

**27. Sewer House Connections (SHC).****a. Type of Service Connections.**

- 1) Connections for individual residential houses and most townhouses require an individual connection.

**b. Allowable Pipe Material for SHC.**

- 1) See Part Two, Section 3 (Selection of Pipe Material – Gravity Sewers).

**c. Size of SHC.**

- 1) SHCs for residential services are generally 4-inch or 6-inch. Larger sizes (8-inch to 12-inch) may be approved by WSSC if required. Submit justification for approval.

**d. Connection of the SHC to the Mainline Sewer.**

- 1) SHCs can be installed using a tee or saddle on mainline sewers 15-inch diameter and smaller. See Connection Notes on Standard Detail S/6.0.
- 2) For SHCs to mainline sewers larger than 15-inch diameter, provide a manhole at the connection to the mainline sewer.
  - a) Variance may be given on the mainline sewer size requirement for smaller than 27-inch diameter, if justification, flow analysis and detailed design are provided for review and approval. For connection to mainline use a drop connection, see Standard Detail S/6.0. For mainline sewer 27-inch and larger, SHCs is not allowed without using a manhole.
- 3) For SHCs down stream of transition manhole for force mains larger than 4-inch in diameter, no connections between the transition manhole and the next manhole will be allowed.
  - a) Variance may be given on the location of the SHC, if justification, flow analysis and detailed design are provided for review and approval.
- 4) Type of connection to the mainline sewer.
  - a) For PVC mainline sewers, use PVC tee and PVC pipe for the SHCs for proposed mainline sewer and when the mainline sewer is existing, use PVC saddle tee, see Standard Detail S/6.3.
  - b) For DIP mainline sewers, use mechanical joint (MJ) tee and a transition gasket which makes the MJ compatible to PVC pipe for the SHCs, see Specifications.
  - c) When the mainline sewer is other than PVC and DIP, see Specifications and provide a design accordingly.
  - d) For all SHCs 8-inch and larger connection must be made with a manhole.
  - e) A SHC connected to a sewer main with a slope of 1% or less shall have a T-Wye fitting at the main line connection. The T-Wye fitting shall be oriented so that the flow from the SHC is directed into the main line in a downstream direction at the T-Wye fitting.



**e. Connection of the SHC to a Manhole.**

- 1) Single SHC to manhole, see requirements under Part Two, Section 12 (Design of Structures). Drop House Connections (DHC) may be designed when single connections are required, see requirements in this section.
- 2) Multiple SHCs to manhole, to facilitate the maintenance of sewer house connections in areas of high-density multi-family residential development, see the following requirements.
  - a) When two (2) or more SHCs are to be provided at the same location, provide a manhole at the mainline sewer.
  - b) Manhole inside diameters, minimum 48-inch and maximum 60-inch.
  - c) Channelization in the manhole.
    - (1) Channel each SHC with a smooth curved channel through the manhole.
    - (2) Interior angle of intersection of the centerline of the multiple SHCs and the discharge mainline sewer pipe, to be not less than ninety (90°) degrees, see requirements and Sketch "W", under Part Two, Section 17 (Manhole Channel Design).
    - (3) Provide 9-inch minimum between outside diameters of SHCs at the interior manhole wall, see requirements and Sketch "N", under Part Two, Section 14 (Pipe to Manhole Geometry).
    - (4) Type of manhole installations for SHCs.
      - (a) Radial SHC see Standard Detail S/6.4 and the following:
        - [1] Whenever possible, design multiple SHCs in a radial manner.
        - [2] Centerline of the SHCs must be designed to pass through the centerline of the manhole.
        - [3] No more than 5 influent radial connections (incoming SHCs and/or mainline sewers) may be connected to a manhole.
      - (b) Parallel SHC, see Standard Detail S/6.5 and the following:
        - [1] Whenever space and alignment constraints prevents the design of radial multiple SHCs, design the connections in a parallel manner.
        - [2] Connections into a manhole are governed by required channelization, diameter of the manhole and the flow of the mainline sewer. Provide a detail of the manhole channelization for the parallel SHCs on the drawings.
  - d) Inverts of SHCs at manholes.
    - (1) For mainline sewers smaller than 15-inch diameter, see Part Two, Section 17 (Manhole Channel Design).
    - (2) For mainline sewers 15-inch and larger, design the invert of the SHC a minimum of 12-inches above the crown of the mainline sewer.



