

## SANITARY SEWER SYSTEMS

- I. Sanitary sewer size and slope design.
  - A. Minimum size is 8 inch.
  - B. Minimum flow velocity is 2 feet per second, 2 fps.
  - C. Maximum flow velocity shall be 11 fps.
  - D. Larger lines will be installed if the projected capacity exceeds the 8-inch line capacity.
    - 1. Future connections require increased capacity.
      - a. Individual residential connections are assumed to require .0021 cfs capacity.
      - b. Future subdivision development will assume to have a specific number of connections per acre based on the general plan and anticipated zoning.
      - c. The following table shows maximum capacity of 8 inch, 10 inch, and 12-inch lines at different slopes. The capacities shown are the number of residential connections and the number of acres for each line size and slope.

Slope %	8 inch conn./acres	10 inch conn./acres	12 inch conn./acres
0.20	not allowed	not allowed	737/210
0.30	not allowed	555/158	903/258
0.40	353/101	641/183	1043/298
0.50	395/113	717/204	1166/333
0.75	484/138	878/250	1428/408
1.00	559/159	1014/289	1649/471

- 2. Larger lines may be installed where the slope requires larger line size to accommodate existing surface gradient, as indicated in the table above.
- E. The developer's engineer shall review the entire subdivision sanitary system to determine that the line with the least capacity has adequate capacity as determined above.
- F. The minimum slope for a dead-end line with less than 8 connections shall be one percent, (1.00 %). This will occur in cul-de-sacs and on dead-end spans.
  - 1. The minimum number of connections on a 12-inch sewer line at 0.20% will be 45 connections.
  - 2. The minimum number of connections on a 12 inch sewer line at 0.30% will be 30 connections.
  - 3. The minimum number of connections on a 10-inch sewer line at 0.30% will be 28 connections.

- G. Sewer lift stations that service more than one residential or business unit are not allowed, unless the elevation of the development project is lower than any sewer gravity feed line, regardless of the distance or easements required to complete a gravity connection. The area that meets this requirement is located below the “bluff.” Individual sewer lift stations that service one residential or business unit are allowed under specific guidelines (see Section IV).

## II. Sanitary Sewer Line Placement

- A. The sanitary sewer lines are placed typically 9 feet south and west of the street centerline.
- B. Sanitary sewer lines shall not be placed in sidelot or rearlot property lines unless all alternatives are exhausted.
  - 1. The developer may be required to change street alignment to accommodate sanitary sewer line placement.
  - 2. Sanitary sewer lines that are approved for sidelot or rearlot installation shall have a 20-foot easement provided.
  - 3. Sanitary sewer lines that are approved for sidelot or rearlot installation shall provide for vehicular access to all manholes.
- C. The minimum sanitary line depth shall be 5 feet from finish ground elevation to top of pipe.
- D. The maximum depth of the sanitary sewer line shall be 20 feet from finished ground elevation to top of pipe.
- E. Manholes shall be placed no closer than 5 feet to the lip of the gutter on a street curve.
- F. The sanitary sewer line shall not extend more than 5 feet past the street centerline on street curves.
- G. The sanitary sewer line shall not cross outside of the lip of gutter location at the outside of the street curve.
- H. Lines shall be extended to the boundary of the development.
- I. Where a subdivision is constructing a new street over an existing sanitary sewer line, the developer will relocate the line to comply with the placement standards.

## III. Manhole size and placement determination.

- A. Manholes shall be installed as follows:
  - 1. Maximum spacing is 400 feet.
  - 2. Change in alignment.
  - 3. Change in slope.
  - 4. Junction with other lines 8 inch in diameter or larger, (or 6 inch in diameter with multiple users/commercial).
  - 5. Within 30 feet of the upstream and downstream ends of an augured or trenched casing.
- B. Minimum size manhole shall be four foot (4') inside diameter.
- C. Five-foot (5') inside diameter manholes shall be used for all locations as follows:
  - 1. Intersection of three sewer lines.
    - a. A 6-inch multi-user/commercial line connecting to an 8-inch or larger main line.

- b. NOTE - No more than four lines will be permitted in one manhole.
    - 2. A change of grade with an algebraic difference of five percent (5.0 %).
      - a. A cast-in-place manhole is required.
    - 3. Change in alignment where the interior angle is greater than 70° but less than 90° and at 90° bends.
      - a. Pipeline alignments that have interior angles less than 70° shall have two manholes placed to divide the angle. Manholes shall be placed at the end of all lines with service connections attached to the line. This includes cul-de-sac lines and/or lines intended for future extension.
  - E. Manholes shall have a minimum of 0.2' fall within the trough.
  - F. Drop manholes shall be installed where a step of 20 inches or more is designed in the sanitary sewer line. (A drop of less than 20 inches is allowed with a slide.)
    - 1. Drop manholes shall be 5-foot diameter.
    - 2. All plumbing for drops shall be on the exterior of the manholes, with an additional manhole over the plumbing. The top of the pipe shall be cut-out to provide access.
  - G. Manholes shall be set to within 12 inches of the final street grade. The manhole shall be raised to grade with concrete or cast iron grade rings, and shall have a 8-inch thick, 12-inch wide concrete collar.

