

## CHAPTER 7

### SANITARY SEWER SYSTEM

- 7-1 DESIGN CRITERIA – These criteria apply to all sanitary sewer / wastewater systems within Sutter County with a capacity up to an Average Dry Weather Flow (ADWF) of 15 million gallons per day (MGD).
- 7-2 TRIBUTARY AREA – Sewers shall be sized for the entire tributary area, even though the tributary area may extend beyond a specific development project’s boundaries. The tributary area includes all existing development and future development that is anticipated in the Sutter County General Plan that will flow to the sewer being sized. The Director of Public Works (Director) may direct that other anticipated development be included in the tributary area.
- 7-3 AVERAGE DRY WEATHER FLOW – The ADWF at any location in the sewer system shall be the total of the ADWF for each land use listed below. The minimum population density used shall be equivalent to that of single family zoning. The area shall be examined for trends toward population concentration greater than present zoning allows and/or more than five lots per acre and, if found, an estimate should be made of the probable extent of such concentration. This estimate shall be used as the basis for determining flow.
- A. Low and Medium Density Residential Units (less than 25 units per acre) – For low and medium density housing units, the ADWF shall be based on 310 gallons per residential unit per day, and the existing or proposed number of residential units.
  - B. High Density Residential Units (25 units per acre and above) – For high density housing units, the ADWF shall be based on 232 gallons per residential unit per day, and the existing or proposed number of residential units.
  - C. Schools – The ADWF shall be calculated by multiplying the gross acreage of the school by 1,860 gallons per acre per day.
  - D. Commercial and Industrial – For standard commercial and industrial development, the ADWF shall be calculated by multiplying the gross acreage by 1,860 gallons per acre per day. Non-standard commercial or industrial development (for example food processing) shall prepare customized ADWF calculations; and these customized ADWF calculations require approval by the Director. The Director may designate any commercial or industry development as non-standard.

- E. Mixed Use (residential and commercial) – For mixed use development, the ADWF shall be calculated by multiplying the gross acreage by 3,020 gallon per acre per day.
  - F. Parks and Open Space - For parks and open space, the ADWF shall be calculated by multiplying the gross acreage by 150 gallon per acre per day. A park with sports facilities with public restrooms and that attracts large audiences may be designated by the Director as an Other Development Type (see below).
  - G. Other Development Types (ODT) – All land uses that are not one of those listed above are considered an ODT. All ODT shall prepare customized ADWF calculations; and these customized ADWF calculations require approval by the Director.
- 7-4 PEAK DRY WEATHER FLOW (PDWF) – The PDWF for low/medium/high density residential, schools, and standard commercial/industrial developments shall be calculated by multiplying the ADWF by the peaking factor from Drawing No S-7. Non-standard commercial or industrial development and ODT shall prepare customized PDWF calculations; and these customized PDWF calculations require approval by the Director.
- 7-5 INFILTRATION AND INFLOW (I&I) – I&I shall be calculated by multiplying the gross acreage by 1,400 gallons per day per acre. Some large, unsewered areas, such as golf courses (just the areas of play), habitat mitigation areas, or regional detention basins, may be removed from the I&I calculation with written approval by the Director. All areas of typical development, such as neighborhood parks, street, landscape areas, drainage ways, and local detention basins shall be included in the I&I calculation.
- 7-6 PEAK WET WEATHER FLOW (PWWF) - PWWF shall be calculated by adding the PDWF and the I&I. The PWWF is also called the “design flow.”
- 7-7 SEWER SIZE, SLOPE, VELOCITY, CAPACITY, COVER AND MATERIAL – Design criteria for the sewer pipes are as follows:
- A. Minimum Sewer Size – The minimum gravity sewer size shall be 8 inches in diameter (see below for service lateral sizing).
  - B. Slope, Velocity and Capacity – Manning’s formula shall be used to determine the relation of slope, design flow, velocity, diameter, and “N” value. The “N” value shall be 0.013 for all pipe materials.
    - 1. Sewers shall be designed to have a minimum velocity at the design flow of 2 feet per second and a maximum velocity of 8 feet per second. Velocities of less than 2 feet per second will be allowed in the upstream segments of 8-inch sewers (minimum allowed diameter).

