

**SECTION 4**

**SANITARY SEWER DESIGN  
STANDARDS**

## SECTION 4

### SANITARY SEWER DESIGN STANDARDS

#### 4.1 General

The City and City Engineer shall issue final approval for the installation of all sanitary sewer facilities. All sanitary sewer facilities shall be designed and installed in accordance with the Indiana Department of Environmental Management (IDEM) and Ten States Standards for Sewage Works.

#### 4.2 Sanitary Sewer Design Criteria

##### A. General

All sanitary sewers shall be designed to carry the estimated flow from the area ultimately contributing to the respective service area of the sanitary sewer. The required capacity shall be established by City Engineer or at the City's option by means of a study conducted by the Owner/Contractor or his authorized representative engineer.

##### 1. Residential

For the purpose of design, the average family unit is considered to generate three hundred ten (310) gallons per day per single family home. Peak flows shall be determined by Ten States Standards.

##### 2. Commercial/Institutional

The average daily flow for these facilities shall be based on 327 IAC Article 3. Peak flow shall be determined by multiplying the average flow by a factor of four (4).

##### 3. Industrial

For those industries which do not have any process wastewater discharge, flows shall be calculated as stated above in "Commercial/Institutional". For industries which will have a process discharge, the Owner shall submit detailed flow estimates for each process, duration and frequency.

Peak capacity shall be determined by multiplying the average discharge by a factor of two (2).

4. Infiltration

Sanitary sewer design capacity must include an allowance to carry unavoidable amounts of groundwater infiltration or seepage in addition to the peak sanitary flows. Collector and trunk sewers shall be designed to include an allowance of two hundred (200) gallons per day per inch diameter mile of pipe.

B. Pipe Capacities

1. Collector Sewers

Collector sewers shall be classified as any sewer ranging between eight (8) inches and twelve (12) inches. Peak design flow capacities shall be based upon sewer flowing full without head.

2. Trunk Sewers

Trunk sewers shall be classified as any sewer fifteen (15) inches and larger.

Peak design flow capacities for trunk or interceptor sewers shall be based on sewers flowing full, without head, using the design population density and appropriate land use determined by the City and City Engineer, and shall include an allowance for infiltration which will be reviewed on a case-by-case basis and is subject to the approval of the City and City Engineer.

C. Minimum Pipe Sizes and Standards

1. Pipe Diameter

The required diameter of gravity sewers shall be determined by Manning's formula using a roughness coefficient, "n", of 0.013 or required by the latest Ten States Standards. The minimum pipe diameter for public gravity sanitary sewers shall be eight (8) inches.

2. Minimum Slopes and Velocities

All sanitary collector and trunk sewers shall be designed and constructed to provide a minimum velocity when flowing full of two (2) feet per second. The slope of the water pipe shall be such that these minimum velocity requirements are attained. The minimum acceptable slopes for the design and construction of sanitary sewers are as follows:

Pipe Size (inches)	Minimum Slope (ft. per 100 ft., %)
8	0.40
10	0.28
12	0.22
15	0.15
18	0.12
21	0.10
24	0.08
30	0.058
36	0.046
42	0.037

Sewers forty-eight (48) inches or larger should be designed and constructed to give mean velocities, when flowing full, of not less than three (3.0) feet per second based on Manning's formula using an "n" value of 0.013.

3. Minimum Depth

For the protection of the sanitary sewer lines from damage caused by utilities installed after the sanitary sewer has been constructed, the minimum depth to crown of all gravity sanitary sewers shall be four (4.0) feet, and the minimum depth to crown of all force main sanitary sewers shall be five (5.0) feet.

4. Building Sewers

Building sewers shall conform to the latest edition of the Uniform Plumbing Code and to these Standards.

The building sewer shall connect to the public sewer at a mainline fitting. Direct connections to manholes shall not be allowed.

Building sewers within the right-of-way or easement shall be a minimum of six (6) inches in diameter. Building sewers shall have a wye cleanout located within three (3) feet of the building's exterior wall and extended to grade.

Cleanouts installed under concrete or asphalt paving shall be made accessible by yard boxes or extended flush with paving with approved materials and be adequately protected.

Building sewers installed for future connections shall be terminated at the right-of-way or easement and plugged to ensure one hundred (100) percent water tightness. A one-half (1/2) inch metal locator rod or a magnetic locator tape shall be installed at the end of the plugged line to within three (3) feet of the finished grade.

If approved by City a service may be cut into a public sewer sanitary sewer service tap saddle of four (4) or six (6) inches. Service tap saddle options include a PCX Saddle Y or a Fernco Tap Saddle with Wye preferred and tee acceptable.

