

ELEMENT 5 - DESIGN AND PERFORMANCE PROVISIONS

The standards and specifications for new construction and repair of the existing sanitary sewer system described in this SSMP Element are utilized to ensure a high quality, well designed, and functioning sanitary sewer system.

5.1 Regulatory Requirements

WDR Order No. 2006-0003-DWQ Section D.13(v) states that the SSMP must identify:

- (a) Design and construction standards and specifications for the installation of new sanitary sewer systems, pump stations and other appurtenances; and for the rehabilitation and repair of existing sanitary sewer systems; and
- (b) Procedures and standards for inspection and testing the installation of new sewers, pumps, and other appurtenances and for rehabilitation and repair projects.

5.2 Design and Construction Standards and Specifications [WDR D.13(v)(a)]

The District uses Standard Plans for the Public Works Construction, 2009, by Public Works Standards, Inc. which is included as Appendix 5A to this element.

5.2.1 Improvement Plans

Improvement plans shall be on 24" x 36" standard plan sheets. Drawings shall become the property of the SCSD and shall have the standard title block of the member entity located in the bottom right-hand corner. Layout sheets shall be on plan and profile. As-built drawings certified by a professional engineer shall be provided. Approval signature shall be by the District Engineer.

5.2.2 Design Criteria for Gravity Sewer Mains

Gravity mains shall be Reinforced Concrete Pipe (RCP), or Vitrified Clay Pipe (VCP), or Polyvinyl Chloride (PVC) pipe, SDR-26 or less. Sewer mains shall be eight inches (8") minimum diameter. Sewer mains may be six inches (6") or larger for ultimate maximum of ten single family units or less and having one (1) percent minimum slope. Plastic pipe shall not be allowed for pipe diameters exceeding fifteen inches (15") diameter.

RCP gravity sewer pipe and fittings shall conform to ASTM C76. Pipe wall thickness shall be "B" or "C." Pipe class shall be as required by loading conditions, but shall not be less than Class III. Pipe joints shall conform to ASTM C443. Rubber gaskets shall be installed per manufacturer's instructions and conform to ASTM C923. Pipe shall be installed in compliance with ASTM C12.

VCP gravity sewer pipe and fittings shall conform to ASTM C700. Pipe joints shall conform to ASTM C425. Pipe shall be installed in compliance with ASTM C12.

PVC gravity sewer pipe and fittings shall conform to ASTM D3034 for diameters from six inches (6") to fifteen inches (15") with integral-bell gasket joints. The inside of the pipe shall be

smooth. Rubber gaskets shall be factory installed and conform to ASTM F477. Pipe joints shall conform to ASTM D3212. Pipe shall be installed in compliance with ASTM D 2321.

Plastic pipe shall be installed with locator wire. The locator wire shall be a minimum of 12 gauge THW or 12 gauge THWN, and shall be continuous for the entire length of pipe laid between manholes. The wire shall be secured to the pipe by tape wrapped completely around pipe every 12 feet, or less. The wire shall be brought into manholes with 2 feet of wire more than is needed to reach the surface.

Manholes shall be located at no more than four hundred (400) foot intervals along the main. The minimum inside diameter shall be forty-eight inches (48"). Drop manholes should be installed where sewer lines do not smoothly channelize through the bottom of manhole. Drop manholes shall be installed where the inlet and outlet differential is two (2) feet or greater. To attenuate turbulence and sewer off-gassing, all pipe transitions inside of manholes shall be smooth and continuous with large radius bends, and should avoid any sudden drops. Manholes shall be located at every change of direction or size. Manholes with internal drop structures shall be epoxy coated to prevent corrosion.

Upon completion of sewer main and manhole installations within public easements and right-of-ways, all sections of pipe shall be inspected with video equipment and tested according to the inspection and test methods outlined below (See "Inspection of Sewer Mains with Video Equipment" and "Acceptance Testing of Sewer Mains and Appurtenances").

5.2.3 Summary of Design Criteria for Gravity Sewer Mains

1. Coefficient of friction "n" = 0.013 for VCP and RCP; n = 0.010 for PVC
2. Minimum velocity = 2 feet per second
3. Maximum velocity = 8 feet per second
4. Minimum cover = 3 feet
5. Minimum diameter = 8 inches or larger (see above for exceptions)
6. Minimum clearance = 10 feet between the sewer main and potable water pipes; 1 foot between the sewer main and crossing pipes
7. Easements – minimum 15 feet wide along mains; minimum 25 foot square area at manholes where there is a change in direction of the sewer mains of more than 45 degrees.

