16. Design of Structures.

a. Standard Details.

1) When using the Standard Details for Air Manholes, Valve Vaults, Pressure Reducing Valve Vaults and Relief Valve Vaults, etc., verify that the depth of the proposed pipeline is adequate for the use of the Standard Details.

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) Allow for a minimum of six and one half (6-1/2) feet of headroom inside the proposed structure. The depth of the pipeline should be based on this dimension. For other requirements, see Part Three, Section 15 (Design of Pipeline Structures).

3) All pipe connections to vaults shall have a watertight seal using a rubber annular hydrostatic sealing device in accordance with the Specifications and Standard Details.

c. Design of Structures on Profiles.

1) Verify that the invert of the pipeline is set at the proper depth in relation to the elevations/dimensions associated with the details of the structure.

d. Access Openings.

1) Vaults. Provide frame and cover for access into vaults, see Standard Detail W/5.5. If the design requires a hatch, then provide a watertight hatch able to withstand H20 loading, see Specifications and Standard Detail W/5.5. Do not design hatches when the vault is located in a paved area subjected to high density traffic (e.g. streets, parking lots, etc.).

2) Manholes. Provide frame and cover for access into manholes, see Standard Details S/4.2 and S/4.3 and Table "10" in Part Two, Section 12 (Design of Structures).

e. Setting of Frames and Covers or Hatches.

1) Design the frames and covers, or hatches, following the guidelines below and provide computations (tabulation sheet) supporting the frame and cover or hatch elevations.

   a) Within a proposed or future roadway with established road grades, provide the elevation of the top of the manhole or vault frame and cover or hatch, see Sketch "G". When an established roadway grade profile is used to calculate the elevation of the frame and cover, give the elevation to within a hundredth of a foot. When an established roadway grade or grading plan showing contour lines is used to calculate the elevation of the frame and cover or hatch, give the elevation to within a 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 "G".

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

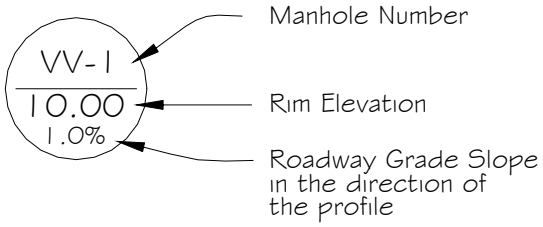
c) Existing areas or developments, design the top of manhole or vault frame and cover or hatch to match the existing ground elevation, see Sketch "H".

d) Undeveloped areas, the top of the manhole frame and cover or hatch are normally designed to be one (1) foot above the existing ground elevation, see Sketch "H".

f. Labeling Structures on the Drawings.

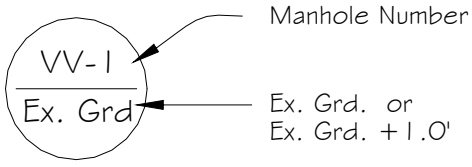
1) On plan and profile views label vaults and manholes as follows:

Air Release Manhole or Vault	=	AR	Entry Port	=	EP
Valve Vault	=	VV	Blowoff	=	BO
Air Release/Vacuum Relief Manhole or Vault	=	ARVR			



SKETCH "G"

Labeling Manholes or Vaults on Proposed or Finished Grades



SKETCH "H"

Labeling Manholes or Vaults on Existing Grades