11. Design of Structures.

a. Manholes.

1) Provide manholes in accordance with Standard Details S/1.0, S/1.1 and S/1.2.

2) Review Standard Details for pipe depth requirements, pipe slope limitations, and type of pipe material (RCP, PVC or DIP). For additional requirements, see the Part Two, Section 12 (Types of Manholes), Section 13 (Manhole Spacing), Section 14 (Pipe to Manhole Geometry), Section 15 (Pipe Slope and Manhole Distance), Section 16 (Manhole Drop Connections), Section 17 (Manhole Channel Design), Section 18 (Manhole Depth Design), and Section 19 (Manholes Built Over Existing Sewers).

b. Special Design Structures.

1) Specially designed structures are required if the Standard Details are not adequate for the particular design. Provide details on the drawings, showing all necessary plan and section views, and label all materials, dimensions, etc.

2) Provide a minimum of six and one half (6-1/2) feet of head room inside the structure when maintenance of equipment or operation of flow control devices is required and a minimum of five (5) feet in all other locations. Base the design for the sewer pipeline on this minimum depth. For other requirements, see Part Three, Section 16 (Design of Pipeline Structures).

c. Design of Structures on Profiles.

1) Verify that the invert of the pipeline is set at the proper depth with the details of the structure.

2) Provide existing and proposed ground elevations.

d. Horizontal Location of Manholes.

1) Locate manholes at all sewer junctions and changes in alignment except in curved sections and according to the spacing requirements in Part Two, Section 13 (Manhole Spacing).

2) Locate manhole frames and covers out of sidewalks or parking areas unless approved by WSSC.

3) Manholes located within a storm management facility. Locate manholes out of the two (2) year design storm pool elevation. For additional information, see Part Two, Section 22 (Impact of Storm Water Facilities on Existing Sewers).

4) When the manhole frame and cover is designed near a sidewalk, curb, etc., indicate on the drawings by note, to rotate the top section (cone) to clear the sidewalk, curb, etc.

e. Vertical Location of Manholes.

1) Locate manholes at all pipeline junctions, at all changes in grade and according to the spacing requirements in Part Two, Section 13 (Manhole Spacing).

f. Diameter of Frames and Covers.

1) Unless otherwise indicated, the required manhole openings are as shown in Table "12" and in accordance with Standard Details.

TABLE "12"

Diameter Requirements for Manhole Frames and Covers

Manhole Inside Diameter	Diameter of Manhole Frames and Covers
48-inch	24-inch
60-inch	30-inch
72-inch	36-inch
84-inch	36-inch
96-inch	36-inch
Larger Than 96-inch	36-inch
48-inch Shallow Type	30-inch

g. Setting of Frames and Covers.

1) Design the frames and covers as follows and provide WSSC with computations (tabulation sheet) supporting the frame and cover elevations.

a) Within a proposed or future roadway with established road grades, provide the elevation of the top of the manhole frame and cover, see Sketch "L". When established roadway grade profile is used to calculate the elevation of the frame and cover, give the elevation to the hundredth of a foot. When established roadway grade or grading plan showing contour lines is used to calculate the elevation of the frame and cover, give the elevation to the tenth of a foot. If the manhole falls within a roadway indicate the roadway grade slope in percent (%) in the direction of the profile see Sketch "L".

b) Outside limits of grading design manhole or vault frame and cover to the existing ground elevation, see Sketch "M".

c) Existing areas or developments design manhole or vault frame and cover to existing ground, see Sketch "M".

d) Undeveloped areas, the manhole frame and cover are normally designed to one (1) foot above the existing ground elevation, see Sketch "M".

e) Areas of future grading over the pipeline.

(1) When the future grading will increase the soil cover over the pipeline by two (2) feet or more, set the frame and cover elevation to the initial grading, with the manhole and pipeline designed to handle the additional fill and provide the future elevation of the frame and cover on the drawings.

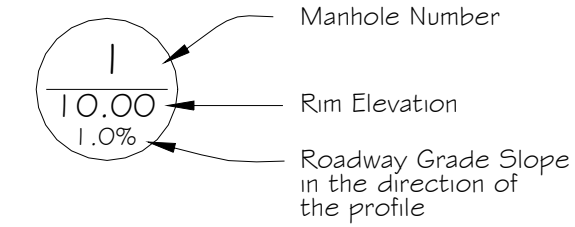
(2) When the future grading increases the cover over the pipeline by less than two (2) feet, set the frame and cover elevation to the future grade or as directed by WSSC.

(3) When the future grading will decrease the cover over the pipeline, set the frame and cover elevation to the initial grading and provide the future elevation of the frame and cover on the

drawings.

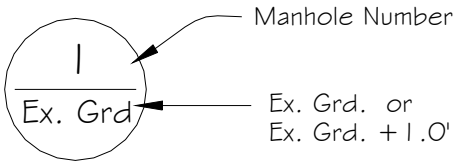
h. Labeling Manholes on the Drawings.

1) On plan and profile, label manholes as follows:



SKETCH "L"

Labeling Manholes or Vaults on Proposed or Finished Grades



SKETCH "M"

Labeling Manholes or Vaults on Existing Grades

i. Infiltration - Sewerage Structures.

1) Infiltration Design. Base the design details on the Standard Details and Specifications whenever possible to prevent groundwater infiltration.

2) Design cast in place concrete structures on the following and Part Three, Section 16 (Design of Pipeline Structures).

a) Design structure, joints and penetrations to prevent infiltration.

b) Provide joints with waterstops.

c) Seal joint between wall and top slab with flexible gasket material in accordance with Specifications or with other materials if approved by WSSC.

d) Provide watertight manhole frame and covers for manway (access) openings.

e) Design the connections between pipe and wall to be either rigid or flexible. In either case, specify a bentonite collar in accordance with Standard Detail S/3.01.

(1) Provide flexible connectors in accordance with the Specifications; consult with manufacturers to verify availability of flexible connectors in the various sizes required.

(2) Rigid connections require a pipe joint within two (2) feet outside of the structure wall.