D. Sewer Structures

1. Manholes

a. General

Manholes shall be installed at the end of each line; at all changes in grade, size, materials or alignment; at all sewer intersections. The maximum distance between manholes shall be four hundred (400) feet.

The minimum inside diameter of manholes shall be forty-eight (48) inches.

Flow channels shall be shaped and formed in each manhole to provide a smooth transition of flow from all inlets to the outlet. The bench wall shall be formed to the crown of the inlet and outlet pipes to form a "U" as shown in the Standard Details.

At changes in sewer alignment and/or sizes, the energy gradient elevation shall not increase. This shall be accomplished by keeping the crown elevation continuous where possible for changes in sewer sizes.

Manholes proposed to be installed in unpaved areas shall be designed and constructed such that the top of the casting is a minimum of two (2) inches above the finished grade to prevent ponding of water over the casting. Positive drainage away from the manhole shall be provided.

Manholes receiving discharge force mains shall have an internal drop connection. Manholes which have force main discharge lines shall have an internal epoxy coating to prevent corrosion.

b. Outside Drop Connections

Outside drop pipe connections shall be provided for all sanitary sewers entering a manhole at an elevation greater than twenty-four (24) inches above the invert of the manhole.

In areas where future residential, commercial and/or industrial growth can occur, the City shall determine which new manholes fifteen (15) feet deep or deeper shall be equipped with outside drop connections. These shall be of a size and at an elevation to

be determined by the City at the time of design to allow for future connections at these points. The drops shall extend from the base to within ten (10) feet of the final graded surface elevation.

2. Lift Stations

If approved by City and City Engineer, all lift stations shall have pre-cast concrete wet wells and separate valve pits. All stations shall, as a minimum, have two (2) submersible pumps.

3. Grease/Sediment Traps

All businesses where consideration of grease and/or sediment is necessary (i.e. food service operations, carwashes, bars, banquet facilities, restaurants, etc.) shall install a grease/sediment trap as shown in the Standard Details. If there is any question if said grease/sediment trap is required, the Developer/Contractor shall resolve the question by contacting the City.

4.3 Easements

A. General

Whenever possible, sanitary sewers shall be constructed within a dedicated easement. The minimum permanent easement widths are as follows.

Depth of Sewer from Finished Grade	Minimum Easement (ft.)
up to 15 feet	20
> 15 feet to 25 feet	25
greater than 25 feet	30

All sewers shall be centered in the easement. For those sewers constructed in the public right-of-way, the easement shall extend the distance outside of the right-of-way necessary to provide the required easement width.

A minimum thirty (30) foot by thirty (30) foot easement shall be provided for all submersible lift stations with wet wells up to thirty (30) feet deep.

Ingress and egress shall be available to the City's crew at all times. All plan sheets shall clearly identify the easement and the location of all other proposed utilities. The horizontal and vertical plans shall identify all utilities proposed to cross the easement.

B. Right-of-Way Plan Sheet

1. Geographic location map showing the extent of the project and including where applicable:

- a. Directional North Arrow and Scale;
  - b. County;
  - c. Civil Township;
  - d. Section, Township and Range Identification;
  - e. Subdivision Names, Recording Information and Lot Numbers;
  - f. Highway, Road and Street Identification;
  - g. Rivers, Creeks and Named Ditches;
  - h. Assigned Parcel Numbers Arranged in Ascending, Numerical Order from the Project Beginning to End; and
  - i. List of Apparent Owners (last deed of record) by Assigned Parcel Numbers.
2. In addition to the above, there should be sufficient information on the design drawings to properly correlate with the right-of-way plan sheet; i.e., property lines, subdivision information, parcel number or name, width of right-of-way, permanent or temporary and special conditions; for example, structures, trees, shrubs to be removed or replaced, sodding, riprap, etc.

C. Legal Description Sheets

The following shall be provided:

1. Parcel Number;
2. Project Number;
3. Project Name;
4. Identification as to permanent or temporary easement;
5. Separate descriptions on separate sheets are required where both permanent and temporary easements are to be taken;
6. Metes and bounds descriptions shall be clear, concise and complete with sufficient detail to positively establish from known and referenced points, monuments, lines, etc. Area of taking should be stated at end of description. Areas should be given in acres;
7. Descriptions of easements from platted subdivision lots, including strips off sides of lots should include name of subdivision and recording information for the subdivision as well as affected lot number(s). NOTE: These are usually small areas; therefore, area should be stated in square feet; and

