



City of Sunnyvale

Sanitary Sewer Design Guidelines

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SANITARY SEWER SYSTEM – DESIGN GUIDELINES

1.0 GENERAL

- A. These design guidelines are applicable to public sewer mains and private laterals. For private sewer systems on private property, upstream of the private lateral that flows to a public main, please refer to Section 1.7 of this document.
- B. All sewer system construction shall conform to the most recent edition of the City of Sunnyvale Standards. If the standard that is sought does not appear in these Guidelines, then the following standards shall be utilized in the order listed:
 - 1. State Water Resources Control Board - Division of Drinking Water (SWRCB-DDW)
 - 2. City of Sunnyvale Municipal Code
 - 3. City of Sunnyvale Standard Details
 - 4. City of Sunnyvale Consolidated General Plan
 - 5. Standard Specifications for Public Works Construction (SSPWC or “Greenbook”), latest Edition
 - 6. Standard Details for Public Works Construction (SSPWC or “Greenbook”), latest edition
 - 7. Santa Clara County Drainage Design Manual
 - 8. All other applicable local state and federal guidelines

Exceptions to this and all other guidelines appearing in this manual may be allowed only upon the approval of the City.

- C. The sewer facilities listed below shall require telemetry and control equipment to be incorporated into the design of the facility. The City shall provide specific design requirements when improvement plans are submitted for Plan Check.
 - 1. Treatment Facilities
 - 2. Sewer Lift Stations and force mains
 - 3. Metering Stations

If the standards as described in these guidelines cannot be met due to existing constraints, then the Engineer shall provide, to the City, written documentation of the deviation and how their specific design meets the intent of these standards

1.1 MAINS

- A. Minimum nominal pipe size shall be eight (8) inches for PVC. For new HDPE The minimum nominal pipe size shall be 10” to provide min 8” inner diameter
- B. Unless otherwise allowed by the City, maximum water depth (d) divided by pipe diameter (D) shall not exceed the following during peak wet weather flow (PWWF):
 - a. Pipes 10 inches and smaller: $d/D = 0.5$
 - b. Pipes 12 inches and larger: $d/D = 0.75$.

If a new development results in an existing main not meeting this d/D criteria the City may require that it be upsized.

- C. No vertical or horizontal curves shall be permitted, unless otherwise approved by the City.
- D. The maximum slope of sewer line between two (2) adjacent manholes shall be 14 percent unless otherwise approved by the City.

E. Sewer Main Locations:

1. Alley: This shall be determined by the City on a case by case basis.
2. Street: Sewer mains shall be located with a minimum 10-foot horizontal separation, outside of pipe to outside of pipe, from waterlines, or per State requirements, whichever is more conservative.
3. Minimum cover for sewer pipe shall be five (5) feet below the finished grade, unless otherwise approved by the City.
4. Streets with 84 feet of right-of-way or more may require special location as approved by the City

F. Minimum Slopes:

Sewer mains and laterals shall have a slope that results in a minimum velocity of 2 feet per second (fps) if and when the pipe is flowing half full per Manning's equation assuming an n value of 0.013. Min slope for 4" laterals shall be 2%. Min slope for 6" and 8" laterals and mains shall be 0.005. Larger pipes may have lower slopes, provided the 2 fps criteria is met.

G. Wastewater flow factors for average daily flows:

Zoning Classification	Zoning Code	<i>gpd/unit</i>	<i>gpd/1000 sqft</i>	<i>gpd/acre</i>
Low Density Res.	R0	170	-	1,100
Low Density Res.	R1	215	-	1,000
Low-Med. Den. Res.	R1.5	190	-	900
Low-Med. Den. Res. PD	R1.7	165	-	1,500
Low-Med. Den. Res.	R2	145	-	1,450
Med. Den. Res.	R3	135	-	2,900
High Den. Res.	R4	150	-	3,500
High Den. Res./Office	R5	100	-	4,500
Res. Mobile Home	RMH	160	-	1,400
Commercial	C1, C2, C3, C4 & MPC	-	245	2,300
Downtown Specific Plan	DSP	-	-	1,600
Lakeside Specific Plan	LSP	-	-	-
Industrial	M3, MPI, MS	-	115	1,500
Moffett Park TOD	MPT	-	170	-
Admin-Prof. Office	O	-	170	1,950
Public Facility	PF	-	245	1,700
Split Zoning	SP	-	-	-

1. Dry weather peak flows for residential and non-residential developments shall be based on the ratio of the peak to average flow per the dry weather peaking factor shown below.

