

CHAPTER 6

SEWER FACILITIES DESIGN AND CONSTRUCTION

6-1 GENERAL INFORMATION

A. Sewer System

1. System Design Criteria. The approved edition of the City of Peoria Wastewater Master Plan provides the criteria for development of sewer treatment and collection systems in the City of Peoria. All new construction shall comply with the Wastewater Master Plan. The Arizona Department of Environmental Quality (ADEQ) Aquifer Protection Permit rules shall apply to all sewer facilities constructed in the City system. The Developer's Design Engineer is responsible for evaluating the specific design conditions including the bedding and backfill requirements and trench loading conditions.
2. Requirement to Connect to Sanitary Sewer Facilities. All developments including single family residences are required to connect to the City's sewer system. Individual sewage disposal systems are not allowed. Exceptions are made only with written request to the Engineering Department and with written approval of the Utilities Department.
3. Classifications. The City's sewer system includes four classifications of sewer lines, which are determined by use or location within the system, identified as follows:
 - a. Building Sewer, House Connection, Service. The extension from the building drain to the public sewer or other place of disposal, also called house connection or service, shall be in accordance with the Uniform Plumbing Code as adopted by the City.
 - b. Lateral Sewer, Collector Sewer. Any sewer that connects one or more building sewers to a main sewer is a lateral sewer.
 - c. Main Sewer, Trunk Sewer. In larger systems, the principal sewer to which laterals are tributary and connected to are interceptor sewers.
 - d. Interceptor Sewer. A pipe that receives flows from a number of transverse sewers, outlets or main sewers, and conducts such wastewater to a point for treatment or disposal.
4. Provision of Ultimate Sewer Facilities. All developments including single-family residential, shall provide for interceptor, trunk, collector, and building sewer as required to provide sewer service for the individual development and the ultimate service area of the basin, as deemed necessary by the Engineering Department.
5. Size. Sewer lines shall be sized to accommodate their ultimate service area. Larger mains may be required dependent upon the maximum flows anticipated with full development of the ultimate service area, with additional consideration given to land use. The minimum size line for any public main is 8-inch diameter.
6. Force Mains. Force mains shall outfall into a manhole.
7. Sanitary Sewer Facilities. When a development is required to construct new sewer system facilities, such as lift stations, the applicant will be required to design such facilities in compliance with the Utilities Department criteria.

8. *Feasibility.* A sewer feasibility report shall be required to determine that the current existing facilities have the capacity for the proposed connection and that the minimum slopes will allow for the installation of additional services. Additionally, the feasibility report shall address availability of treatment capacity at the Wastewater Treatment facilities. (Refer to Wastewater Master Plan).

6-2 HAZARDOUS WASTE CONTROL

A. General

1. *Cross-Connections are prohibited.* No person shall connect to the City water system any water operated equipment or mechanism, or any water treating chemical or substance, if it is determined by the City that such equipment, mechanism, chemical or substance may cause pollution of the domestic water supply. Such equipment or mechanism may be permitted only when equipped with a backflow prevention assembly approved by the City.
2. *Control Requirement.* All developments shall provide for hazardous waste control per the following guidelines.

B. Commercial Developments

1. *Interceptor Requirements.*
 - a. Grease, oil, and/or sand interceptors shall be provided for laundries, restaurants, service stations, auto repair shops, car washes, and other facilities when the City determines they are necessary for the proper handling of liquid wastes containing grease or oil in excessive amounts of any flammable wastes, sand, and other harmful ingredients.
 - b. All interceptors shall be of a type and capacity approved by the Utilities or Engineering Department and shall be located as to be readily and easily accessible for cleaning and inspection.
 - c. Where installed, all grease, oil, and sand interceptors shall be maintained by and at the expense of the owner in continuously efficient operation at all times.
 - d. Connection of drainage from trash enclosures to the sanitary sewer system is prohibited.

C. Industrial Developments

1. *Preliminary Treatment Facilities.* Where necessary, as determined by the Utilities or Engineering Department, any user of the sewer system shall provide at their expense, such preliminary treatment as may be necessary to reduce objectionable characteristics or constituents to within the maximum limits provided for in the Uniform Plumbing Code (UPC), latest edition.