IV. Sewer service lateral size and placement

- A. All residential connections shall have an individual service connection. The sharing or joint use of residential lines is not allowed.
  - 1. In the case where a sewer lateral is extended to the building lot, but is at an elevation higher than the anticipated lowest floor elevation:
    - a. The developer shall define on the dedication plat the elevation of the sewer lateral and a note indicating gravity service is not available below that elevation.
    - b. The use of individual sanitary sewer pumps or lift stations is acceptable in locations where gravity sewer systems cannot be constructed, only if the pump and pressurized lines remain on the individual lot that utilizes the pump station.
  - 2. If one building lot requires a gravity sewer line to cross another downhill building lot, the separate sewer lateral shall be extended to the uphill lot, providing that a specific easement for that service line is granted by the downhill owner to the uphill owner. The use of public utility easements is not allowed.
- B. Residential service lines shall be 4-inch PVC pipe.
  - 1. The service lateral shall be installed 10 feet downstream from the center of the building lot.
  - 2. The service lateral shall be either a wye or a tee on the mainline.
  - 3. The service lateral shall be installed so that the top of the 4-inch line is not lower than the top of the mainline.
  - 4. The service lateral shall extend to the property on a minimum slope of 2.0%. A 6-inch line may be installed where the slope is 1.0%.
  - 5. The contractor will install identifier tape one foot over the top of the lateral

- for the entire length of the lateral, and the tape will say 'Sewer'.
- C. All commercial connections shall have individual connections based on unit ownership.
    - 1. If one building site has one or more buildings and has one owner or one group of owners, (such as a partnership or a condominium venture) but is divided into two or more units, only one connection per building will be allowed. An example may be a strip center, which is built on one lot but contains several stores. Only one service is provided.
    - 2. If several buildings are built on separate lots as part of an over-all development scheme, one connection per unit will be required.
  - D. Commercial connections will be required to submit calculations showing the anticipated peak flow demand OR the number of fixture units for the sanitary system.
    - 1. The International Plumbing Code will dictate the size of the line depending on the submitted information.
- V. Pipe line materials, construction and testing. (Testing to be witnessed by the Public Works Inspector)
- A. 4 inch and 6 inch service lines shall be PVC 3034 pipe.
  - B. 8 inch to 12 inch sewer lines shall be PVC ASTM 3034 pipe. Fifteen inch (15") and greater sewer lines shall be extra strength concrete.
    - 1. PVC pipe shall have a minimum of 12 inches of 1 1/2-inch minus sewer rock placed for bedding, blinding pipe sides and cover over the line.
    - 2. PVC lines shall be tested for deflection after the trench has been back-filled, compacted and/or settled.
    - 3. Concrete pipe shall be bedded in a minimum of 6 inches of gravel (to spring-line).
    - 4. The backfill around and over the pipe shall be compacted to a minimum of 95%. Import borrow material is required for backfill of trenches between November 1, and April 1. This requirement may be extended by the Public Works inspector, dependant on condition of native soils. See standard drawing ST-ST-01.
    - 5. Compaction tests shall be conducted every 200 linear feet along the trench for each lift. (Maximum lift is 18 inches).
  - C. All lines shall have an air test after all service lines are installed, all manholes are constructed, and at least 80% of the backfill material has been placed and compacted.
  - D. All lines shall be televised after the system has passed the air test.
    - 1. The video recording will be reviewed to determine that the laterals are correctly installed
    - 2. The recording will determine that no "low-spots" exist.
    - 3. The recording will determine that the line has been properly cleaned by using power flushing equipment, ensuring that all sediment and waste materials have been vacuumed from the system.
    - 4. The video shall display a continuous location identifier, showing the section being reviewed, by identifying the beginning and ending manhole,

- along with a footing indicator.
5. The Contractor shall furnish a CD of the lines televised. Each manhole section video shall be a separate file on the CD. The Contractor shall also furnish a map of the lines televised with each manhole/box labeled according to the corresponding number/name found on the video and a hard copy of an information sheet for each manhole section video which will need to include the development name, the excavation contractor name, and the location of any defects found.
- E. Manhole bases may be pre-cast using the design as a guide for stub orientation.
1. Pre-cast manholes are not allowed where the change of grade has an algebraic difference of 5.0 % or greater.
  2. Pre-cast manhole bases shall be placed on a minimum of 8 inches of gravel rock.
- F. Poured-in-place manhole bases shall conform to the following standards:
1. The concrete base shall be at least 10 inches thick.
  2. The sub-grade material shall be gravel rock where the existing material is wet or is unstable.
- G. Manhole sections shall be tongue & groove, pre-cast concrete sections with cast-in-place vinyl steps.
- H. The frame and cover shall be cast iron, similar to the D&L Supply model #A-1180.
- I. Steel Casing Construction
1. ASTM A53, Grade B steel pipe for jacking operations, minimum wall thickness of 0.375 inch, minimum yield strength of 42,000 psi. Use a casing with a diameter equal to the outside bell diameter of the pipe plus a minimum 4 inches.
  2. Fillet-weld joints continuous around casing and reinforce joints to withstand jacking operations.
  3. Use casing spacers CCI Pipeline Systems Model CSP or CSC or acceptable equal to center pipe within casing. Minimum of three spacers per length of pipe.
  4. Install neoprene rubber end seal with stainless steel bands CCI Pipeline Systems Model ESC or ESW as applicable or acceptable equal at each end of casing.