2. Table 7-1 presents slopes and design flow capacities for various pipe diameters. Pipe slopes less than those listed in this table shall not be used without the approval of the Director. The slopes indicated are based on a velocity of two feet per second with the pipe flowing full.
3. The maximum ratio of depth of flow to pipe diameter (d/D) at the PWWF in any sewer 12 inches in diameter or less shall be 0.7. Sewers 15 inches in diameter or larger may be designed to flow full (d/D = 1.0). However, for sewers of any size with service lateral connections, d/D shall not exceed 0.7.

**Table 7-1. Gravity Sewer Minimum Slopes and Resulting Capacities**

Pipe Diameter (inches)	Minimum Slope (foot per foot)	Capacity at d/D = 0.7 (MGD)	Capacity when Flowing Full (MGD)
8	0.0034	0.38	0.46
10	0.0025	0.59	0.71
12	0.0020	0.86	1.03
15	0.0015	1.35	1.62
18	0.0012	1.97	2.35
21	0.0010	2.71	3.24
24	0.0010	3.87	4.62
27	0.0010	5.30	6.33
30	0.0010	7.02	8.38
33	0.0010	9.05	10.81
36	0.0010	11.41	13.63
42	0.0010	17.21	20.56
48	0.0010	24.58	29.36

- C. Material – Pipe material shall be as approved by the Director and shall conform to the requirements of the Standard Construction Specifications. Pipe materials which will normally be considered are as follows:
  1. Vitrified Clay Pipe – Vitrified clay pipe and fittings shall conform to and meet all of the requirements of ASTM Designation: C700, Standard Specifications for unglazed vitrified clay sewer pipe, extra strength, and shall conform to all materials data contained in the current Clay Pipe Engineering Manual published by the National Clay Pipe Institute. A

certification of compliance with these requirements shall be furnished by the pipe manufacturer.

Joints in vitrified clay pipe shall be of a factory applied resilient-type polyurethane compression type which conforms to ASTM Designation: C425.

2. Ductile Iron Pipe – Ductile Iron Pipe shall be used in high groundwater conditions when required by the Director. Ductile iron pipe (DIP) shall conform to ANSI A21.51 (AWWA C151) for a minimum working pressure of 150 psi unless otherwise specified. Ductile iron castings shall conform to and be tested in accordance with ASTM A536. Casting grade for pipe shall be 60-42-10. Laying length shall be the manufacturer's standard length, normally 18 feet. Shorter lengths may be used when required for closures and proper location of special sections.

The interior surface of all (DIP) shall be lined. DIP pressure pipes designed to remain full shall be cement-mortar lined and seal coated in conformance with AWWA C104, except at air relief points/pipe high points. At air relief/high points, two pipe joints upstream and two pipe joints downstream shall be lined with 40 mils of ceramic epoxy (Protecto 401, or equal) to protect the pipes from corrosive gasses. All gravity flow pipes and pressure pipes that will periodically be drained shall be lined with 40 mils of ceramic epoxy (Protecto 401, or equal). The exterior surface shall have a bituminous coating of either coal tar or asphalt base, approximately 1 mil thick. At a minimum, buried DIP shall be encased in an 8-mil polyethylene wrap in accordance with AWWA C105. Additional external corrosion protection such as sacrificial anodes and/or impressed current cathodic protection may be required to suit site specific soil corrosivity, as required by the Director.

Fittings shall be push-on, mechanical, or flanged-type ductile iron or cast iron and shall conform to ANSI 21.10 (AWWA C110) or ANSI 21.11 (AWWA C111) designed for a working pressure of 250 or 350 psi. Coating and lining requirements shall be the same as specified for pipe.

Joints shall be push-on or mechanical type and shall conform to ANSI 21.11 (AWWA C111) with Nitrile (acrylonitrile butadiene) rubber gasket unless otherwise approved by the Director.