6-3 TECHNICAL DESIGN REQUIREMENTS

A. Sewer Main System

1. Materials and Details.
 - a. All construction shall conform with the latest MAG Uniform Standard Details and Specifications for Public Works Construction, except as provided herein and as modified on the approved plans.
 - b. For allowable materials, refer to City of Peoria Standard Detail PE-101. Exceptions are only allowed by written request to the Engineering Department and with written approval by the Utilities Department.
 - c. Pavement replacement type and compaction type shall be indicated per MAG Standard Details and Specifications on each sheet or as modified in the City of Peoria General Notes.
 - d. Trench excavation, back filling and compaction shall be per MAG Standard Details and Specifications or as modified in the City of Peoria, General Notes, Sewer.
 - e. Private on-site sewer lines shall be constructed of materials and at slopes as specified in the City of Peoria adopted Plumbing Code.
 - f. Pavement sawcuts shall be in straight lines parallel to the trench, to a depth which exceeds the pavement thickness. Sawcut lines shall be a minimum of 100-feet in length before a jog in the alignment of the sawcut is permitted.
2. Slopes. Pipe slopes are to be sufficient to maintain a mean flow velocity in the sewer of 2.5 feet per second when circumstances permit. The maximum velocity shall not exceed 10-feet per second at the design flow rate. Slopes and "n" values are to be designed per ADEQ, Engineering Bulletin No. 11, except that minimum slope is to be 0.005 feet per foot for 8-inch sewer lines. Exceptions to these slopes require the written request to the Engineering Department and written approval by the Utilities Department.
3. Location within the Right-of-Way.
 - a. Sewer easements are to be dedicated as part of a Final Plat or by separate instrument with written approval from the Engineering Department.
 - b. Major arterial streets - sewer main alignment shall be reviewed individually.
 - c. Minor arterial streets - sewer mains shall be offset from the street centerline 13-feet south or west.
 - d. Collector streets - sewer mains shall be offset from the street centerline 6-feet south or west.
 - e. Local streets - sewer mains shall be offset from the street centerline 6-feet. For curvilinear streets the offset from the street centerline can range from 6 to 9-feet south or west.
 - f. Generally the intent is to avoid locating the manhole covers so that wheel line of normal traffic does not track over the casting.

- g. All sewers shall be parallel to the centerlines or as close to parallel as possible.
 - h. In cases where public sewers are authorized outside of public right-of-ways, easements with a minimum clear width equal to twice the depth of cover or a minimum of 20-feet, whichever is greater, shall be provided. All such sewers shall be centered and parallel to the property lines or as close to parallel as possible. In such cases, no part of any manhole shall be located any closer horizontally than the depth of cover or 6-feet, whichever is greater, from any wall, fence or structure etc. The minimum width of a sewer easement, which is shared with any other utility, is 30-feet. Larger easement widths will be required for deeper installations as determined by the Utilities or Engineering Department.
 - i. Vertical and horizontal separation from water lines shall be in accordance with MAG Section 610.5 and MAG Standard Detail 404-1. Minimum horizontal separation from the sewer line to other underground utilities shall be 6-feet.
 - j. The location for the covers and lids should not be closer than 6-feet from the street drainage flow line or gutter line.
4. Cover and Depth.
- a. Maximum depth for sewer lines and manholes shall be 12-feet, unless detailed loading calculations and materials selection is approved with the written request by the Developer's Design Engineer to the Engineering Department and with written approval by the Utilities Department. The proposed design shall be submitted to the Engineering Department for review.
 - b. All laterals shall have a minimum of 5-feet of cover measured from finished grade to the invert of the lateral. During construction consideration shall be given to the conditions when depth of cover, which may be less than 5-feet, such as preparation of street sub-grade, foundations, culverts or utilities.
 - c. All trunks, mains, or branches shall have a sufficient depth to serve the ultimate service area with a minimum cover of 6-feet.
 - d. Where cover is less than 4-feet (due to topography or facilities such as canals, washes, or rivers) an encasement per MAG Standard Detail 404-3, shall be constructed. Encasement of the sanitary sewer is required in cases where the bottom of any irrigation, storm drain, sanitary sewer, force main or other gray water pipe is over and less than 24 inches to the top of the sanitary sewer. This is allowed only with the written request by the Developer's Design Engineer to the Engineering Department and with written approval by the Utilities Department. The proposed design shall be submitted to the Engineering Department for review. Additionally, encasement is required in all cases where a sanitary sewer crosses above any water line, force main or pressure main and there shall be at least 24 inches of clearance between the bottom of the sanitary sewer and the top of the water line, force main or pressure main.
 - e. Sewer lines will not be permitted within the limits of retention/detention basins.
5. Pipe Bedding Requirements.
- a. Bedding for Sewer pipe shall be per City of Peoria Standard Detail PE-401.

