3. Pipeline Crossings and Clearances.

a. General.

1) When determining pipeline clearances, measure the distance between pipelines or utilities, from the outside diameter (OD) or edge of each pipe or utility unless otherwise noted.

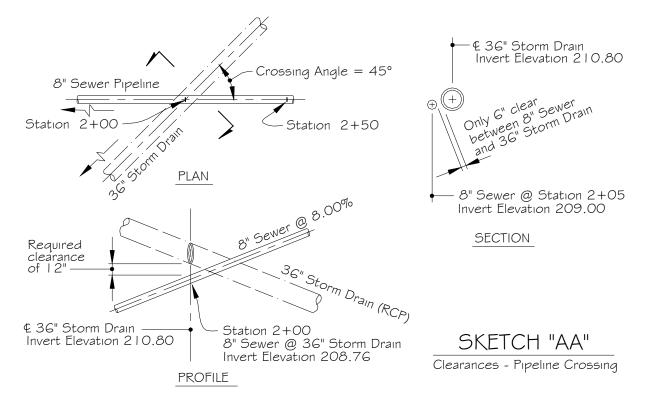
2) Water and Sewer Pipelines.

- a) Sewer pipelines (which include gravity sewers, small diameter pressure sewers, force mains, and SHCs) run <u>parallel or cross</u> water pipelines and WHCs, special clearance/separation requirements are necessary to protect the water supply from contamination due to possible sewerage leaks. See Vertical Separation for Water Pipelines Crossing Sewer Pipelines, Horizontal Separation Between Water and Sewer Pipelines and Horizontal Separation Between WHCs in this section.
- b) For other requirements see this section.
- 3) Tunnels Crossings.
 - a) For crossing and clearances requirements for tunnels, see Part Three, Section 26, Tunnel Design Criteria

b. Vertical Clearances for Pipeline or Utility Crossings.

- 1) Provide minimum one and half (1'-6") feet vertical clearance between water and sewer pipeline and when water and sewer pipelines are crossing other utilities provide minimum one (1'-0") feet vertical clearance.
- 2) When two (2) pipelines or utilities cross each other and are not perpendicular ninety (90°) degrees check the plotting of the entire pipeline or utility crossing in the vertical plane. In the profile, when the crossing is not perpendicular, the total length of the crossing may be greater than one (1) pipe diameter. The vertical clearance requirements may be several feet from the centerline of the two (2) pipelines or utilities. Sketch "AA" is an example of two pipelines, in which the required pipeline clearances are satisfied at the centerline of the two crossings, but the entire pipeline crossing does not meet the required pipe clearances, see the Sketch "A-A" Clearances Pipeline Crossings.





Example.

8-inch sewer at station 2+00 crosses a 36-inch storm drain at an angle of 45° . At the centerline of the two pipelines, the design shows that the two pipelines have a 12-inch clearance, but at station 2+05 the two pipelines have only 6-inch of clearance. This is due to the slope of the two pipelines, see "Section" of Sketch "AA".

To have the required pipe clearance at the centerline of the two pipelines, the clearance at station 2+00 will need to be at least two (2) feet so that the centerline crossing will have the required one (1) foot clearance over the entire pipeline crossing, see Sketch "AA".

3) The minimum vertical clearance for other jurisdiction's utilities, is governed by that utility (i.e., Colonial Pipeline requires a minimum of two (2) feet of vertical clearance).

c. Horizontal Separation With Other Utilities/Structures.

- 1) Provide a minimum of five (5) feet horizontal separation between water/sewer pipelines and other utilities and structures (manholes, inlets, vaults, poles, etc.).
- 2) Provide the following minimum separation when a water/sewer pipeline is parallel or adjacent to existing or proposed buildings or dwellings:

a) Water Pipelines.

(1) For water pipelines 12-inch and smaller in diameter, provide a minimum separation from a building or dwelling the greater of the following: fifteen (15) feet horizontal separation or 1:1 slope from the bottom of the foundation of the existing or proposed building or dwelling to the bottom edge of the pipeline trench.