Average Dry Weather Flow	Dry Weather Peaking Factor
Less than 8,000 gpd	3.5
8,000 gpd to 15,000 gpd	3.25
15,000 gpd to 35,000 gpd	3.0
35,000 gpd to 80,000 gpd	2.75
80,000 gpd to 250,000 gpd	2.5
250,000 gpd to 600,000 gpd	2.2
Over 600,000 gpd	2.0

2. Wet weather flows for residential and non-residential developments shall include an infiltration and inflow allowance based on a 10-year storm event that is 65% of the average dry weather flow (ADWF). This allowance is added to the peak dry weather flow.

$$\text{Peak Wet Weather Flow (PWWF)} = \text{ADWF} \times (\text{Dry Weather Peaking Factor} + 0.65)$$

- H. Where a public sewer must be installed on private property, the property owner shall provide a min 15-foot wide sewer easement, centered on the sewer pipe. In some special cases, a wider easement may be required; the City shall determine size. Where water and sewer mains are located within the same easement, the minimum jurisdictional width shall be 30 feet wide. All easements shall at all times provide excavation access to the City. No trees, structures, building overhangs, or debris are allowed within City easements. Any hardscape surfaces other than standard asphalt or grey concrete that are removed during sewer repair work shall be replaced by the owner. Easements shall be made accessible to heavy City maintenance vehicles including full size vacuum trucks and excavators, in all weather. An all-weather access road shall be required as approved by the City.
- I. During backfill of new sewers, three (3) inch wide green warning tape marked "SEWER" in 1-½ inch black letters shall be placed on the compacted and graded bedding material within one foot above and centered over the sewer main.

1.2 MANHOLES

- A. For new manholes along new 6" and 8" sewer mains, where the direction of flow changes by 45 degrees or more, provide a min 0.1 foot elevation drop along the manhole channel, provided this would not require inadequate slope of connected pipes. For sewers 10" and larger, the slope along the manhole channel can match the slope of the connected pipes.

Where a new incoming lateral or main is perpendicular to the main channel within a manhole, in most cases, the crown of the new pipe shall be at an equal or higher elevation than the crown of the main channel. The crown of the incoming pipe should never be submerged by flow in the main. Incoming pipes shall have a smooth manhole channel at least as high as the pipe springline. Where the incoming pipe is at a similar invert elevation as the main channel, the new channel shall have a smooth horizontal curve to meet the main channel.

- B. New manholes shall be required:

- 1. At all changes of slope;
- 2. At all changes of direction;
- 3. At all intersections of mains
- 4. At all ends of main lines and beginning of main lines;
- 5. At the upstream end of private laterals 6" and larger, immediately inside private property and outside of any easement. Any onsite pumping must discharge to a private, gravity manhole before flowing into the lateral that drains to a public main.
- 6. Where a private lateral 6" or larger connects to a public main, unless an existing manhole can receive the connection as determined by the City.
- 7. Changes in pipe size and/or material;
- 8. At the right-of-way line where a private street intersects a public street for residential development with five (5) units or more. For less than five (5) units, a clean-out is required.

- C. Prohibited locations for Manholes.

