

PART 8 - SANITARY SEWERS

8.01 APPROVALS, PERMITS, AS-BUILTS, AND MAINTENANCE BONDS

- A. Plans and specifications for public sanitary sewer facilities must be certified by a professional engineer registered in the State of Iowa and utilize the NGVD of 1929.
- B. Plans and specifications for public sanitary sewer facilities must be reviewed and approved by the City Engineer prior to construction.
- C. Plans and specifications for public sanitary sewer facilities must be reviewed and approved by the Iowa Department of Natural Resources prior to construction. Other local, state and federal permits may be required, depending on the circumstances. It shall be the responsibility of the Engineer of Record to acquire all applicable permits. A copy of all permits shall be provided to the City Engineer before construction.
- D. The Engineer of Record is responsible to submit "Record of Construction" drawings to the City Engineer on reproducible vellum or Mylar, and a digital base map in an AutoCAD file or other approved electronic format. Drawings shall include the horizontal locations of services.
- E. A 4-year maintenance bond covering defective materials and workmanship is required for all sanitary sewer facilities.

8.02 DESIGN RESOURCES AND REFERENCES

The design for sanitary facilities shall be in conformance with the Requirements and Standards of the Iowa Department of Natural Resources.

8.03 PERMITTED FLOWS AND CONNECTIONS

- A. No combined sewers shall be constructed. Sanitary and storm sewers shall be kept separate.
- B. Only sewage shall be permitted in the sanitary sewers. Footing drains, downspouts, sump pumps, etc., conveying clear water will not be allowed to discharge into the sanitary sewer system. Air conditioning condensation water may be allowed in the sanitary sewer.
- C. Flows from commercial car washes must be discharged to the sanitary sewer after passing through approved oil and sediment traps.
- D. Every building, including each unit of zero-lot-line residences, shall have a direct service connection to a public sewer main.

8.04 DESIGN FLOWS AND CAPACITY (for new construction only)

A. Peak rates will be taken at approximately 2.5 times the normal flow. Infiltration will be calculated by the addition of 200 gallons per inch pipe diameter per mile per day (200 gimd).

B. The peak wet weather flows for various land usage are as follows:

1. Single Family Dwellings
(100 gal/cap/day) x 2.5 (peak factor) +
(infiltration) = 250 gpcd + infiltration
Assume 3.5 people/home

2. Mobile Homes
(50 gal/cap/day) x 2.5 (peak factor) +
(infiltration) = 125 gpcd + infiltration
Assume 2.5 people/home

3. Multi-Family Dwellings
(75 gal/cap/day) x 2.5 (peak factor) +
(infiltration) = 187 gpcd + infiltration
Assume 1.5 people/bedroom

4. Motels and Hotels
(50 gal/cap/day) x 2.5 (peak factor) +
(infiltration) = 125 gpcd + infiltration
Assume 1.5 people/room

5. Schools, without cafeteria and/or showers
(10 gal/cap/day) x 2.5 (peak factor) +
(infiltration) = 25 gpcd + infiltration

6. Schools, with cafeteria and/or showers
(20 gal/cap/day) x 2.5 (peak factor) +
(infiltration) = 50 gpcd + infiltration

7. Office Buildings
(10 gal/cap/day) x 2.5 (peak factor) +
(infiltration) = 25 gpcd + infiltration
Assume 1 person/200 sq. ft.

8. Light Industrial
(14,000 gal/acre/day) x 2.5 (peak factor) +
(infiltration) = 36,200 gpad

gpcpd = gallons per capita per day

gpapd = gallons per acre per day

gimd = gallons per inch diameter per mile per day

C. If a proposed sewer is to serve a predominantly wet area or an area prone to excessive infiltration and inflow, special design information should be obtained from the City Engineer. If no information is available, the designer should use a

minimum of 1000 gmd for infiltration.

- D. All sanitary sewers shall be a minimum of 8 inches in diameter.
- E. Pipes will be sized to carry peak rates with the pipe flowing at no more than 0.67 of the pipe diameter for pipes 15 inches and smaller and 0.75 of the pipe diameter for pipes larger than 15 inches in diameter.
- F. All sewers shall have a slope which will give a mean velocity when flowing full of not less than 2.0 feet per second based on Manning's formula using an "n" value of 0.013.
- G. Where velocities greater than 15 feet per second are calculated, special provisions shall be made to protect against displacement, erosion or shock.
- H. Sanitary sewers shall be sufficiently deep so as to receive sewage by gravity from basements and to prevent freezing.