6. Trench Backfill Requirements.

- a. Minimum trench backfill requirements shall be Type I per MAG Specification 601.4.3, with compaction densities per MAG Specification Table 601-2. Backfill requirements provided by the Developer's Design Engineer shall apply, when such provisions are more restrictive than MAG Specification.
- b. Within the existing pavement section of public streets, the backfill shall be ½ sack Controlled Low Strength Material (CLSM) per MAG Specification 728.

7. Intersecting Lines.

- a. The crown lines of smaller intersecting lines shall match the through line crown.
- b. Manholes with a through line shall have the invert on a continuous slope and a minimum 0.10-foot drop through the manhole.
- c. Manholes with a line intersecting the through line: the intersecting line invert shall be a minimum of 0.10 foot above the flow line of the through line. The lines shall intersect at not more than a 90-degree angle.

8. Curved Sewers. Curved sewers are prohibited.

9. Tie-ins to Existing System. Construction plans shall call for the contractor to tie-in new work to the existing, active system, only after completion of the new work and written approval of the Engineering Inspector to make the tie-in.

B. Manholes

1. Materials and Details.

- a. All manholes shall be per MAG Standard Details and Specifications. Workmanship on manhole bottoms will be closely inspected for uniformity and smoothness of channel. The preferred method for construction of manhole invert channels is to place pipe in manhole bottom and remove top of pipe after manhole is constructed. Failure to provide smooth, uniform channels shall be cause for rejection, removal and re-construction. Lateral pipes shall not enter a manhole at an angle greater than 90 degrees to the sewer trunk line.
- b. Manholes on boundaries of the subdivision or improvement district shall have stubs with shaped inverts in appropriate directions for future connections.
- c. All manholes shall be "T-Lock" PVC lined per MAG Specifications 741 or epoxy coated as specified below. The manhole base and adjusting rings in all PVC lined manholes shall be coated with a 100% solid epoxy coating system. The coating system shall have a minimum wet film thickness of 125 mils. The epoxy coating systems shall be one of the following: RLS Raven 405, Joseph Painting Sewer Shield 101, AP/M Permaform COR=GARD, Sauereisen SewerGard No. 210 or Neopoxy NPR-5300".
- d. All sanitary sewer manholes shall be installed with gasket, joint sealer, or water stop between the base and riser section as approved by the Engineering Department.
- e. In all cases the rim elevation shall be a minimum of 0.10 feet above the flow line of the roadway gutter.

- f. Odor control systems shall be installed in sewer systems as deemed necessary by the Utilities or Engineering Department.
- g. All Private Sewer Manholes shall have "Private Sewer" labeling, and shall not be labeled "City of Peoria".
- h. Manholes which exceed ten feet in depth shall be five-foot in diameter, without steps.
- i. Brick manholes are prohibited.
- j. All manholes located outside of roadways shall have locking lids and have a curve-flex utility marker manufactured by Carsonite or approved equal.
- k. Drop manholes will be allowed only if the pipe slopes exceed maximum slope requirements and if approved by the Engineering Department. Construction of Drop manholes shall comply with MAG Standard Detail 426.

2. Spacing.

- a. Manholes are required at all changes in grade and alignment.
- b. Maximum manhole spacing shall be:
 - 400 feet for 8 inch or 10 inch sewers
 - 500 feet for 12 inch or larger
- c. A manhole shall be placed on the upstream end of all sewer lines. If sewer system is to be phased, a stub shall be provided. The stub shall be capped and plugged.
- d. Clean-outs are prohibited. Existing clean-outs shall be removed and replaced by Developer with a manhole per these guidelines.

