the Virginia Waterworks Regulations with respect to minimum distances from water supply wells or other water supply sources and structures. No sewer line shall pass within 50 feet of a potable water supply well or other potable water supply source or structure unless special construction and/or pipe materials are used to attain adequate protection. The designer is referred to current editions of the Waterworks Regulations and the requirements contained in "Rules and Regulations of the Board of Health, Commonwealth of Virginia, Governing the Disposal of Sewage" as basic design references. The proposed design shall identify and adequately address the protection of all potable water supply structures within 100 feet of the proposed project.

1.4.04 HIGH VELOCITY PROTECTION

Where velocities greater than 15 feet per second are expected, special provisions shall be made to protect against internal erosion by high velocity. The pipe shall conform to appropriate ASTM or AWWA specifications which provide protection against internal erosion.

1.5 STREET AND STORM DRAIN DESIGN

- A. An analysis of projected traffic flows shall be prepared to determine street design and the effect on adjacent streets. The traffic projections shall be tabulated by incremental areas.
- B. Developments within 3000' of a VDOT maintained street or highway may be required to complete a 527 Traffic Impact Analysis. Traffic studies shall incorporate relevant parameters from existing Adaptive Control elements in the City Traffic Control System.
- C. Temporary termination - streets that terminate temporarily, appearing in character as a dead-end street, shall be provided with a temporary terminal turn-around having a radius of not less than fifty (50) feet of traffic-capable surfaced area to be a minimum of six (6) inches compacted 21-A aggregate plus two (2) inches base asphalt. Future street grades shall be accommodated as much as possible in constructing the temporary turnaround. The developer shall provide on-site temporary construction easements of sufficient width to accommodate the future completion of the street when the adjacent area is developed. (Insert Fire Code Requirements)
- D. Plans shall include extension of street profile into adjacent property for a minimum distance of three hundred (300) feet, to show feasibility for future extension without excessive cuts or fills.
- E. A permanent dead-end street (cul-de-sac) serving a residential development shall be designed with a minimum radius of forty-five (45) feet to the face of the curb, with a fifty-five (55) foot radius on the right-of-way.
- F. A permanent dead-end street (cul-de-sac) serving a commercial or industrial development shall be designed with a minimum radius of fifty (50) feet to the face of curb, with a sixty (60) foot radius on the right-of-way.

1.5.01 STORM DRAINAGE

- A. A storm water management plan shall be prepared in accordance with Chapter 13 of the City Code. All designs shall include Low Impact Design strategies.
- B. For purpose of computing runoff, all existing and proposed gravel drives and parking areas shall be treated as being asphalt-paved.
- C. Clearly label drainage easements as “public” or “private”.
- D. Stormwater control structures shall be detailed with plan and section views sufficient to visualize and construct the facilities in accordance with the design intent.

1.5.02 GRADING PLANS

- A. Grading and Erosion control plans shall show 1 foot contours up to 60 scale drawings. For larger scale drawings, 2 foot contours may be appropriate. Where steep slopes make smaller contour intervals impractical, larger intervals may be acceptable.
- B. All Fine Grading plans shall include spot elevations with enough detail to determine compliance of the design with ADA regulations, and enough detail to determine positive drainage to inlets.

1.6 DRAWING ORGANIZATION AND FORMAT

1.6.01 Drawing Organization

- A. Drawings shall consist of the following types of sheets arranged in the order listed:
 - (1) Cover Sheet
 - (2) Index Sheet (if necessary)
 - (3) Overall Utility Plan
 - (4) Plan Sheets
 - (5) Plan and Profile Sheets
 - (6) Standard Sheets and Special Details
 - (7) Standard Erosion and Sediment Control Notes and Details.
 - (8) Engineering Report with Narratives and Calculations