8.05 SERVICE CONNECTIONS

- A. A sanitary service pipe will be provided for every platted lot or location where construction of a building is likely. A 4-inch or 6-inch sanitary service pipe will be used for single-family residential. Pipes for multi-family residential, commercial, or industrial will be sized as required.
- B. Sanitary service pipes will be extended from the main to the right-of-way line or outer utility easement line, whichever is further.
- C. No 2 sanitary services shall be constructed in the same trench. Service connections shall be separated by a minimum of 6 feet.
- D. The end of all sanitary services shall be marked with a metal post or #4 reinforcing steel at least 24 inches in length buried within 1 foot of the finished grade.
- E. Service taps in manholes are allowed only in extreme conditions and with the approval of the City Engineer. If permitted, service connections to manholes must be between 6 inches and 12 inches above the invert elevation of the outlet. Sewer flow channels in the manhole bottom must be provided for all services. Internal drops for service connections may be permitted on manholes deeper than 12 feet upon approval of the City Engineer. Internal drops shall be constructed of SDR 23.5 PVC with stainless steel bands and fasteners spaced at a maximum of 4 feet.

8.06 PIPE STANDARDS AND STRENGTH DESIGN

- A. **Reinforced concrete pipe** manufactured in accordance with ASTM C-76 and meeting the following standards may be used for pipe 18 inches in diameter or larger.
1. Joints: All joints will be confined O-ring gasket meeting ASTM C443. All pipe 36-inch diameter and smaller will have bell and spigot joints. Pipe larger than 36-inch diameter may have tongue and groove joints.
 2. Wall Thickness: Minimum wall thickness will be B-wall as defined in ASTM C-76.
 3. The required pipe strength and bedding requirements shall be calculated on a case-by-case basis. The minimum pipe strength shall be Class III as defined in ASTM C-76.
 4. Pipe Markings: All pipe shall be marked with the date of manufacture and ASTM class. If quadrant reinforcement is used, the top shall be marked on the outside of the pipe.
 5. No lift holes.
 6. Hydrogen sulfide shall be considered in the design of concrete pipe sewers downstream from lift stations.
- B. **Ductile iron pipe** manufactured in accordance with ANSI/AWWA-C150/A21.50-02 and ANSI/AWWA-C151/A21.51-02 and meeting the following standards may be used.
1. Joints: Use push on gasketed joints.
 2. Thickness: Use Class 52 ANSI standard unless a thicker wall is required because of depth.
 3. Lining and Coating:
 - a. Inside of pipe and fittings: Double thickness cement lining and bituminous seal coat conforming to ANSI/AWWA-C104/A21.4-95.
 - b. Outside of other pipe and fittings: Standard bituminous coating conforming to appropriate ANSI Standard.
- C. **PVC truss pipe** manufactured in accordance with ASTM D2680 and meeting the following standards may be used for pipe 8 inches through 15 inches in diameter.
1. All PVC truss pipe shall be made of PVC compound having a minimum cell classification of 11432 as defined in ASTM D4396.
 2. Joints: Gaskets shall comply with requirements in ASTM F477 and F913.

Joints shall meet the requirements of ASTM D3212.

3. Pipe shall have a minimum pipe stiffness of 200 lb./inch/inch at 5% deflection.

D. **Poly vinyl chloride (PVC)** manufactured in accordance with ASTM D3034-88 and meeting the following standards may be used for 4-inch and 6-inch services and for main line pipe 8-inch through 15-inch.

1. Joints: ASTM D3212 gasketed.
2. All 4-inch and 6-inch services shall be SDR 23.5 or 26 PVC.
3. SDR 35 may be used for main pipe 8-inch through 15-inch.

E. The designer shall specify pipe material, bedding and trench width to withstand anticipated dead and live loads. Minimum pipe and bedding standards are listed in Table 8.1.