3. Polyvinyl Chloride Pipe (PVC) Sewer Force Main and Gravity Sewer –

- a. Thickness – PVC pipe for force main and gravity service wall thickness shall be designed for a calculated deflection of 5% at constructed depth with AASHTO H-20 surface loading.
  - i. PVC Force Main: 4-Inch through 12-Inch Diameter – Polyvinyl chloride pipe shall have a maximum dimension ratio (DR) of 18 (minimum Pressure Class 150), unless otherwise specified and shall conform to AWWA Standards C900 or C905. Outside diameter (OD) pipe dimension shall be manufactured to cast iron pipe (CIP) equivalent. Pipe shall be furnished in minimum standard lengths of 20 feet.
  - ii. Gravity Piping: 8-Inch through 36-Inch Diameter Sizes – Polyvinyl chloride pipe shall have a maximum dimension ratio (DR) of 25, unless otherwise required by the Director and shall conform to ASTM D3034.
- b. Outside diameter (OD) pipe dimension shall be manufactured to cast iron pipe (CIP) equivalent. Pipe shall be furnished in minimum standard lengths of 20 feet.
- c. Joints – All PVC pipe joints shall be gasketed, bell-and-spigot, push-on type conforming to ASTM D3212 pipe shall have integral wall-thickened bell ends designed for joint assembly using elastomeric-gasket seals. The minimum wall thickness of the integral wall-thickened bell, at any point between the ring groove and the pipe barrel, shall conform with the DR requirements for the pipe barrel. The minimum wall thickness in the ring-groove and bell entry sections shall equal or exceed the minimum wall thickness of the pipe barrel. The elastomeric-gasket seals shall conform to ASTM F477.  
The pipe shall have a pipe stop indicated on the barrel that will accurately position the pipe end within the joint. The pipe in place shall permit thermal expansion and contraction of the pipe ends.
- d. Fittings – Pressure Applications – Fittings for polyvinyl chloride pipe shall be those specified by the pipe manufacturer. All pressure pipe fittings for 12-inch diameter PVC and smaller shall be ductile iron compact fittings conforming to AWWA C153 Class 350. Fittings for PVC 14 inches in diameter and greater shall be standard mechanical joint connections conforming to AWWA Standard C110 or restrained to the satisfaction of the Engineer. Adapter “O” rings are not acceptable.

7-8 THRUST RESTRAINTS – All pressure sewer pipe shall have thrust restraints. Locating wire, consisting of 10 AWG with green colored PVC insulation, shall be installed on pressurized sewer mains.

7-9 SEWER LOCATIONS AND ALIGNMENT REQUIREMENTS – Location and alignment criteria are as follows:

- A. General – All sanitary sewers shall be placed within rights-of-way dedicated for public streets unless the use of easements is specifically approved by the Director. Easements shall be a minimum of 25 feet wide for sewers up to 36 inches in diameter and as determined by the Director for larger diameter sewers. Temporary working easements of adequate dimensions shall be provided to allow the construction within the permanent easement to be completed in a safe and reasonable manner. Easements shall be granted to the appropriate district or the County of Sutter.
- B. There shall be a minimum horizontal clearance of ten feet clear between the outside wall of parallel water and sanitary sewer lines; the water main shall be a minimum of 12 inches higher than the sewer. On crossings the water line shall be at least 12 inches above the sewer line. If a sanitary sewer force main must cross a water main, the requirements of Section 6-10 shall apply.
- C. Location of New Subdivisions – In new residential subdivisions, sewers shall preferably be located six feet south or east of street centerlines within minor and primary streets. Sewers located in arterial streets shall be located as approved by the Director.
- D. Location in Existing Streets – When sanitary sewers are to be installed in an existing street, factors such as curbs, gutters, sidewalks, traffic conditions, traffic lane conditions, pavement conditions, future street improvement plans, and existing utilities shall all be considered. The approval of the Director shall be obtained in every instance.
- E. Water Well Clearance – No sanitary sewer interceptor, trunk line, lateral, or service shall be placed nearer than 50 feet to any water well, public or private, unless the well has been destroyed in accordance with the requirements of County Code and the County Environmental Health Division; or the location otherwise approved, in writing, by the appropriate health agencies. If a clearance of less than 50 feet is approved, all pipes within 50 feet distance from the well shall be of material approved by the Environmental Health Division.
- F. Alignment – Alignment of all sewer pipe and structures shall be designed to provide a minimum six inch clearance from all other utilities and/or improvements, unless otherwise approved by the Director.
  - 1. Horizontal alignment shall be parallel to the street centerline wherever possible. Minimum radius for sanitary sewers 6 inches through 12 inches in diameter shall be 200 feet. A larger radius shall be used wherever practicable or where necessary to avoid joint deflection in excess of the pipe manufacturers' recommended maximum.

2. Vertical alignment shall provide a constant slope between manholes. If a change in grade is necessary, construction of a manhole shall be required. Vertical curves shall not be used unless approved by the Director.

