

DESIGN CRITERIA FOR  
SANITARY SEWERS AND APPURTENANCES

- A. DESIGN FACTORS. Sanitary sewers should be designed for the ultimate tributary population. Due consideration should be given to current zoning regulations and approved planning and zoning reports where applicable. Sewer capacities should be adequate to handle the anticipated maximum hourly quantities of sewerage and industrial waste together with reasonable consideration given to infiltration/inflow.
- B. SEWER DESIGN. Sewers shall be designed for the total tributary area using the following minimum criteria:

Interceptors and trunk lines	0.01 CFS/Acre
Laterals and sub-mains	0.02 CFS/Acre

Using this criteria all pipes are to be sized flowing full.

- C. MAXIMUM SIZE. The diameter of sewers proposed shall not exceed the diameter of the existing or proposed outlet, whichever is applicable, unless otherwise approved by the County Engineer.
- D. MINIMUM SIZE. No public sewer shall be less than eight (8) inches in diameter. Stublines for service connections shall not be less than four (4) inches in diameter and shall be extended at a ninety (90) degree angle to the main sewer line.
- E. MATERIALS OF CONSTRUCTION. Sanitary sewers shall be constructed of pipe material resistant to or protected from bacterial degradation, acid and alkaline solutions, normal sewer temperature variation, abrasion, and industrial wastes or other materials which may be transmitted by the collection system.

The following types of commercial pipe are approved for gravity sanitary sewer systems constructed in the unincorporated areas of Clay County:

Vitrified Clay Pipe	ASTM C700 extra strength
Reinforced Concrete Pipe	ASTM C76, Class II (Wall B or C)
Ductile Iron Pipe	ANSI A21.51; ASTM A536, Grade60-42-10; thickness Class 50, unless otherwise required by the County Engineer.
PVC Pipe	ASTM D3034, Type PSM Polyvinyl (Chloride), SDR 35; PVC Material shall conform to ASTM D1784 and shall have a cell classification of 12454-B, 12454-C, or 13364-B. The minimum pipe stiffness for pipe used for stublines shall be SDR 26.

The use of thermoplastic pipe shall be limited to residential or commercial areas as approved by the County Engineer and shall not be used for pipelines exceeding fifteen (15) inches in diameter unless otherwise approved.

- F. MINIMUM SLOPE. All sewers shall be designed to give mean velocities when flowing full of not less than 2.0 feet per second.

All velocity and flow calculations shall be based on the Manning Formula using an "n" value of 0.013. The following slopes shall be the minimum for the size indicated.

<u>SEWER SIZE</u>	<u>MINIMUM SLOPE IN PERCENT FULL AND HALF FULL FLOW</u>
8"	0.40
10"	0.28
12"	0.22
15"	0.15
18"	0.12
21"	0.10
24"	0.08

Exceptions to these minimum slopes shall be made at the upper end of the lateral sewers serving under thirty houses. Said sewers shall have a minimum slope of 0.76 percent.

Where lateral sewers serve less than ten (10) houses, the minimum slope shall not be less than 1 percent unless otherwise approved by the County Engineer.

- G. INCREASING PIPE SIZE. When a sewer joins a larger one, the invert of the larger sewer should be lowered sufficiently to maintain a continuous energy gradient.
- H. HIGH VELOCITY PROTECTION. In situations where flow is continuous and grit is a problem, and where velocities greater than ten (10) feet per second are possible, special provisions shall be made to protect against abrasion damage to the pipe. Such protection may be attained utilizing ductile iron pipe.
- I. ALIGNMENT. All sewers shall be laid with straight alignment between manholes.
- J. MANHOLE CONSTRUCTION. Manholes shall be installed at the end of each line; at all changes in grade, size, or alignment; at all intersections; and at a distance not greater than four hundred (400) feet for sewers fifteen (15) inches or less in diameter and not greater than five hundred (500) feet for larger sewers.

- K. MANHOLES. The construction of all manholes shall conform to the details shown on the Standard Drawings.

The minimum horizontal clear distance within the barrel of standard manholes shall not be less than four (4) feet. Manholes with connecting pipe diameters greater than twenty-four (24) inches shall have a minimum inside clear dimension of five (5) feet.

Drop manholes should be avoided as much as possible. However, an outside inside pipe shall be provided for a sewer entering a manhole at an elevation of twenty-four (24) inches or more above the manhole invert. The outside drop pipe shall be protected against breaking or settling by the use of concrete encasement. The drop pipe shall have the same nominal diameter as that of the incoming sewer.

Without utilizing drop manholes, the difference in elevation between the invert of any incoming sewer and the invert of the outgoing sewer should not exceed twenty-four (24) inches except where required to match crowns. When a sewer joins a larger one, the crown of the smaller sewer shall not be lower than the crown of the larger one. The minimum drop through manholes shall be 0.2 feet.

Where manholes are to be built in close proximity to streets, the top of manhole elevation shall be set within the following limits:

Minimum Elevation	1/4" per foot rise above top back of curb
Maximum Elevation	1/2" per foot rise above top back of curb

All other sanitary sewer lines (sewer lines across unplatted land, etc.) shall have the tops of manholes set flush with the existing ground elevation. The top of all manholes shall be located above the one hundred (100) year flood plain.

Any variation from the above top of manhole criteria will require a letter of explanation to be submitted with the drawings and be subject to approval by the County Engineer.

- L. SEWER LOCATIONS. Sanitary sewers shall be located within street or alley rights-of-way (outside pavement limits) unless topography dictates otherwise. When located in easements on private property, access shall be provided to all manholes. A manhole shall be provided at each street or alley crossing.

End lines shall be extended to provide access from street or alley rights-of-way where possible. Imposed loading shall be considered in all locations. Not less than eight (8) feet of cover shall be provided over top of pipe in street and alley rights-of-way and five (5) feet in all other areas unless otherwise approved by the County Engineer.

- M. CLEANOUTS AND LAMPHOLES. Cleanouts and lampholes will not be permitted.

N. PROTECTION OF WATER SUPPLIES. There shall be no physical connection between a public or private potable water supply system and a sewer, or appurtenance thereto, which would permit the passage of any wastewater or polluted water into the potable water supply.

1. Horizontal Separation: Sewer mains shall be laid at least ten (10) feet horizontally from any existing or proposed water main. The distances shall be measured edge to edge. In cases where it is not practical to maintain a ten (10) foot separation, the Engineer may allow deviation on a case-by-case sewer closer to a water main, provided that the water main is in a separate trench or on an undisturbed earth shelf located on one side of the sewer at such an elevation that the bottom of the water main is at least eighteen (18) inches above the top of the sewer.
2. Crossings: Sewers crossing water mains shall be laid to provide a minimum vertical distance of eighteen (18) inches between the outside of the water main and the outside of the sewer. This shall be the case where the water main is either above or below the sewer. The crossing shall be arranged so that the sewer joints will be equidistant and as far as possible from the water main joints. Where a water main crosses under a sewer, adequate structural support shall be provided for the sewer to prevent damage to the water main.
3. Special Conditions: When it is impossible to obtain proper horizontal and vertical separation as stipulated above, the sewer shall be designed and constructed equal to water pipe, and shall be pressure tested to assure water tightness prior to backfilling.

No water pipe shall pass through, or come in contact with, any part of a sewer or a sewer manhole.

O. AERIAL CROSSINGS. Adequate support shall be provided at all joints in pipes utilized for aerial crossings. Only ductile-iron pipe with restrained joints shall be used unless otherwise approved by the County Engineer.