C. Taps

1. Materials and Details.

- a. New sewer taps shall be per MAG Standard Detail 440-1. See the Materials List, City of Peoria Standard Detail PE-101, for allowable materials.
- b. Taps are not allowed into manholes unless approved by the Engineering Department.
- c. A 3-foot minimum separation between service taps is required. A 5-foot minimum separation between a service tap and the outside diameter of a manhole is required.
- d. All taps shall be stationed using the closest downstream manhole as station 0+00.
- e. All taps shall be perpendicular to the lateral.
- f. Taps are not allowed into existing 12-inch or larger sewers.
- g. Provide a single tap for each residential or commercial building lot.
- h. Additional taps are not allowed unless approved by the Engineering Department with written approval by the Utilities Department.

- i. A check valve is required on the sewer service line when the finished floor is lower than the rim elevation of the nearest upstream manhole.
2. Sizes.
 - a. Tap sizes for single family residential developments shall be 4-inch minimum. Larger taps shall be sized as determined by the Developer's Design Engineer.
 - b. Commercial lots with buildings shall have a minimum 6-inch tap.
 - c. Multi-family developments shall have a minimum 6-inch tap.
 - d. All 8-inch and larger services shall discharge to a manhole.
3. Location. Proposed tap locations shall be shown on all plans. Any changes in the field must be approved by the Engineering Department.

D. Metallic Locating Tape

1. Materials. All sewer lines require the installation of metallic locating tape, in accordance with MAG Spec. 616.4. The tape shall be solid green in color. Markings shall be in accordance with MAG Spec. 616.4 except with the following words printed thereon "CAUTION SANITARY SEWER LINE BELOW."
2. Location. Installation of the pipe locating tape shall be per MAG Specification 616.4 and placed 2' above the top of the pipe.

6-4 CONSTRUCTION

A. Standards

All construction shall be per the latest MAG Uniform Standard Details and Specifications for Public Works Construction, as revised and subject to City of Peoria modifications, as revised.

B. Testing and Inspection

1. Manhole Testing

All new sanitary sewer manholes installed shall be tested for integrity either by an exfiltration test or by a negative air pressure (vacuum) test.

- a. Exfiltration testing shall be performed in accordance with MAG Section 615.11(B) and Arizona Department of Environmental Quality (ADEQ) Engineering Bulletin No. 11, Chapter 4, Section B. When using the exfiltration test method, water loss shall not exceed 0.1 gallons per vertical foot of manhole in a 24-hour period.
- b. Negative air pressure (vacuum) testing shall be performed in accordance with ASTM C 1244. Testing shall be performed at the top of the manhole cone for manholes located in paved areas. Manholes outside paved areas shall be vacuum tested at the ring and cover. Apply a negative air pressure of ten (10) inches of mercury (136 inches water) on the manhole and measure the time in seconds for the vacuum to drop to nine (9) inches of mercury (122 inches water). The manhole will pass this test if the time for the vacuum to drop the specified amount meets or exceeds the following values:

TEST DURATION (SECONDS)

<u>MANHOLE DEPTH</u>	<u>48" DIAMETER</u>	<u>60" DIAMETER</u>
10 feet or less	60	75
Greater than 10 feet to 15 feet	Not Applicable	90
Greater than 15 feet	Not Applicable	105

If manhole joint compound is pulled out during the vacuum test, the manhole shall be disassembled and the joint repaired or replaced as necessary. The vacuum testing shall then be repeated until the manhole passes.

2. Closed Circuit TV (CCTV) Inspection. Perform CCTV inspections in accordance with NASSCO's Pipeline Assessment Certification Program. CCTV inspections shall be provided in digital (DVD) format utilizing a measuring device ahead of the camera to identify deflections in the line. Measuring device shall be able to measure water depth from 0-2 inches in ¼ inch increments.