- (2) For water pipelines larger than 12-inch diameter, the minimum separation from a building or dwelling is to be determined based on the following factors: maintain a minimum horizontal separation of twenty-five (25) feet and consider potential property damage and physical injury during construction, maintenance and failure of the pipeline in assessing whether a greater separation is warranted. Select the separation so that the existing or proposed foundation of the building or dwelling will not be damaged during the construction, maintenance and failure of the pipeline.
- b) Sewer Pipelines.
 - (1) For sewer pipelines 12-inch and smaller in diameter, provide a minimum separation from a building or dwelling the greater of the following: fifteen (15) feet horizontal separation or 1:1 slope from the bottom of the foundation of the existing or proposed building or dwelling to the bottom edge of the pipeline trench.
 - (2) For sewer pipelines larger than 12-inch diameter, the minimum separation from a building or dwelling is to be determined based on the following factors: maintain a minimum horizontal separation of twenty-five (25) feet and consider potential property damage and physical injury during construction, maintenance and failure of the pipeline in assessing whether a greater separation is warranted. Select the separation so that the existing or proposed foundation of the building or dwelling will not be damaged during the construction, maintenance and failure of the pipeline.
- 3) Minimum separation requirements <u>between existing and proposed or relocated water pipelines</u>, where the existing water line is to remain in service.
 - a) For water pipelines 14-inch and smaller in diameter, provide a minimum of ten (10) feet separation centerline to centerline of the two pipelines.
 - b) For water pipelines 16-inch to 24-inch in diameter, provide a minimum of ten (10) feet separation OD to OD of the two pipelines.
 - c) For water pipelines 30-inch and larger in diameter, provide a minimum of twenty (20) feet separation OD to OD of the two pipelines.
 - d) Horizontal separation between the existing and proposed water pipelines may have to be increased when the pipeline is within the zone of influence of existing concrete blocking. To determine if there is adequate passive soil resistance, see Passive Soil Pressure for Concrete Thrust Blocks in Part Three, Section 27 (Thrust Restraint Design for Buried Piping).
- 4) Minimum separation requirements <u>between existing and relocated sewer pipelines</u> where the existing sewer is to remain in service until the relocation is complete.
 - a) For sewer pipelines smaller than 14-inch diameter, provide a minimum of ten (10) feet separation, centerline to centerline of the two pipelines.
 - b) For sewer pipelines 14-inch to 24-inch diameter, provide a minimum of ten (10) feet separation, OD to OD of the two pipelines.
 - c) For sewer pipelines larger than 24-inch diameter, see requirements below for minimum separation requirements between relief sewers and original sewer pipelines.
- 5) Minimum separation requirements between relief sewers and original sewer pipelines.

- a) If both pipelines are 36-inch and smaller diameter, provide a minimum of twenty (20) feet separation, centerline to centerline of the two pipelines.
- b) If one or both pipelines are larger than 36-inch diameter, provide a minimum of twenty five (25) feet separation, *centerline to centerline* of the two pipelines.
- 6) Minimum separation requirements between an existing or new sewer and a new force main.
 - a) If both pipelines are 12-inch and smaller diameter, provide a minimum of ten (10) feet separation, centerline to centerline of the two pipelines.
 - b) If either pipeline is larger than 12-inch diameter, provide a minimum of ten (10) feet separation, OD to OD of the two pipelines.
- 7) Horizontal Separation Between Sewer and Water Pipelines.
 - a) When a sewer is parallel to a water pipeline, provide ten (10) feet minimum horizontal separation, see Standard Detail M/18.0.
 - b) Where sewers and water pipelines are less than ten (10) feet apart horizontally, design the bottom of the water pipeline with a minimum of eighteen (18) inches vertical clearance above the top of the sewer pipeline, see Standard Detail M/18.0.
 - c) If it is impossible to obtain the horizontal separation between the water and sewer pipelines as stated above, see Alternatives When Water and Sewer Clearances Cannot Be Met, in this section.

d. Crossing Under Existing Pipelines and Utilities.

- 1) When crossing under an existing critical pipeline or other utility with a new pipeline(s), special precautions and provisions are necessary in the design to avoid damage and minimize future settlement of the existing utility. Consider the following pipelines and utilities as critical:
 - a) All sizes of Prestressed Concrete Cylinder Pipes (PCCP), both water and sewer.
 - b) All ductile iron water and sewer pipelines larger than 24-inch diameter.
 - c) All non-PVC sewer pipes equal to and larger than 18-inch diameter.
 - d) Any other critical utility identified on a case by case basis such as electrical ductbanks, etc.
- 2) The necessary precautions and provisions to be considered in the design of new pipelines crossing under existing utilities are as follows:
 - a) <u>Supporting the existing pipe or utility across the proposed trench</u>. This is accomplished by limiting the proposed pipe trench width so that the existing pipe is self-supporting or specially designing a support. New water and sewer pipelines that are installed according to the Specifications will be built using standard trench widths indicated in Standard Detail M/8.0.
 - (1) Generally, it is the responsibility of the contractor to provide support as necessary when trenching under existing utilities. This provision is included in the Specifications, therefore,



special design typically is not required.