8. Registered land surveyor's licensed in the State of Indiana, seal and signature.

D. Property Plats

1. Parcel Number;
2. Project Number;
3. Project Name;
4. County;
5. Civil Township;
6. Section;
7. Township;
8. Range;
9. Owner;
10. Permanent or Temporary Legends;
11. Permanent or Temporary Easement Areas;
12. Total area of property out of which easement is to be taken;
13. Drawn By;
14. Directional North Arrow;
15. Scale;
16. Unplatted properties: complete boundaries of property description out of which easements are to be taken, including properly identified referenced corners, P.O.B.'s, monuments, roads, bearings, distances, etc.;
17. Platted subdivisions: dimensions of lot(s) as well as the lot number(s) and including the subdivision name and recording information;
18. Easement boundaries as described in Item A. of this subsection, including referenced bearings, distances, etc., and identified as in legend; and
19. Registered land surveyor seal and signature.



#### 4.4 Drafting Standards

##### A. General

These Standards have been established for the purpose of ensuring uniformity in the design and drafting techniques of projects to be submitted for review and acceptance.

1. All projects submitted, having more than two (2) sheets, shall have a title sheet which will include:
  - a. General Overall Area Map;
  - b. Vicinity Location Map;
  - c. A Site Plan Map Detailing the Project;
  - d. Name/Title of Project, including Section Number if applicable;
  - e. Owner and Engineer's Name; and
  - f. Professional Engineer's Seal and Signature.
2. All plan and profile sheets are to be certified and dated by a professional engineer of the State of Indiana.
3. All sheets are to be numbered, with total number of sheets included.
4. Include detail sheet(s)/specification sheet(s), as applicable.
5. Design drawings shall be twenty-four (24) inch by thirty-six (36) inch.

##### B. Scales

The following scales for drawings are required:

1. Plan and Profile: Variable; Not to Exceed 1" = 50' Horizontal and 1" = 5' Vertical
2. Cross Sections: 1" = 5' Horizontal and Vertical.

##### C. Materials

Mylar type drafting film shall be used for all reproduction "originals" to be submitted as record drawings. They shall be of a quality suitable for blue printing.

##### D. Plan and Profile Drawings

All plan sheets shall include the following information when applicable:

1. A North Arrow;

2. The Scales Used;
3. Project Name and Number, Sheet Number, Date Drawn, Date and Nature of Revisions;
4. All topography in the area affected by construction;
5. Right-of-Way lines, property lines and easements;
6. Locations of benchmarks and their descriptions;
7. Locations of all existing and proposed utilities in the project area; and
8. Match lines shall be easily identifiable.

All profiles shall include the following:

1. Existing and finished grade lines;
2. Inverts at all manholes;
3. Length and size of pipe between manholes;
4. Slope of pipe in percent;
5. Elevations to USGS datum;
6. Top of casting elevations;
7. Types of materials used;
8. Profile of existing and proposed utilities; and
9. Special construction required due to unfavorable soil conditions.

E. Lift Station Drawings

Lift station plans shall, at a minimum, contain the following:

1. At least two views of the station, plan view and cross section;
2. Electrical panel detail;
3. Pump and alarm control elevations;
4. Inlet and outlet pipe elevations;
5. Finished grade and foundation elevations;
6. Special construction required due to unfavorable soil conditions;

7. Design pump capacity, rated horsepower, total dynamic head, manufacturer and model number;
8. Sump capacity and cycle time;
9. Also, the Owner's Engineer shall submit a copy of the head discharge curve and the complete design calculations for the lift station and force main;
10. Fence and access drive detail; and
11. Scada Unit

F. Record Drawings

At the completion of the construction, a revised set of drawings shall be submitted to the City providing all "as-built" details. These details shall include, but not be limited to, invert elevations, top of casting elevations, manhole locations with tie down improvements, final dimensions and elevations, pipe sizes, and location of utilities encountered. All project components submitted within the record drawings shall include GPS locations.

The record drawings ("as-built") shall have all laterals shown on the plan view with their locations properly scaled. Lateral measurements shall be indicated by their distance from the downstream manhole in the form of stationing. Lateral stationing shall begin at 0+00 at each downstream manhole.

All sheets shall have the phrase "as-built" or "record drawing" boldly printed on them with the date and shall be stamped and signed by a professional engineer registered in the State of Indiana.

**4.5 Sanitary Sewer Crossing Drainage Ways**

Sanitary sewers shall be constructed of ductile iron pipe or shall be encased in a minimum of six (6) inches of concrete wherever the sanitary sewer crosses under a naturally occurring drainage way (i.e., creeks, rivers, streams, etc.). Wherever applicable, the sanitary sewer crossing the drainage way shall be pressure tested to assure one hundred (100) percent water tightness prior to backfilling.