Manholes shall not be placed in the following locations:

- 1. Inaccessible locations;
- 2. Gutters and other depressions;
- 3. In sidewalks, crosswalks, or pedestrian ramps;
- 4. In driveways;

5. In freeway ramps or lanes;
 6. Between railroad tracks (within a railroad right-of-way the manhole shall be located a minimum of fifteen feet from the track bed and in accordance with the jurisdictional authority);
 7. Within fifteen feet of any structure;
 8. Within any area subject to localized flooding.
- D. All manholes shall be numbered and stationed on the improvement plans, and on the sewer table calculations.
- E. The maximum allowable spacing between manholes is 300 feet for pipelines up to and including 18 inches in diameter, and 400 feet for pipelines greater than 18 inches, or as approved by the City.
- F. Drop manholes, where proposed, will be evaluated by the City on a case by case basis as to whether an alternative design without a vertical drop may be adequate. Where drops are approved, and where the incoming pipe invert is less than 2 feet above the main channel invert, provide a smooth concrete channel from incoming pipe down to main channel. Where the invert of the incoming pipe is 2 feet or higher above the main channel invert, provide inside drop piping per City standard details.
- G. When changes in grade of the inlet and outlet pipes are greater than 10 percent and the potential for a hydraulic jump exists, the grade change shall be made in a smooth vertical curve, upstream of the manhole, with the manhole located 25 feet downstream of the lower end of the vertical curve. Each hydraulic jump shall be carefully evaluated by the Designer and submitted to the City for review.
- H. Large Diameter Manholes. For sewer mains greater than 36 inches in diameter, special design and structural details for the manholes or vaults shall be shown on the plans. Vaults shall require a minimum of two (2) access manholes.
- I. Deep Manholes. For manholes that exceed 25 feet in depth, structural calculations (signed by a California licensed structural engineer) shall be provided to verify that the structure is designed to accommodate the design depths
- J. Opening of City manholes for inspection or survey purposes shall only be done upon approval from the City.
- K. All manholes shall have a minimum five (5) foot horizontal separation from dry utilities unless jurisdictional agency requirements are more stringent.
- L. An approved seal or water-stop shall be placed around manhole pipe penetrations.
- M. Interior of Manholes: Coat entire interior of new and retrofitted manholes with Sewpercoat, Mainstay or Sancon calcium aluminate cementitious mortar.

1.3 LATERALS

- A. For development that includes new building structures, existing sewer laterals must be abandoned or replaced unless the City allows them to be re-used. To propose re-use, the applicant shall submit CCTV video of the lateral to the City. The beginning of the video must show the front of the property to confirm its location before insertion into the pipe. Video

must extend from the cleanout to the main. Camera may not be submerged at any time, and must include a footage counter. If the City feels that the lateral is in acceptable condition, and has no significant sags, damage, or root intrusion, the City may allow it to be re-used.

- B. Size - Minimum four (4) inches for single family and minimum six (6) inches for all multi-family and commercial.
- C. All lateral piping and appurtenances located within private property shall be the responsibility of the owner. All installation, maintenance, repair, and replacement shall be at the expense of the owner and shall conform to City standards.
- D. All laterals, including sizes, are to be shown on improvement plans by stationing or a lateral table. On post-construction record drawings, all laterals shall be shown in plan view to scale and dimensioned from the nearest sewer manhole.
- E. Lateral Locations:
 - 1. Right angle along a street or radial to a cul-de-sac.
 - 2. 4" laterals shall not be located in a driveway
 - 3. For 4" laterals, an "S" shall be stamped on the curb face directly above the lateral location.
 - 4. Separation between sewer and water laterals shall be per State requirements.
 - 5. Minimum of five (5) feet from the edge of existing and new trees.
- F. Cover: Five (5) feet minimum at property line unless approved by the City.
- G. Each parcel or lot shall be a separate connection to public sewer main.
- H. For 4" laterals, house foundation and property line clean outs shall be installed.
- I. Sewer laterals connected to systems having a pumping system or houses having a finished floor elevation 12 inches or less above the rim elevation of the nearest upstream manhole structure shall install a City approved sewer Backwater Valve, as designed by a California licensed engineer, immediately upstream of the clean out at the right-of-way. The valve must be installed in a valve box for easy access and be visible from the public right-of-way. The property owner shall be responsible for the installation, routine service and all maintenance of the sewer Backwater Valve. The Backwater Valve shall be shown on the precise grading and improvement plans.
- J. Building drains, sump pumps, and area stormwater drains shall not be connected to the sanitary sewer system.