**f. Horizontal Alignment.**

- 1) When possible, coordinate with the Applicant to determine the appropriate location and size.
  - a) SHC information required on the drawings: limits of the SHC, from the mainline sewer to the property line or as required in this section and the WSSC permit numbers in the General Notes or below the lot number. These numbers will be provided by WSSC.
  - b) Type of lots that can be served with a SHC.
    - (1) Improved lots.
      - (a) For existing dwellings or buildings, show the elevation of the lowest level of the dwelling or building, (basement or first floor) on the plans and profiles. If the lowest level cannot be served, a note must be provided on the drawings stating what can be serve in the dwelling or building with the proposed pipeline.
      - (b) For proposed dwellings or buildings, show the proposed elevations on the plans and profiles.
    - (2) Unimproved lots.
      - (a) Existing lots with no dwellings or buildings.
      - (b) Proposed or future lots with no plans for any dwellings or building.
- 2) Horizontal location of the SHC.
  - a) Improved lots, locate the SHC to readily serve the existing or proposed dwellings or buildings in a cost-effective manner.
  - b) Unimproved lots, where practical, locate the SHC ten (10) feet downgrade from the center of the property being served and individually serve each dwelling or building. In no case should the SHC be closer than ten (10) feet from the downgrade side of the dwelling or building if the SHC must run to the back side of the dwelling or building. See Sketch "Z".
  - c) When both a Water House Connection (WHC) and a SHC are to be provided, locate both house connections in the same trench when possible, see Standard Detail M/18.0 and Part Three, Section 3 (Pipeline Crossings and Clearances). Existing dwellings or buildings may have existing water (wells) and sewer (septic tanks) connections on the opposite sides of the dwelling or building; in this case locate the SHC in a cost-effective manner.
  - d) Limits of SHCs.
    - (1) For SHC 6 inches and smaller.
      - (a) When within a roadway right of way, terminate the SHC at the property line, see Standard Detail S/6.2.



- (b) When within a WSSC right of way, terminate the SHC as indicated on Standard Detail S/6.7.
  - (c) At the end of the SHC, terminate the SHC with a vertical and horizontal connection, as shown on Standard Detail S/6.8. The Plumbing Code requires the end of the SHC to have a vertical connection in accordance with Standard Detail S/6.8.
- (2) For SHC 8 inches and larger, provide manhole at the end of the SHC to allow access to clean out the SHC. (There will also be a manhole at the connection to the mainline sewer.)

**g. Vertical Alignment.**

- 1) Minimum Cover over the SHC.
  - a) Provide minimum cover of three (3) feet over the SHC. (Variance may be given on the minimum cover requirement, if justification and detailed design are provided).
  - b) For minimum clearance between SHC and WHC, see Part Three, Section 3 (Pipeline Crossings and Clearances).
- 2) Maximum Pipe Depth for Pipe Material, see Part Two, Section 3 (Selection of Pipe Material - Gravity Sewers).
  - a) Refer to Part Two, Section 8 (Vertical Alignment (Profiles)) for deep sewer requirements.
  - b) For mainline sewer over 24 feet deep, connect SHC with a manhole, not on the mainline sewer pipe.
  - c) For mainline sewer 20 to 24 feet deep, the SHC should be relocated out of deep areas when possible.
- 3) Grade or Slope of the SHC. Provide minimum two (2%) percent grade for the SHC.
- 4) Pipeline Clearances, see Part Three, Section 3 (Pipeline Crossings and Clearances).
- 5) Determining the depth of the SHC at the mainline sewer.
  - a) Improved lots, determine the invert of the SHC on the mainline sewer using Formula "J" and Sketch "Z"
  - b) Unimproved lots.
    - (1) In existing areas with existing mainline sewers, the SHC is controlled by the invert elevation of the existing mainline sewer. Insure the SHC can connect to the existing mainline sewer with sufficient slope.
    - (2) For proposed mainline sewer extensions for unimproved lots, the normal depth of the mainline sewer is controlled by the adjacent lots (which have dwellings or building) and in general, is not to exceed ten (10) feet. For unimproved commercial areas, the normal depth of the mainline sewer is not to exceed twelve (12) feet.



