

## CHAPTER 4

## SEWER SYSTEM APPURTENANCES

## 4-1. Manholes.

a. Requirement. Manholes are required at junctions of gravity sewers and at each change in pipe direction, size or slope, except as noted hereinafter for building connections.

b. Spacing. The distance between manholes must not exceed 400 feet in sewers of less than 18 inches in diameter. For sewers 18 inches in diameter and larger, and for outfalls from wastewater treatment facilities, a spacing of up to 600 feet is allowed provided the velocity is sufficient to prevent sedimentation of solids.

c. Pipe connections. The invert of the outlet pipe from a manhole will be on line with or below the invert of the inlet pipe. When the outlet pipe from a manhole is larger than the largest inlet pipe, the crown of the outlet pipe is to be no higher than the lowest inlet pipe crown. Where the invert of the inlet pipe would be more than 24 inches above the manhole floor, a drop connection will be provided. Typical manholes, dimensions, materials, and methods of construction are shown on Standard Mobilization Drawing No. XEC-001.

d. Frames and covers. Manhole top elevations will be set to avoid submergence of the cover by surface water runoff and ponding. Frames and covers must be sufficient to withstand impact from wheel loads where subject to vehicular traffic.

e. Design standards.

(1) Smooth flow channels will be formed in the manhole bottom. Laying half tile through the manhole, or full pipe with the top of the pipe being broken out later, are acceptable alternatives.

(2) In areas subject to high ground water tables, manholes will be constructed of materials resistant to ground water infiltration.

f. Materials of construction. The primary construction materials to be used for manhole structures are precast concrete sections, prefabricated fiberglass units, cast-in-place, reinforced or nonreinforced concrete and, if necessary, brick masonry. In the past, most manholes were built of brick masonry, and are now frequently the source of significant volumes of ground water infiltration. More recently in attempts to alleviate this problem, precast concrete and fiberglass manholes have been utilized. In certain situations precast units will not be suitable, and cast-in-place reinforced concrete will be required. Cast-in-place construction permits greater flexibility in

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the configuration of elements, and by varying reinforcing the strength of similar sized structures can be adjusted to meet requirements.

4-2. Building connections. Building connections will be planned to eliminate as many bends as practical and provide convenience in rodding. Generally, connections to other sewers will be made directly to the pipe with standard fittings rather than through manholes. However, a manhole must be used if the connection is more than 100 feet from the building cleanout.

4-3. Cleanouts. Cleanouts must be installed on all sewer building connections to provide a means for inserting cleaning rods into the underground pipe. An acceptable cleanout will consist of an upturned pipe terminating at, or slightly above, final grade with a plug or cap. Preferably the cleanout pipe will be of the same diameter as the building sewer, and never smaller than 6 inches.