1.4 LIFT STATIONS

Lift Stations shall not be installed unless deemed essential by the City. Designer shall develop design criteria that are subject to the review and acceptance of the City.

1.5 LIST OF AUTHORIZED MATERIALS USED IN THE CITY SEWER SYSTEM

- A. Manhole steps shall not be installed.

- B. Interior of manholes: Coat entire interior of new and retrofitted manholes with Sewpercoat, Mainstay or Sancon calcium aluminate cementitious mortar .
- C. Pipe shall be SDR-26 PVC per ASTM D3034 / F679, or HDPE per AWWA C906 with light colored interior.
- D. Backfill and Bedding Materials
 - 1. Bedding standards are contained in the City of Sunnyvale Standard Details. All sewer mains shall meet these requirements.
 - 2. Where sand or native materials are specified, they shall meet the testing specification requirements of the Construction Standards and Requirements section of this Manual.
 - 3. Trench backfill shall be compacted to a minimum of 95 percent.

1.6 PRIVATE SEWER SYSTEMS

- A. All private sewer systems shall be governed by and permitted through the Building Division.
- B. Property owner shall adequately maintain private sewer system for functionality. Property owner shall be held financially responsible for any and all negative impacts to the public sewer system due to discharge from the private system.
- C. In the event that a private sewer system is proposed to be converted to a public system, the entire system must be upgraded to meet the public standards as presented in this manual.

END OF SANITARY SEWER SYSTEMS DESIGN GUIDELINES

Abandonment Notes for Sewers

1. Lateral connections at mains:

(a) Disconnect lateral from main. Remove existing wye and/or segment of existing main as needed to meet the following requirement. New PVC main segment must connect to minimum 2 horizontal feet of buried & undamaged main where nearest buried joints are minimum 2 feet away from the trench wall. Use flashlight inside the main to check distance to joints. Expose and remove additional main as needed to meet this requirement.

(b) Install segment of new SDR 26 PVC main on $\frac{3}{4}$ " crushed rock bedding. Connect new PVC to existing main via couplings with stainless steel shear bands, Mission Flex-Seal ARC or approved equal. For new lateral at same location, install PVC wye with SDR 26 PVC stubs. Do not backfill before inspection and approval from the DPW Inspector.

(c) Remove abandoned lateral within 3 horizontal feet of the active sewer main. Remove or abandon in place any remaining lateral extending to the back of walk or property line, whichever is further. Remove any property line cleanout to minimum 24" below grade, and cap remaining riser.

2. Mains & Laterals: Pipes may be abandoned in place or removed. All pipes to be abandoned in place shall be filled with lightweight cellular concrete (LCC) of 28-day compressive strength between 50 and 200 psi. LCC installer must first be approved by the DPW Inspector.

3. Abandoned Pipe Connections at Manholes (MHs): Where abandoned pipe connects to MH(s), enter MH(s) and plug the pipe hole with concrete. Plug shall be finished flush with manhole wall, and any abandoned channel shall be filled with concrete flush with the bench, such that no evidence of a previous connection remains. Repair any remaining active channel(s) as directed by the DPW Inspector. Perform the same task at any private MH to remain at the upstream end of an abandoned lateral.

4. Manhole Abandonment: Break apart existing MH base. Install new SDR 26 PVC main segment per Sewer Note 1 above. Hinged MH frames and lids shall be delivered to the City's Corp Yard at 221 Commercial St. Remove all other MH parts to 4 feet below grade. Abandon in place all deeper MH features. For hardscape surface, backfill void with Class 2 AB to 95% compaction. For unpaved surface, backfill with native soil to 85% compaction.

GENERAL:

1. Contractor is responsible for verifying the location of all existing utilities.
2. Contact the City or other utility owners as needed for removal, abandonment, or relocation of their facilities.
3. Upon discovery of any unidentified utilities, coordinate with the DPW Inspector for direction.
4. See demolition plans for removal of on-site improvements.
5. Abandonment of all pipes and features shall be shown in the Contractor's detailed redlines. These redlines shall be provided to the engineer of record for the preparation of accurate Record Drawings.