- (2) If there is considerable interest in protecting the existing pipeline or utility which may be undermined by a wide trench, etc., and if directed by the WSSC. Provide a design for the support of the excavation and the utility as part of the contract documents; see Part Three, Section 18 (Temporary Construction Support Criteria).
- b) <u>Restoring a firm foundation and bedding</u>. Restore a firm foundation and bedding for the existing utility to minimize future settlement and maintain the structural strength of the pipe.
 - (1) When the design calls for crossing under the critical pipelines listed in 1) a) through c) above, provide a note on the drawings, both plan and profile, referring to Standard Detail M/8.3. This detail calls for replacing disturbed earth under and to 1'-0" above the existing pipeline with compacted structural fill.
 - (2) For special crossing situations, such as 1) d) above, provide the special design and details for backfilling under the utility.

e. Vertical Separation For Gravity and Pressure Sewer Pipelines Crossing Water Pipelines.

- 1) When the sewer is <u>below</u> the water, provide minimum one and half (1'-6") feet vertical clearance.
- 2) When the sewer is <u>above</u> the water, provide minimum v one and half (1'-6") feet vertical clearance and design the new pipeline with one full eighteen (18) to twenty (20) foot nominal pipe length centered at the crossing. If the design requires pipe bedding for the new pipes, provide a compacted well graded material such as special borrow material, in accordance with the Specifications, for a minimum of ten (10) feet on each side of the crossing.
- 3) If it is impossible to obtain the vertical separation between the water and sewer pipelines as stated above, see Alternative When Water and Sewer Clearances Cannot Be Met, in this section.

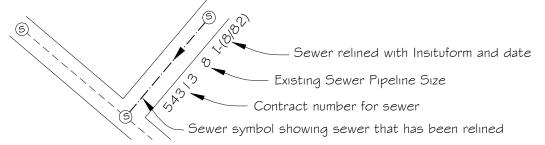
f. Horizontal Separation Between SHC and WHC.

- 1) <u>Separate Trench</u>, provide ten (10) feet minimum horizontal separation between gravity SHC and WHC when they are designed in a separate trench.
- 2) <u>Common or Combined Trench</u>, when the WHC and SHC are designed in a <u>common or combined</u> <u>trench</u> sees Standard Detail M/18.0 for the horizontal and vertical clearances and the following:
 - a) If a ductile iron WHC and a SHC are less than ten (10) feet apart horizontally, design the bottom of WHC with a minimum of eighteen (18) inches vertical clearance above the top of the SHC and a minimum of eighteen (18) inches horizontal separation.
 - b) If a copper pipe WHC and a SHC are less than ten (10) feet apart horizontally, design the bottom of WHC with a minimum of twelve (12) inches vertical clearance above the top of the SHC and a minimum of eighteen (18) inches horizontal separation.
- 3) Provide ten (10) feet minimum horizontal separation between Pressure Sewer House Connection (PSHC) and WHC when designed in a separate trench. <u>Do not design PSHC's and WHC's in a</u> <u>common or combined trench</u>. Where PSHC and WHC are less than ten (10) feet apart horizontally, design the bottom of WHC with a minimum of eighteen (18) inches vertical

clearance above the top of the PSHC.

g. Alternatives - When Water and Sewer Clearances Cannot Be Met.

- 1) If it is impossible to obtain the vertical and horizontal separations between water and sewer pipelines as stipulated in "Vertical Separation For Gravity and Pressure Sewer Pipelines Crossing Water Pipelines" and "Horizontal Separation Between Sewer and Water Pipelines" in this section, then specify one or more of the following alternative methods for the section of the pipeline which is less than the required clearance.
- 2) Prior to specifying these alternatives, consider re-aligning the pipeline to meet the required vertical and horizontal separations between water and sewer pipelines, unless it is more cost effective to use the alternative methods.
- 3) Alternative Methods.
 - a) <u>Slip lined sewer pipelines</u>. Nothing additional is required if the existing or proposed sewer pipeline are slip lined with an approved continuous liner such as the following.
 - (1) Slip line existing sewer pipeline. Review the Sewer 200-foot reference sheets to determine if the existing sewer in question has been lined. See example of 200-foot reference sheet below. Provide a note on the drawings indicating that the existing sewer has been lined.