TABLE 8.1

PIPE MATERIAL	SIZE	JOINT	MINIMUM STRENGTH	MINIMUM BEDDING*
<u>Sanitary Sewers</u>				
•Reinforced Concrete	18" & up	See 8.06.A..1	Class III, B wall	Type B
•PVC SDR-35	8"-15"	Gasket	SDR-35	Crushed-Stone Encasement
•PVC Truss	8"-15"	Gasket		Crushed-Stone Encasement
Ductile Iron	3" & up	Gasket, push	Class 52	Type B
<u>Sanitary Service</u>				
PVC	4" & 6"	Gasket	SDR 23.5	Crushed-Stone Encasement
DIP	4" & 6"	Gasket	Class 52	Type B

*See Figure 8.4.

F. All sewer mains shall have a 12-gauge insulated trace wire taped to the top of the pipe every 6 feet. Trace wire shall be brought to the surface at each manhole and as directed.

8.07 MANHOLE STANDARDS

- A. Manholes shall be located as follows:
1. At the end of each line.
 2. At all changes in grade, size, or alignment.
 3. At all intersections of pipes.
 4. At distances not greater than 400 feet for sewers 15 inches or less in diameter and 600 feet for sewers 18 inches to 30 inches in diameter. Greater spacing may be permitted in larger sewers.
- B. Drop Connections: An external drop pipe shall be provided for a sewer entering a manhole at an elevation of 24 inches or more above the manhole invert. Where the difference in elevation between the incoming sewer and the manhole invert is less than 24 inches, the invert shall be filleted to prevent solids deposition.
- C. Minimum Drop Across Manholes
1. For the same size pipe with a change in alignment of 45° or less, no drop is required.
 2. For the same size pipe with a change in alignment of greater than 45°, or junction of 2 inflow pipes, a 0.2-foot drop is required.
 3. For the same size pipe with a junction of 3 or more inflow pipes, a 0.3-foot drop is required.
 4. When a smaller sewer joins a larger one, the invert of the larger sewer shall be lowered sufficiently to match the 0.8-foot depth point of both sewers at the same elevation.
- D. Bedding: All manholes shall be placed on a minimum of 6 inches of crushed-stone bedding.
- E. Materials:
1. Joints: All joints will be a confined O-ring gasket meeting ASTM C443.
 2. No lift holes through the entire wall.
 3. Mark class and date of manufacture.
 4. Inverts: Precast and cast-in-place inverts must provide a channel at least $\frac{1}{2}$ the depth of the pipe and match the full cross-sectional area of the pipe. All junctions and changes in directions of inverts shall be smooth and rounded to the maximum extent possible to supplement flow through the manholes.

5. Diameter: The minimum diameter for manholes is 48 inches for pipe 21 inches in diameter and smaller, and 60 inches for pipe greater than 21 inches in diameter.
 6. Castings shall be Neenah R-1642 and Type "B" non-rocking self-sealing lid or approved equal.
- F. Standard manholes, step details, drop connections and risers are shown in Figures 8.1, 8.2 and 8.3.
- G. All manholes shall be marked with 2 metal fence posts to remain in place until landscaping is complete. In subdivisions, the posts shall remain in place until landscaping has been completed by the lot owner.
- H. If a manhole is in an area subject to surface water inundation, the casting shall be bolted to the cone section with stainless steel anchors. In addition, an exterior Cretex manhole chimney seal (or approved equal) shall be installed that spans from the casting ring to the cone section.
- I. Concrete spacer rings and metal shims with grout shall be the only materials utilized to adjust manhole frame elevations. A minimum of 8 inches and a maximum of 24 inches of space rings shall be provided.

