

IV. SEWER SYSTEM DESIGN CRITERIA

A. GENERAL

Sewer system improvements proposed for inclusion into the District's service area shall be designed in accordance with the criteria set forth herein, unless otherwise approved in writing by the District.

The design shall take into consideration physical conditions known to exist at the time and place of each installation and the probable operating requirements. Where such conditions render sections of these Specifications inapplicable, alternate methods of design may be submitted to the District, and upon approval thereof, may be incorporated in the Plan.

B. LOCATIONS OF MAINS

1. Alignment:
 - a. 6' north or east of centerline of street.
 - b. Horizontal curves are allowed on all sizes 8" and larger. All curved sewers shall have a minimum radius of 288', but no less than the radius recommended by the pipe manufacturer. No reverse curves allowed between manholes. Manholes shall be constructed at or near all BC's, EC's, PRC's, and PCC's.
 - c. No vertical curves allowed.
2. Depth: Minimum cover over pipe should be sufficient to service adjacent property by gravity, and cover shall not be less than 7.0' to finish grade of street, unless otherwise approved by District. In addition, sewer mains must be sufficiently deep in subdivisions to allow water lines to be set with 4' min. cover without interference from sewer laterals.

C. FLOW RATE COMPUTATIONS

1. All flows shall be computed on the basis that the area served by the extension or addition is completely improved to limits imposed by its present zoning required to allow construction of the proposed development.

2. Average Daily Rates:

a. Residential Areas:	<u>GPCD</u>	<u>Pop./Unit</u>	<u>GPD/Unit</u>
Apartments	90	2.0	180
Single Family			
Tributary to City of Riverside Water Quality Control			252 Plant
Tributary to Western Riverside County Regional Wastewater Authority Plant			220

b. Commercial and Industrial: For initial planning, District will use 2000 gpd/gross acre to estimate average daily flows. For final sizing, investigate each installation

3. Peak Flow Rates:

- a. Residential Areas: $Q_{PEAK} = 2.5Q_{ADF}^{(0.91)}$
Where Q_{PEAK} & Q_{ADF} are in millions of gallons per day (mgd)
- b. Commercial & Industrial: Investigate each installation

D. PIPE SIZING

Pipe sizing for gravity mains shall be determined as shown below:

1. for 8" diameter mains and smaller:
 - a. $n = 0.013$;
 - b. D/d (depth of water to pipeline diameter ratio) ≤ 0.50 (i.e. 50% \pm full)
2. for 10" diameter mains and larger:
 - a. $n = 0.013$
 - b. D/d ratio ≤ 0.75 (i.e. 91% \pm full)
3. House Connection Laterals (at 2% slope, utilizing 45° connection at main)

E. MANHOLES

1. Spacing shall not exceed:
 - a. 350' for all pipes; unless otherwise approved by District.
 - b. Manholes shall be located at or near all BC's, EC's, PRC's and PCC's on curved sewers.
 - c. Distance noted between manholes shall be measured to manhole centerlines.
 - d. Minimum 60" inside diameter manholes shall be required for pipelines deeper than 15' and/or for sewer diameters 15-inch and larger. Minimum 72" inside diameter manholes shall be required for pipelines 30-inch in diameter and larger.
2. Inverts:
 - a. Provide 0.1' fall through manholes for grades less than 2.5%. Show pipe flow line elevations at inlet and outlet of manhole. For grades greater than 2.5%, design grade may be continued through the manhole. Show pipe flow line elev(s). at centerline manhole station.
 - b. Where manhole invert is formed in field, a drop may be required, as follows:
 - 1) 0.1' on all bends 45° or greater
 - c. Unless otherwise approved by the District, junction manholes shall have the crowns (soffits) of the intersecting pipes at the same elevation where their projections intersect the manhole centerline.
 - d. Connections to existing facilities shall be verified in the field during the design stage, or provisions made to verify them prior to construction.
3. Drop manholes may be utilized only upon prior approval by the District. Drops shall not be less than 3 feet. ("Steep" slopes from the first manhole upstream are preferred to drop manholes.)
4. Manholes shall not be buried except where approved by District. Manholes shall be raised above ground level where necessary to maintain them in farmed areas and in waterways.
5. Use of cleanouts on sewer mains is not permitted.

6. A manhole per District Standard Drawing No. S-7 shall be provided at the street right-of-way line for all laterals 8” in diameter and larger unless a wastewater flow monitoring station is provided or unless otherwise approved in writing by the District.

