

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-inch 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 crown of the outlet pipe from a manhole will be on line with or below the crown of the inlet pipe. Where conditions are such as to produce unusual turbulence in the manhole, and especially where the size of the outlet pipe is to be smaller than the inlet pipe because of the availability of a more favorable slope, it may be necessary to provide an invert drop to allow for entry head, or increased velocity head, or both. Where the invert of the inlet pipe would be more than 18-inches above the manhole floor, a drop connection will be provided.

d. Frames and covers. Manhole top elevations will be set to avoid submergence of the cover by surface water runoff and ponding. Where this is not possible, watertight covers will be installed to prevent storm water inflow. Bolting or locking devices will be included on covers to prevent unauthorized entry in areas designated by the using agency as secure. Frames and covers must be sufficient to withstand impact from wheel loads where subject to vehicular traffic.

e. Design standards. Where suitable Federal, Army or Air Force standard drawings and specifications exist, they will be used for design of manhole structures, unless a special design is required. The following construction practices will be required:

- 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.
- For manholes over 12 feet in depth, one vertical wall with a fixed side-rail ladder will be provided.
- Drop connections will be designed as an integral

part of the manhole wall and base.

—In areas subject to high groundwater tables, manholes will be constructed of materials resistant to groundwater infiltration.

f. Materials of construction. The primary construction materials to be used for manhole structures are precast concrete rings, prefabricated plastic and fiberglass units, and cast-in-place, reinforced or nonreinforced concrete. In the past, most manholes were built of brick masonry, and are now frequently the source of significant volumes of groundwater infiltration. More recently in attempts to alleviate this problem, precast concrete, plastic, 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 the configuration of elements, and by varying reinforcing the strength of similar sized structures can be adjusted to meet requirements. In general, materials used should be compatible with local construction resources, labor experience, and should be cost competitive.

4-2. Building connections.

Building connections will be planned to eliminate as many bends as practical and provide convenience in rodding. Bends greater than 45 degrees made with one fitting should be avoided; combinations of elbows such as 45-45 or 30-60 degrees should be used with a cleanout provided. 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. Normally, the cleanout inside the building will not be adequate for complete rodding, thus outside cleanouts will be provided. Manholes will be installed where cleanouts are not feasible.

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.