5.2.4 Design Criteria for Gravity Sewer Laterals

Gravity laterals shall be Vitrified Clay Pipe (VCP), or Polyvinyl Chloride (PVC) pipe, SDR-35 or less. Sewer laterals shall be four inch (4") minimum diameter. PVC gravity sewer pipe and fittings shall conform to ASTM D 3034 with integral-bell gasketed joints. Rubber gaskets shall be factory installed and conform to ASTM F 477. Pipe joints shall conform to ASTM D 3212. Pipe shall be installed in compliance with ASTM D 2321.

Lateral connections to the sewer main shall be subject to written approval from the District Engineer. All lateral connections to sewer mains shall be made by means of wye branches or saddles in the upper half of the sewer main. A rubber connector with stainless steel clamps shall be used to attach the wye to the sewer main. The rubber for the connector shall comply with ASTM C923. The stainless steel elements of the connector shall be Series 305 stainless steel. The stainless steel clamp shall be capable of sustaining an applied torque of eighty (80) inch- pounds without deforming any part of the clamp.

Connections shall not be allowed at manholes. Connections shall not penetrate into the sewer main and shall be constructed in accordance with American Public Works (APWA) *Standard Plans for Public Works Construction* (the Greenbook), latest edition. Each single family residence shall have a separate connection to the sewer main. Additional wye branches may be installed in the sewer mains for future anticipated services. The wye branch shall terminate outside of the public right-of-way with a water-tight seal.

5.2.5 Summary of Design Criteria for Gravity Sewer Laterals

1. Coefficient of friction “n” = 0.013 for VCP; n = 0.010 for PVC smooth wall
2. Minimum velocity = 2 feet per second
3. Maximum velocity = 8 feet per second
4. Minimum cover at property line = 3 feet
5. Minimum diameter = 4 inches
6. Backflow prevention device approved by the latest version of the Uniform Plumbing Code shall be installed on the lateral within 2 feet of exterior of building envelope.

5.2.6 Design Criteria for Pump Stations and Other Appurtenances

The design of pump stations and other appurtenances shall be performed by a qualified professional engineer registered in the State of California. The District Engineer shall review and approve all designs prior to implementation. The design of pump stations and other appurtenances shall consider the existing and future hydraulic capacity of the sewage collection and treatment systems. All components of the system shall be properly sized to avoid surcharging the gravity collection system.

Force mains shall be connected to manholes with discharge pointing downstream. Manholes receiving force main connections shall be epoxy coated to prevent corrosion.

5.3 Inspection and Testing Procedures and Standards [WDR D.13(v)(b)]

5.3.1 Inspection of Sewer Mains with Video Equipment

A digital recording of all sewer mains shall be made with software that encodes breaks, laterals, etc. with Pipeline Assessment & Certification Program (PACP) Standard Codes. Written summaries and digital copies of video inspections shall be submitted to the District Engineer within seventy-two (72) hours of completing the inspection. A signed cover letter shall transmit the video information and shall note all pipe defects and major anomalies observed in the inspection.

5.3.2 Acceptance Testing of Sewer Mains and Appurtenances

Manholes shall be negative pressure tested in accordance with ASTM C1244 prior to backfilling. Sewer mains shall be air pressure tested in accordance with applicable portions of ASTM C828 and ASTM C924 and manufacturer's requirements. Plastic pipe mains shall be tested with a ninety-five (95) percent mandrel in accordance with ASTM D2122 to ensure pipe roundness requirements are met. All test results shall be recorded and submitted to the District Engineer for review and approval. Sections of piping failing testing shall be removed and replaced to the satisfaction of the District Engineer.

5.3.3 Repair of Sewer Mains and Appurtenances

Repairs of sewer mains and appurtenances shall be made by removing the defective sections of piping and appurtenances to the limits specified by the District Engineer. New piping and appurtenances shall be installed in accordance with the design and construction standards outlined above. An encroachment permit from the District is required prior to commencing any work within the public right of way.