6-5 PLAN PREPARATION**A. Plan Approvals**

1. Plans shall be prepared per the guidelines in Chapter 1, Section K Improvement Plan Preparation.
2. A Design Report is to be submitted with all Wastewater Infrastructure Improvement Plans. This Design Report is to include the following at a minimum:
 - a. Design calculations for all line sizes and slopes.
 - b. Wastewater System Analysis shall be compliant with the approved edition of the Peoria Water System Master Plan. Refer to Appendix - Sample Water and Sewer System Analysis Report.
 - c. Statement of compliance with the Peoria Wastewater Master Plan intended use for the area being served/developed.
3. A copy of a "Certificate of Approval to Construct," issued by Maricopa County Environmental Services Department (MCESD) and the cover sheet signed by MCESD must be submitted to the Engineering Department prior to receiving final plans approval from the City.
4. Sewer systems shall be located within public rights-of-way or centered within a 20-foot wide easement dedicated for sewer line, or within a 30-foot wide easement (minimum width) dedicated for both water and sewer lines. Larger easement widths will be required for deeper installations as determined by the Utilities or Engineering Department. Easements shall be dedicated to the City. Sewer systems shall not be located within the limits of retention/detention basins.

5. Submit electronic versions of final design documents. Drawings shall be in AutoCAD and follow requirements a – i below and specifications are to be in Microsoft Word. This information will be required at final plans approval from the City.

a. **Compact Disc or DVD**

A Disc containing AutoCAD drawing files, through release 2005, will be required. Compact Disc will be labeled with the Project Name and Review Number. No data compression should be utilized.

b. **Disc Folder Structure / CAD Sheet Naming Convention**

Create a folder with the Project Name or Review Number. Within the Project folder create subfolder's and label them Water, Sewer, Paving, Grading & Draining, and Storm Drainage and copy the corresponding CAD Dwg files in those sub-folders. Copy all water drawings to the water sub-folder and all sewer drawings into the sewer sub-folder and so on.

Example:

-  Project Name & Review Number: (SCA Office Building - R010011)
-  Water
-  Sewer
-  Paving
-  Grading & Drainage (use G/D to abbreviate Grading & Drainage sheets)
-  Storm Drainage (use S/D abbreviate sheets)
-  Xref

c. **Model Space / Paper Space**

All CAD as-built line work is to be created in model space.

CAD work in Paper space is for Page Layout, Title Block, Notes, Legend, etc.

d. **Coordinates System**

CAD Drawings site/civil base models supplied will be created in relation to its geographic location. Use the Arizona State Plane Coordinate system, FIPSZONE 0202, North American Datum 1983, Units: International Feet (0.3048 Meters) will be used to ensure consistency with the current City of Peoria Projection Model.

e. **Geodetic Ties**

All CAD drawings (model space) will be referenced to (at least) two accepted geodetic control points identifiable via the Peoria Geodetic Network - these points may be part of the existing Peoria Bench Mark control project, Maricopa County Geodetic Densification and Control Survey (GDACS) control network (published through MCDOT), or any approved (via Peoria Engineering Department) monumented survey control.

f. **X References**

The City of Peoria would prefer that X references **NOT** be used; If X references are utilized, all X referenced drawings will need to be placed in one common directory (Xrefs) and the subdirectory tree structure will need to be sent accordingly. Further, each drawing will need to be opened prior to sending to verify the X references will load properly.

g. **References Information**

Ensure that all non-related cad structures as empty layers, unused blocks, line types, dimension styles, plot styles, text styles, shapes, etc. are purge from the folders. A denied status will be generated for Non-compliances to this standard.

h. **Fonts**

The use of standard AutoCAD fonts and shapes is required. Non-standard FONTS and Shapes Must be transmitted with the drawings in the original file format as separate FONTS subdirectory.

i. **Blocks**

All Blocks or Symbols will include a single point feature. If BLOCK ATTRIBUTES are used, the BLOCK ATTRIBUTES STRUCTURES and BLOCK NESTING should be included in the transmittal. Use Microsoft Word to create such list is preferred. ANSI text files are also acceptable.

B. Wastewater Infrastructure Acceptance

Copies of the following documents must be submitted to the Engineering Department prior to acceptance of the wastewater line(s) by the City.

1. A copy of the "Certificate of Approval of Construction" (AOC) issued by MCESD.
2. A copy of the "Engineer's Certification of Completion".
3. Refer to Chapter 7 of this document for as-built requirements.
4. Pressure and Vacuum Testing documentation.
5. Deflection Testing documentation.
6. Video C.C.T.V. Inspection Records on DVD as required in Section 6-4B.2.
 - a. Post sewer line construction video.
 - b. Post roadway construction – second video of the sewer line.