## c) Drop House Connections (DHC).

- (1) When the depth of the SHC exceeds the twelve (12) feet of cover at the mainline sewer and the minimum elevation of the SHC as calculated using Formula "J" states that the mainline sewer can be at depth of eight (8) feet below the centerline elevation of the road, provide a DHC as follows:
  - (a) DHC to the mainline sewer, Standard Detail S/6.0. Provide the location (station along the mainline sewer) and the invert elevation of the upper vertical 1/8 bend, see Standard Detail S/6.0. Minimum depth of cover required is eight (8) feet measured from the centerline elevation of the roadway or finished grade at the property line.
  - (b) DHC at manholes, Standard Detail S/6.1. Provide the location of the connection at the manhole and the top elevation (invert of the SHC at the property line). Minimum depth of cover required is eight (8) feet measured from the centerline elevation of the roadway finished grade at the property line.

**FORMULA "J"**

$(C - d - h - ID) =$  minimum elevation at the mainline sewer

Where:

- C = elevation of the cellar of the dwelling/building (use FF for first floor)  
 h = distance from the furthestmost point of the dwelling/building to the mainline sewer multiplied by two (2%) percent, (which is the required house connection slope)  
 d = standard dimension for determining the minimum depth requirement under the cellar floor (slab) for clearing the dwelling or building foundation;  
     use three (3) feet for existing and two (2) feet for proposed dwelling/building  
 ID = Inside Diameter of the SHC. (Typically 4-inch or 6-inch diameter)

**Example (Proposed):**

Proposed Cellar elevation of the house to be served is 100.00 and the SHC is 4-inch diameter.

Distance using Sketch "Z" (see following page) from Design Point 'a' at the house to Design Point 'b' at the mainline sewer is 75 feet.

House is located in a proposed development and the house is proposed.

$$\begin{aligned} \text{minimum invert elevation @ mainline sewer} &= C - d - h - ID \\ &= 100.00 - 2' - (75' \times 0.02) - 0.33' \\ &= 100.00 - 2' - 1.5' - 0.33' \\ \text{minimum invert elevation @ mainline sewer} &= 96.17 \end{aligned}$$

If the mainline sewer is 8-inch, then the invert of the mainline has to be at 96.00 or lower.

$$\begin{aligned} 96.17 - 0.17' &= 96.00 & 0.17' \text{ is one-half the difference between } 8'' \text{ and } 4'' \\ & & 8'' = 0.67' \quad 4'' = 0.33' \quad (0.67' - 0.33') \div 2 = 0.17' \end{aligned}$$



**Example (Existing):**

Existing Cellar elevation of the house to be served is 100.00 and the SHC is 4-inch diameter. Distance using Sketch "Z" (see following page) from Design Point 'a' at the house to design Point 'b' at the mainline sewer is 75 feet.

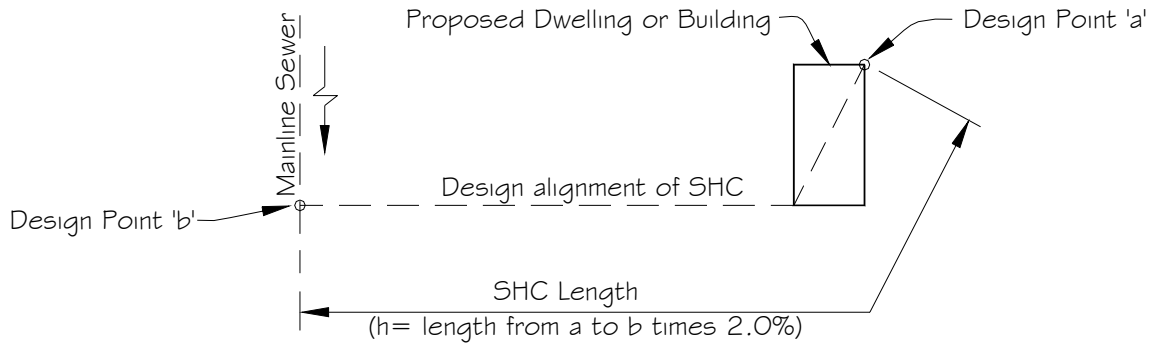
House is located in an existing development and the house is existing.