7-10 TRENCH LOADING CONDITIONS AND PIPE DESIGN – The loading condition and pipe design criteria for conduits are as follows:

- A. Rigid Conduit Loading – On rigid conduits, Marston’s formula shall be used to determine the load placed on the pipe by the backfill. The procedure for rigid pipe is described in the ASCE Manual and Report of Engineering Practice No. 60, the Clay Pipe Engineering Manual, and in similar handbooks. In the absence of specific soils data, as determined by a Geotechnical Engineer, a soil weight of 120 p.c.f. and a Ku factor of 0.110 shall be used.
- B. Bedding and Initial Backfill – Bedding types and factors shall be as indicated on Standard Drawing No. S-8. Bedding and initial backfill type shall be as necessitated by height of cover over the pipe, trench width, pipe strength, and other factors used to determine safe pipe loading. Special attention shall be given to backfill requirements for pipe located in State rights-of-way and for pipe placed in areas where trench width is excessive, such as in the vicinity of bore pits. See Section 7-15 regarding this condition. Any special requirements shall be noted on the plans.
  1. Bedding and initial backfill for VCP and DIP may be all types indicated. Bedding and initial backfill for PVC shall not be Type II.
  2. The minimum trench width shall be pipe O.D. plus 12 inches.
- C. Special Pipe Strength Requirements – Ductile iron or other high-strength pipe approved by the Director shall be used whenever cover is greater than 25 feet or where extra support strength is required. Ductile iron pipe, Class 200 or other high-strength pipe approved by the Director shall be used whenever cover is less than three feet, or insufficient clearance exists between the sewer pipe and rigid or load transmitting structures.
- D. Design Guide – Tables which relate cover, pipe diameter, trench width, and bedding and initial backfill type for vitrified clay, according to the procedures contained in these Standards are provided on Standard Drawings No. D-25 and S-8.

7-11 MANHOLE CRITERIA – The design criteria for manholes are as follows:

- A. General - Manholes shall be placed at the intersections of all sanitary sewer lines, at the end of any line terminating with a cul-de-sac, at the end of all permanent

lines, and at the end of any temporary line more than 50 feet in length. All manholes from which sewer line extensions are anticipated shall have a pipe stub installed at the grade and in the direction of the anticipated extension. Summit manholes connecting two sewers are acceptable.

- B. Spacing – Maximum spacing of manholes shall be 400 feet for all straight lines of ten inch diameter or less. A line with a radius greater than 400 feet shall be considered as straight for purposes of this section. Manhole spacing on lines that are on a continuous curve of 200 foot radius (minimum allowable) shall be 200 feet. Manhole spacing on curved lines of radius between 200 and 400 feet, or where only a portion of the line is curved, shall be adjusted proportionately. Reverse curves require a manhole at the point of tangency between the curves. A manhole shall be required at any change in vertical alignment. A manhole shall also be placed at any change in horizontal alignment.
- C. Elevation Criteria – When two lines of the same size enter a manhole and the flow of one must change direction by more than 20 degrees or if flow in a single line must change direction more than 20 degrees, the invert grade at the exit shall be at least 0.10 foot below that of the entrance pipe or, as a maximum, the crown of the exit pipe shall match the invert of the entrance pipe. If the pipes entering and exiting any manhole are not of the same size, the minimum invert elevation differential shall be when the pipes are matched crown to crown and the maximum invert elevation differential shall be based on the invert of the entering pipe matching the crown of the exit pipe. Drop connections are not governed by the above elevation requirements.
- D. Construction Requirements – Manhole construction shall conform with the provisions of Standard Drawing No. S-3. Lock-type or pressure-type manhole covers shall be used on manholes located in areas subject to flooding. Where the manhole depth is less than four feet, an 18 inch high cone, as shown on Standard Drawing No. S-4 may be used. The plans shall note the frame on manholes located in unimproved areas shall be set 12 inches above existing ground level. Pipe material which does not provide adequate bonding between pipe and manhole may similarly require special designs. Manhole joints shall be sealed with bitumen impregnated sealant such as Ram-neck or equal.
- E. Vacuum Testing Manholes – All sewer manholes shall be vacuum tested in accordance with ASTM C1244 and the Standard Construction Specifications.