8.08 PROTECTION OF WATER SUPPLIES

- A. There shall be no physical connection between a public or private potable water supply system and a sewer appurtenance which would permit the passage of any sewage or polluted water in the potable supply.
- B. Under normal conditions water mains parallel to sewers shall be placed at least 10 feet horizontally from any sanitary sewer, storm sewer or manhole. Where local conditions prevent this separation, the water main may be laid closer provided the bottom of the water main is at least 18 inches above the top of the sewer and the water main is placed in a separate trench or in the same trench on a bench of undisturbed earth at a minimum horizontal separation of 3 feet from the sewer.
- C. Water mains crossing sewer services, storm sewers or sanitary sewers shall be laid to provide a separation of at least 18 inches between the bottom of the water main and the top of the sewer. Where local conditions prevent this vertical separation, the water main shall not be placed closer than 6 inches above a sewer or 18 inches below a sewer under any circumstances. Additionally, 1 full length of water pipe crossing the sewer shall be centered at the point of crossing so that the water pipe joints will be equal distance as far as possible from the sewer. The water and sewer pipes must be adequately supported and have pressure tight joints. A low permeability soil shall be used for backfill material within 10 feet of the point of crossing.
- D. No water pipe shall pass through or come in contact with any part of a sewer manhole. A minimum horizontal separation of 3 feet shall be maintained.

8.09 CREEK CROSSINGS

- A. Sanitary sewers crossing creeks shall be Class 52 D.I.P. encased in reinforced concrete or 3/8 inch thick steel carrier pipe.
- B. Rip-rap all disturbed creek banks and bottoms after construction.

8.10 BACKFILL AND BEDDING

- A. Within the right-of-way, backfill shall consist of Class A crushed stone placed in 1-foot lifts and compacted to 90% modified proctor density or suitable job excavated material placed in 1-foot lifts and compacted to 90% Modified Proctor Density. If Class A crushed stone is used, the top 12 inches of backfill shall consist of suitable job excavated materials. Flowable mortar may be used upon approval of mix design by the City Engineer. Sand backfill is not permitted.
- B. In all other areas backfill shall consist of suitable job excavated material placed in 1-foot lifts and compacted to 85% Modified Proctor Density.
- C. The gradation of bedding material shall be compatible with surrounding soils to prevent migration of fines and shall be approved by the City Engineer.
- D. See Table 8.1 and Figure 8.4 for pipe bedding requirements.

8.11 PERFORMANCE & TESTING

- A. All sewers and manholes will be lamped and visually checked for leakage prior to acceptance.
- B. All sanitary sewers, including service pipes and manholes, will be air-tested using current ASTM standards prior to acceptance.
- C. All tests will be completed after backfill is complete.
- D. Polyvinyl Chloride Truss Pipe and PVC Pipe shall have a deflection test conducted after the final backfill has been in place at least 30 days. No pipe shall exceed a deflection of 5%. If the deflection test is to be run using a rigid ball or mandrel, it shall have a diameter equal to 95% of the inside diameter of the pipe and the tests shall be performed without mechanical pulling devices.

8.12 SEWER LOCATION AND EASEMENTS

- A. Manholes in street right-of-way must be located in areas which allow direct access by maintenance vehicles. Manholes in areas outside the street right-of-way shall be subject to the approval of the City Engineer in which case access to the manhole shall be along a route in which the transverse slope does not exceed 4% and longitudinal slope does not exceed 12%. Placement of sewers in front yards outside of the right-of-way is discouraged.

- B. Sewers shall be placed a minimum horizontal distance of 1.5 times the depth from potential or existing building sites. Greater separations are desirable.
- C. All sanitary sewers outside public right-of-way shall be placed in an easement for operation and maintenance. Easement width from the center of the pipe shall generally be 1.0 times the sewer depth rounded up to the nearest 5 feet.
- D. The minimum easement width is 30 feet.
- E. Sanitary sewer mains shall be extended to, through or across the frontage of all subdivisions and land development projects. Provisions will be made to connect sanitary sewer mains to serve future adjacent undeveloped land.

8.13 LIFT STATIONS & FORCE MAINS

- A. It is the City's intention and preference to have all extensions or additions to the sanitary sewer collection system be gravity sewer systems. If gravity sewer is not feasible, lift stations shall be designed to have regional service areas.
- B. Telemetered alarm systems are required.
- C. Provisions for the connection of standby power or auxiliary pumping are required.
- D. If an area is desired to be developed which is not capable of connecting directly into the existing gravity collection system at the time of development, the developer shall install, operate and maintain a temporary lift station. This temporary lift station shall remain in operation until the gravity collection system from this development can be connected into the City's gravity system at the developer's expense.