- (2) Slip lined water pipeline. The allowable water pipeline liner is a steel pipe liner with welded joints.
- b) <u>Pipe bell joint leak clamps</u>. Provide pipe bell joint leak clamps on either the water or sewer pipeline. Provide special provisions to the Specifications, see Part Three, Section 6 (Modifications to Specifications and Standard Details). Indicate the limits of the bell clamps, which should include the section of the pipeline where there is less than the required clearance on the drawings.
- c) <u>Concrete encasement of existing sewer pipelines</u>. Provide concrete encasement on the existing sewer pipeline joints, at least one (1) foot minimum on both sides of the joint and in accordance with Standard Detail M/9.0. (Do not encase in concrete PVC sewer pipelines) For the allowable sewer pipeline materials which can be encased in concrete, see Part Three, Section 13 (Concrete Encasement, Arches and Cradles). Nothing additional is required if the existing sewer pipeline is already encased in concrete. Provide a note on drawings indicating the limits of the existing concrete encasement.
- d) <u>Tunnel or casing pipe</u>. If either/both the existing/proposed water or sewer pipelines are within a tunnel or casing pipe as indicated below, nothing additional is required. Provide a note on the drawings stating that the existing pipeline is within a tunnel or casing pipe.
 - (1) The water pipeline or pressure sewer is to be within a continuous welded joint steel casing



pipe, in accordance with Standard Details M/17.1 or M/17.7.

- (2) The gravity sewer pipeline is to be within a tunnel or casing pipe that is filled with concrete, in accordance with Standard Detail M/17.0.
- e) <u>Special pipe materials</u>. If the water or sewer pipeline is one of the following pipe materials, nothing additional is required: Steel Pipe with welded joints, Prestressed Concrete Cylinder Pipe with continuous welded joints, High Density Polyethylene Pipe (HDPE) with butt fusion joints or solvent welded PVC pipe. Provide note on the drawings indicating the type of material.
- f) <u>Upgrade the sewer pipe material</u>. If the existing or proposed sewer pipeline material is one of those used for water pipelines, see Part One, Section 2 (Pipe Materials and Fittings), nothing additional is required.
- g) <u>Replace the sewer pipeline</u>. At the pipe crossings, replace the existing sewer pipeline, if the existing pipe material is either of PVC AWWA C900/905 pipe or ductile iron pipe, with a nominal full length (18 to 20 foot) centered at the crossing. For parallel installation, replace the existing sewer pipeline with an upgraded sewer pipe material, as specified in this section.

h. Working in the Vicinity of Existing 36-inch and Larger Water Mains.

These notes are to be added to construction plans used for paving and grading above WSSC facilities when there will be less than 3'-0" of cover over the top of the pipe(s) during construction.

<u>SPECIAL CONSTRUCTION REQUIREMENTS FOR WORK PERFORMED</u> <u>IN THE VICINITY OF THE EXISTING (fill in type, size of pipe)</u>

1. Construction vehicles generating a load greater than an AASHTO H20 and vibratory compaction equipment are not permitted within 10 feet clear of the existing ____ water or sewer main(s).

2. The Contractor shall submit construction vehicle specifications for all vehicles to be used closer than 10 feet clear of existing ____ water or sewer main(s) to the WSSC Relocations Unit for WSSC approval prior to commencing work over the mains.

3. Stockpiling of soil or other material is not permitted within 10 feet clear of the mains.

4. The contractor shall locate and stake out the existing ____ water or sewer mains and maintain the markers during construction. Unless otherwise approved by WSSC Relocations Unit, construction vehicles are not permitted within 10 feet clear of the ____ water or sewer mains at any time when less than 3'-0" of cover exists over the mains during construction. The Contractor is responsible for identifying areas where less than 3'-0" of soil cover will exist over the mains during his construction operations.

5. All backfill and compaction over the ____ water or sewer mains with less than 3'-0" of soil cover must be performed manually and/or with vehicles positioned a minimum of 10 feet clear of the main(s) until 3'-0" of cover is achieved. If necessary, temporary fill shall be placed over the existing mains to allow WSSC approved vehicle traffic to cross over the pipeline.

6. All exposed rocks, broken pavement, curbing and other unyielding debris having any

dimension greater than three inches shall be removed from above the main(s) prior to placing and compacting fill, subgrade materials or paving over the main.

7. The contractor shall notify the WSSC Construction Inspector ______ at telephone number ______ at least _____ days in advance of any grading or paving in the vicinity of the existing ____" water or sewer main(s). All grading and paving over the mains shall be coordinated and performed under the supervision of the WSSC Construction Inspector.

8. The contractor shall use special care while performing work in the vicinity of the existing _____ water or sewer main where less than 3'-0" of soil cover exists and strictly adhere to these special construction requirements. The Contractor is responsible for any damage and/or replacement required as result of his work over the mains.

i. Working Within Maryland Transit Administration (MTA) Rail Lines.

- 1) Locations of water and sewer pipelines (which include water mains and gravity sewers, small diameter pressure sewers, force mains SHCs, and WHCs, manholes, vaults, valves and fire hydrants) shall not be located with the MTA Rail Line of Influence, see Sketch "UU".
- 2) When within the MTA Rail Line of Influence install the water and sewer pipelines in a casing pipe, see Casing Pipe Lengths, Section 26 (Tunnel Design Criteria).