1.6.02 Sheet Format

- A. All construction drawings shall be on sheets 24 inch x 36 inch. Construction drawings shall be black and white or grayscale. Color construction drawings are permitted only if accompanied by legible black and white or grayscale copies. Existing features should be shown in dashed or shaded linetypes. Proposed features should be shown in solid bold linetypes. Future proposed work may be shown in dashed linetypes, but should be accompanied with a linetype legend.
- B. The cover sheet shall contain the Owner's name and project description in large, distinctive letters, a minimum 3"X3" vicinity map drawn where possible on a scale of 1 inch equals 2,000 feet to indicate the general vicinity of the contemplated construction, and an index to the plan sheets with the signed stamp of the design professional.
- C. An Index Map shall be prepared for linear projects such as sewer line, sewage force main and water line projects. The Index Map shall be to a scale of not less than 1 inch equals 600 feet and shall show all proposed utility construction together with proposed utility structures which shall be indexed to the drawings to indicate the extent of coverage on each drawing, or, in the case of structures, to the group of drawings involved.
- D. The Overall Utility Plan shall show the extents of the project, connections to existing utilities, and proposed structure numbers. Structures shall be numbered by system, e.g. MH100. No topo shall be shown on overall utility plan.
- E. Drafting Conventions:
 - (1) Line weights shall be such that there is easy distinction between existing and proposed features.
 - (2) Symbols and line styles shall be such that existing facilities are easily identified.
 - (3) Drafting standards for lettering shall be such that prints reduced to half size are legible.
- F. Additional Information
 - (1) Horizontal scale in Plan and Profile Sheets shall be no smaller than 1 inch equals 60 feet. All utility lines shall be

stationed in the plan and profile view. Duplicate stationing for individual line segments is discouraged. No topo shall be shown in utility or roadway plan and profile drawings.

(2) Vertical profile scale shall be no smaller than 1 inch equals 10 feet. Where vertical cross slope is significant, the use of right and left offset profiles at the Right of Way line, or at typical service location or building setback line are encouraged.

(3) All existing and proposed underground utilities shall be shown in plan and profile.

(4) Vertical and horizontal control shall be tied to the City's published control network. It shall be noted on the plans the control monument(s) used.

1.7 EASEMENT REQUIREMENTS

1.7.01 Easement surveys shall be made and easement plats prepared in all cases where proposed construction limits exceed the limits of public rights-of-way or properties under the ownership of the developer. These surveys shall tie the lines of proposed construction to existing property lines and property corners, where the property may be identified by corners. Where readily identifiable corners are not found, fence lines and corners, and other indications of property lines may be used. In the absence of any such identifications, the surveyor shall tie the survey to boundaries as set forth on existing plats and in descriptions.

1.7.02 Permanent easements shall be a minimum of 20 feet in width with consideration for wider easements where more than one facility may occupy an easement, or where, because of line size or access requirements, wider easements are desirable. No City utility shall be designed with less than 10 feet of Right of Way or Easement on either side. No retaining walls or other improvements shall be allowed in easements or in close proximity to them if they would make maintenance or replacement of the utility unnecessarily difficult. Where lines have cover in excess of 10 feet, the minimum easement width shall be 30 feet between manholes.

1.7.03 Construction easements shall be acquired for all City projects. Developer's construction facilities are not required to have construction easements where work is on the developer's property. Construction easements shall typically provide a minimum working width of 40 feet, including the 20 foot permanent easement. Generally it is desirable to

provide more construction easement on one side than the other. This allows room for construction traffic and material storage.

1.7.04 Easement plats shall be on sheets 8-1/2 inch x 14 inches. Multiple sheets may be utilized.

A center line for the easement shall be shown together with the limits of both the proposed permanent and construction easement widths referenced to the center line of the easement. Bearings and distances shall be shown on the center line of the easement and on the right-of-way or property lines where they intersect the center line. Distances shall be shown from fixed points on both the center line and the property lines to the intersection of the two. Bearings, distances and closures shall be to the degree of accuracy of 1 in 8,000 except that approximations will be permitted where it is considered impractical to delineate existing property lines. The body of the plat shall show the name of the property owner and the Deed Book, Instrument Number, or Will Book reference for the source of title. Address and Parcel ID shall be provided. The names of all adjacent property owners and a north arrow shall also be shown. Street names or highway route numbers shall also be shown where applicable.