$$\begin{aligned}
 \text{minimum elevation @ mainline sewer} &= C - d - h - ID \\
 &= 100.00 - 3' - (75' \times 0.02) - 0.33' \\
 &= 100.00 - 3' - 1.5' - 0.33' \\
 \text{minimum elevation @ mainline sewer} &= 95.17
 \end{aligned}$$

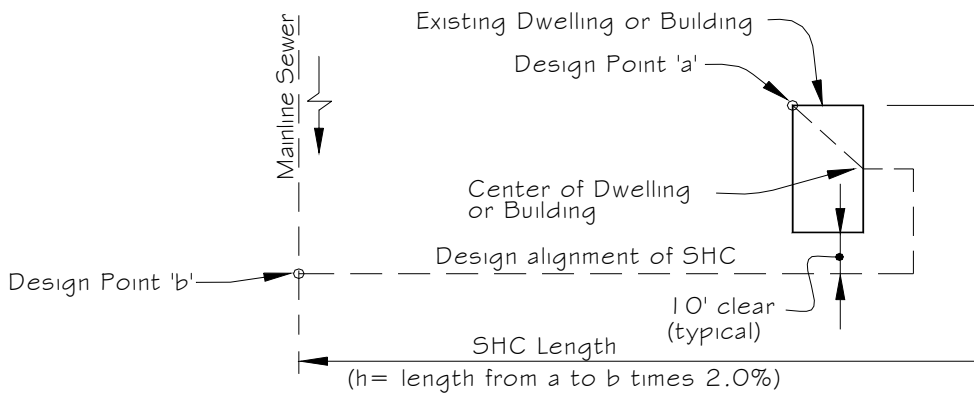
If the mainline sewer is 8-inch, then the invert of the mainline has to be at 95.00 or lower.

$$\begin{aligned}
 95.17 - 0.17' &= 95.00 && 0.17' \text{ is one-half the difference between 8" and 4"} \\
 8" &= 0.67' && 4" = 0.33' && (0.67' - 0.33') \div 2 = 0.17'
 \end{aligned}$$

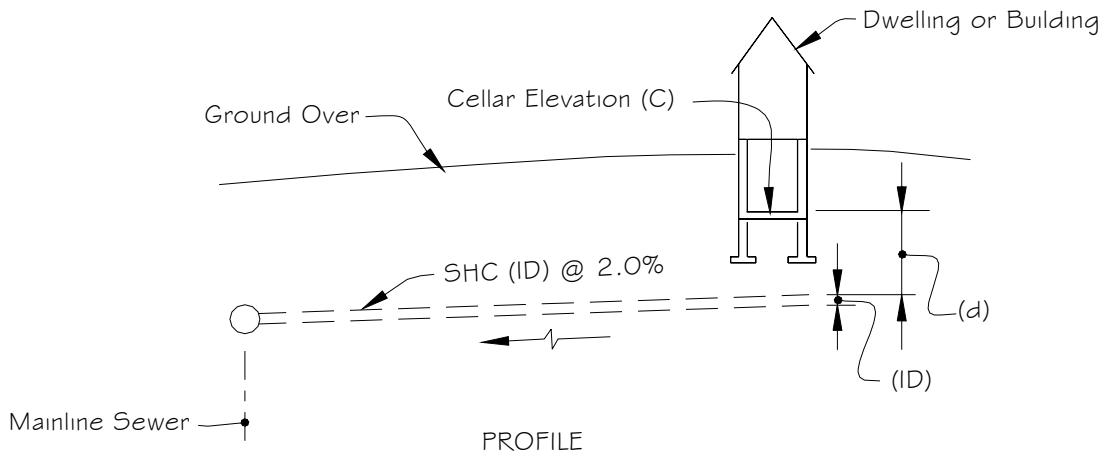




PLAN - Design of the rate of run from Proposed Dwelling or Building to Mainline Sewer



PLAN - Design of the rate of run from Existing Dwelling or Building to Mainline Sewer



SKETCH "Z"

Determining SHC Invert Elevation at Mainline Sewer