Required Notes for Sanitary Sewer Systems Construction Plans

1. All work shall be in accordance with the most recent editions of the City of Sunnyvale Standards; and Standard Specifications for Public Works Construction (SSPWC) (Greenbook) and Supplemental Amendments, most current editions.
2. The Contractor must secure approval from the City prior to backfill over any sewer line. 24 hour advanced notice required.
3. No revisions shall be made to these plans without the approval of the City.
4. No disruption to existing sewer services shall be allowed during connections to existing mains without the expressed approval of the City.
5. The Contractor shall notify the Underground Service Alert 48 hours prior to starting excavation so that existing sewer facilities may be marked in the field. (UNDERGROUND SERVICE ALERT: 800-227-2600 or 811).
6. Potholing location and elevation of existing sewer facilities shall be confirmed by field measurements and excavation exploration by the Contractor, in the presence of the City after a two (2) working day notice prior to the beginning of new work. This shall allow time to permit revision of plans, as necessary, because of conflicts with other facilities.
7. The contractor is responsible for field verification of the accuracy of the information provided. The existence and location of sewer facilities shown on these plans were obtained from available City records. The City of Sunnyvale does not guarantee the accuracy of these records.
8. The City shall be notified at least two (2) working days prior to commencing work on the sewers. To arrange for inspection call the City at (408) 730-7605.
9. All sewer lateral connections shall be placed prior to surfacing of streets and other surface restorations.
10. All new and rehabilitated manholes are to be coated in accordance with the City Standard Specifications and Details.
11. All manhole covers for public sewer systems shall be manufactured with "SANITARY SEWER" stamped on top of the manhole covers.
12. All sewer mains shall be inspected by closed circuit television at the Contractor's expense prior to final acceptance. The inspection shall take place after completion of trench backfill and finish grading but prior to the placement of pavement or permanent trench resurfacing to determine the existence and extent of any obstructions, structural deficiencies, sags, or foreign material. Both a verbal description and a written manuscript of the inspection shall be submitted to the City for review and approval prior to final acceptance. The CCTV Inspection shall meet the requirements of TELEVISIONING SEWER MAINS in the City Design Standards.
13. All sewer mains shall pass a 95 percent mandrel test and air pressure test per the manufacturer's requirements, prior to street paving, but after all other utilities have been completed, backfilled, tested, and testing certified compaction approved.

14. Plastic sewer pipe shall be bedded in strict accordance with City of Sunnyvale Standard Drawing 16A-1. Bedding shall remain undisturbed by subsequent construction.
15. PVC pipe shall be stored on a flat surface so the barrel is evenly supported. Do not stack pipe higher than four (4) feet. Pipe shall not be exposed to direct sunlight while being stored. Gaskets shall be stored in a cool, dark place out of contact with oil or grease.
16. Existing sewer mains shall not be used for discharge of storm waters, drainage, or other similar uses per City of Sunnyvale Municipal code 12.12.020 and California State Water Quality Control Board.
17. During any activity or work around, or in, an existing sewer line, the contractor at their expense, shall protect against debris entering the system by installing “traps” in the outlet side of the closest manhole. The “traps” and their location shall be submitted to the City for approval. The “traps” shall remain in place until all requirements (testing, cleaning, videotaping, etc.), have been completed and approved.
18. Upon activation of a sewer line, the Contractor—at their expense—shall protect the line from foreign material by installing plywood over the manhole base until all grading, paving, and manhole raising is complete and accepted by the City.
19. The inside and outside of the pipe shall be clean and free from foreign material of any kind before being installed.
20. Three (3) inch minimum width green color coded (per USA Mark Out System) detectable tape marked “SEWER” in 1-½ inch black letters shall be placed on the compacted and graded bedding material within one (1) foot above and centered over the sewer main prior to backfilling the trench.
21. All water discharge from cleaning, CCTV inspection, and other activities shall comply with all requirements of the City of Sunnyvale Municipal Code, California Regional Water Quality Control Board—San Francisco Bay Region (RWQCB), along with any other jurisdictional regulatory agencies.

END OF REQUIRED NOTES FOR SEWER SYSTEM DESIGN PLANS