F. PIPE VELOCITIES

1. Minimum
 - a. Sewer Mains: 2 - 2.5 fps
 - b. Force Mains: 2.5 - 3 fps
 - c. Inverted Siphons: 3 fps
2. Maximum
 - a. Sewer Mains: 10 fps
 - b. Force Mains: 5 fps

G. SLOPES

1. House Connection Laterals:

Pipe dia.	4"	6"
Slope	0.020	0.020

(0.010 Extreme Minimum with prior approval only)

2. Sewer Mains:

Pipe Diameter	Minimum Slope
8"	.0040
10"	.0032
12"	.0024
15"	.0016
18"	.0014
21"	.0012
24"	.0010
27"	.0008
30"	.0007

Gradients should be set to 2 figures, evenly divisible by 4, wherever possible.

H. BEDDING

1. PVC (SDR 26 or 35)

The trench width and pipe bedding requirements shall be per JCSD Standard Drawing No. S-2 based on the proposed pipe diameter. Pipe thickness is dependent on depth cover over top of pipe. For pipes installed with less than 14-feet of cover, pipe thickness to be minimum of SDR 35. For pipes installed with greater than 14-feet but less than 25-feet of cover, pipe thickness to be minimum of SDR 26. For other conditions such as deep cover (greater than 25-feet), ground water, additional live loads beyond H20 loading, other trench conditions, wide trench conditions, independent analysis must be conducted. The following assumptions apply:

- a. Minimum Live Load: H20 Traffic Loads;
- b. Unit Weight of Soil: 120 lbs./ft³;
- c. Embedment Stiffness (E'): 1,000 lbs./ft²;
- d. Pipe Bedding: Class I (Full Crushed Rock);
- e. Maximum Diametric Deflection: 7.5%;
- f. Min. Factor of Safety: 2;
- g. Conduct independent analysis for pipes 18-inch dia. and greater;
- h. Refer to AWWA M23 for additional requirements.

2. HDPE (DR 11 minimum)

The trench width and pipe bedding requirements shall be per JCSD Standard Drawing No. S-2A based on the proposed pipe diameter. This pipe material is for installation within sewer easements only and at the District's direction. The minimum pipe thickness is DR 11 with a maximum depth of cover over top of pipe of 25-feet. For other conditions such as deep cover (greater than 25-feet), ground water, additional live loads beyond H20 loading, other trench conditions, wide trench conditions, independent analysis must be conducted. The following assumptions apply:

- a. Minimum Live Load: H20 Traffic Loads;
- b. Unit Weight of Soil: 120 lbs./ft³;
- c. Embedment Stiffness (E'): 1,000 lbs./ft²;

- d. Pipe Bedding: Class I (Full Crushed Rock);
- e. Maximum Diametric Deflection: 7.5%;
- f. Min. Factor of Safety: 2;
- g. Conduct independent analysis for pipes 18-inch dia. and greater;
- h. Refer to AWWA M55 for additional requirements.

I. BACKWATER VALVES

Backwater valves shall be required in accordance with the Uniform Plumbing Code, Latest Edition.

The backwater valves, where required, shall be installed in accordance with the County of Riverside Building and Safety Department's requirements and shall be installed at shallowest location allowing access for future inspection and maintenance. Where backflow valves are required, they shall be installed on private property by the property owner or tract developer and are to be maintained by property owner.

J. SEWAGE INJECTORS

- 1. In some extreme circumstances, the ability to sewer an individual lot by gravity may be uneconomical based on excessive depths of the mainline sewer. The definition of these circumstances shall be determined by the District. Should the District determine these conditions exist for a lot, and upon District approval only, an individual sewage injector may be used.
- 2. The injector shall be constructed to District specifications for installation on private property by the property owner or tract developer. Maintenance of the injector shall be the responsibility of the property owner.

K. LATERAL CONNECTIONS TO MAIN

- 1. Direct connections of 4" and 6" diameter laterals to the mainline shall only be allowed when the sewermain has a diameter less than 15" and the connection is made per Standard Drawing No. S-5, S-6 or S-18. Direct lateral connections to 18" diameter sewer lines and larger shall be allowed at the discretion of the District and only if approved in writing by the District.
- 2. All mainline connections, 8" and larger, shall be made with the installation of a manhole.

L. INDUSTRIAL WASTE PROVISIONS

The developers of all commercial/industrial projects shall provide the District with detailed information concerning the project's expected wastewater quality and quantity. The District will review this information and determine which of the following facilities are required.

1. Building sewer sampler.
2. Wastewater flow monitoring station.
3. Gravity separator.
4. Industrial waste clarifier.
5. Pretreatment facilities.

Additionally, a separate irrigation meter and service shall be required to segregate the water quantity used for irrigational purposes so that equitable sewer user fees can be charged.