

GENERAL:

1. To provide minimum standards for Sanitary Sewer Systems outside five feet from the building.

DESIGN GUIDELINES:

1. Sanitary sewers shall be designed and installed in accordance with the standards and requirements of the Missouri Department of Natural Resources and local requirements (MSD, City of Columbia, Rolla, or Kansas City), unless noted otherwise in these design guidelines.
2. The state of Missouri HB 1867 requires tracer wire for all new or fully replaced sewer installations in public right of way. Provisions for sewer installations are included herein.
3. Unless noted otherwise, installation details shall be same as city details where sanitary sewer is being installed.
4. Sewer systems shall be designed to carry traffic loads in all locations.
5. The minimum service line size shall be 6". The minimum sewer main shall be 8".
6. Pre-cast concrete manholes shall comply with ASTM C478 or ASTM C76, Class 3. Cast-in-place manholes shall be detailed in the construction documents.
7. Cleanouts may be used at the end of a sewer line where the distance to the downstream manhole is 150-feet or less. Cleanouts are required on service lines outside a building footprint and at horizontal or vertical bends in a service line. The deflection should utilize a wye with the cleanout as an upstream extension of the downstream line's alignment.
8. Sewer piping installation shall include granular bedding with fines and backfill within the pipe envelope.
9. Sewer piping shall be laid to the lines and grades indicated on the drawings. Laser beam equipment or surveying instruments shall be utilized to determine and maintain proper line and grade.
10. Sewer piping shall be installed without any bellies or sags. Owner may inspect any or all sections of sewer line at their discretion for straightness.
11. Trench backfill in yard areas shall generally be soil compacted, in continuous layers not exceeding 8" in compacted depth, to 85% Standard Proctor Density.

12. Trench backfill under pavements shall generally be granular material compacted, in continuous layers not exceeding 8" in compacted depth, to 95% Standard Proctor Density.
13. Maintain -2% to +4% optimum moisture content for cohesive soils. For cohesionless soils, maintain moisture at less than +4% of optimum moisture content.
14. Sanitary Sewer Pipe shall be:
 - 14.1. Standard Pipe Sizes: 6, 8, 12, 15, 18, 21 inches (PVC)
 - 14.2. Standard Pipe Sizes: 6, 8, 12, 16, 18, 20 inches (Ductile)
 - 14.3. Ductile iron conforming to ASTM A746 with cement interior lining and asphaltic coating on the interior and exterior conforming to ANSI/AWWA C104/A21.4. ANSI/AWWA C111/A21.11 rubber gaskets.
 - 14.3.1. Ductile iron pipe shall be encased V-Bio polyethylene wrap conforming to ANSI/AWWA C105/A21.5.
 - 14.4. Ductile Iron fittings shall conform to ANSI/A21.10 with the joint meeting the requirements of ANSI/A21.11 for push-on joints.
 - 14.5. Polyvinyl chloride (PVC) pipe conforming to ASTM D3034. Pipe compound ASTM D1784. Gasket ASTM F477. Integral Bell Joint: ASTM D3212. SDR 26. Color: Green.
 - 14.6. PVC fittings shall conform to ANSI D3034/F1336 SDR 26 PSM PVC, with solvent welded joints.
 - 14.7. Couplings shall be shielded with stainless steel shear rings to prevent pipe dislocation. Fernco Strong Back 1000 or approved equal.
15. Manholes
 - 15.1. Manholes shall be pre-cast concrete conforming to ASTM C478 or ASTM C76, Class 3.
 - 15.2. Joints shall conform to ASTM C361 or ASTM C443.
 - 15.3. Pipe openings shall be provided with flexible connectors designed to produce a positive watertight connection for pipes entering the manhole. Connectors shall be A-LOK or equal.
 - 15.4. Grade rings shall conform to ASTM C478.
 - 15.5. Waterproofing shall consist of two coats of asphaltic pitch conforming to ASTM D449, and shall be asbestos-free.
 - 15.6. Standard frame and lid shall use a Deeter 1247, Neenah R-1642, or exact equal frame and lid. The lid shall be lettered with the words 'Sanitary Sewer'. Watertight frames and lids shall be used in areas with high infiltration potential and in Regulatory Flood Plains.
 - 15.7. Manhole steps shall be Neenah 1980-J, Deeter 1606, M.A. Industries PS2-PF, or equal.
 - 15.8. Manholes shall have eccentric top sections.
 - 15.9. Manhole bottom shall have flow channeling to inverts.

16. Cleanouts

- 16.1. Cleanouts are required on service lines outside a building footprint and at horizontal or vertical bends in a service line. The deflection should utilize a wye with the cleanout as an upstream extension of the downstream line's alignment.
- 16.2. Cleanout material shall be cast iron.
- 16.3. Frame and casting shall be Neenah R-1976, Deeter 1830, or equal. Casting shall be anchored by a 2' x 2' x 8" thick concrete pad, 6" below finished grade. Separate concrete from pipe with two layers of Building Paper.
- 16.4. End of line cleanouts shall use long radius bends and include a concrete cradle under the bends.

17. Trace Wire & Test Stations

- 17.1. **MU:** Tracer Wire shall be #14 AWG solid, steel core soft drawn high strength tracer wire, 250# average tensile break load, 30 mil High Molecular Weight (HMWPE) or High Density (HDPE) polyethylene jacket complying with ASTM-D-1248, 30 volt rating. Jacket color shall be **green**. No THHN insulated wire shall be allowed. Tracer wire shall be Copperhead Industries HS-CCS or approved equal. The tracer wire shall be taped to the pipe at the three o'clock position every 5 feet. The tracer wire ends will terminate in a manhole under the lid, or at a tracer wire test station.
- 17.2. **MS&T:** Tracer wire shall be #12 THHN attached to top of pipe at 5' intervals. Tracer wire ends to terminate in manhole near the lid with 5' coil of wire.
- 17.3. **MU:** Tracer wire shall have moisture resistant splices for direct bury applications. Splices shall be Copperhead Industries Snakebite or 3M DBR or approved equal.
- 17.4. **MU:** Tracer wire test stations shall be installed at locations where a manhole cannot be used. These stations shall be designed to be easily detected by magnetic and electronic locators. A magnet shall be securely attached at the top of the upper tube of the box for locating purposes. Lid shall be green and have a brass terminal for attaching locating equipment and a brass 5-sided nut for removing cap. Tracer wire test station shall be Copperhead Industries Snake Pit or approved equal.
- 17.5. Warning tape shall be 100% plastic and installed at least 12" above the pipe.