- 7-12 DROP CONNECTION CRITERIA – A drop connection shall be required whenever a pipe enters a manhole higher than 3 feet above the exiting pipe. If an elevation difference of at least three feet is not available, the slope of the incoming line shall be increased to eliminate the need for the drop. Drop connections shall conform to Standard Drawing No. S-9. The inside drop connection shall be used for all service laterals and sewer connections up to eight inches in diameter. The outside drop connection shall be used for pipes larger than eight inches in diameter and require written approval by the Director.
- 7-13 FLUSHING BRANCH CRITERIA – A temporary flushing branch may be used in lieu of a manhole at the upstream end of a sewer if all of the following apply: 1) The cleanout is less than 50 feet upstream of a manhole, 2) the sewer is planned future extension, 3) there are no service lateral connections between the clean out and the man hole. Flushing branches shall conform to Standard Drawing No. S- 1A.
- 7-14 SERVICE LATERAL DESIGN – The design criteria for service laterals are as follows:
- A. General – Service laterals shall be constructed of VCP or PVC as previously specified or solid wall acrylonitril-butadiene-styrene (ABS) conforming to ASTM D2751 minimum wall thickness SDR 35. Service laterals shall conform to Standard Drawing No. S-2 and S-5 and shall be constructed perpendicular to the sewer main unless otherwise approved by the Director. The service laterals shall extend from the sewer to the edge of public right-of-way or edge of easement unless a water main is to be installed at back of sidewalk as part of the subdivision improvements. In such cases, service shall be extended to seven feet back of sidewalk. The cleanout to grade shall remain within two feet of back of sidewalk. See Note A of Standard Drawing No. S-5 for cover requirements. Service laterals shall extend one foot beyond edge of pavement of any private road and easements of adequate width to accommodate the services shall be obtained. A plan and profile of any service laterals shall be supplied to the Director upon request.
  - B. Cleanout – The cleanout to grade required at the termination of service laterals shall be constructed by the building plumber at the time the building sewer connection is made. Unless otherwise noted on the plans, construction of the cleanout to grade is the responsibility of the plumbing contractor for the building improvements. At the time of construction of the service lateral and until the building connection is made a 4” x 4” green painted post shall be maintained at the end of the service lateral, extending from the pipe invert to not less than 12 inches above ground surface. Deferral of cleanout will not be allowed where a water main will be installed at the back of sidewalk.
  - C. Division of Responsibility - Each property owner is responsible for the installation of a service lateral across his/her property frontage and connecting to the sewer system. This responsibility can be complied with by paying the appropriate fees for the County (or sanitation or sewer district) to install the service lateral. After initial installation, the section of the service lateral within

the private property is the responsibility of the private property owner. The section of the service lateral within a public right-of-way is the responsibility of the County (or sanitation or sewer district).

- D. Service Lateral Cover – Service laterals shall have a minimum slope of 1/4 inch per foot. The minimum cover shall be 12 inches at any buildable location within the properties to be served. At the right-of-way line, a minimum of 4 feet of cover is required. If a water main is installed at the back of sidewalk, a minimum of 5 feet of cover is required at the right-of-way line. The invert elevation of the service lateral at the property line shall be shown on the improvement plans.
- E. Sizing – Minimum residential service lateral diameter is four inches. Service laterals serving two or more residential units, schools and other developments expected to contribute high sewage flows shall be six inch or larger. In addition, service laterals shall be sized according to requirements of the California Plumbing Code, and determinations by the Consulting Engineer. If the service lateral and collector sewer are of the same size, a manhole shall be constructed; if the collector sewer is larger than the service laterals, a factory fitting at the connection is satisfactory. Connection to trunk lines will be permitted only at manholes.
- F. Connection Limitations – Service laterals shall not directly connect to sewers more than 14 feet deep without the approval of the Director.
- G. Location – When sewers are constructed as part of new subdivision improvements, service laterals shall be constructed to each lot. In new subdivisions or development areas, service laterals shall be placed on the low side of any subdivision lot with two percent or greater slope across the front. The service lateral shall be placed in the center of lots of slopes less than 2 percent. Consideration shall be given to trees, improvements, etc., so as to minimize interference when the service lateral is extended to service the house.

If the property is located with service lateral available both to a sewer located in an easement and also in right-of-way, service laterals shall be in the right of way location unless otherwise approved by the Director. No service laterals shall be located where future on-site construction will result in the sewer being in close proximity to a water well or water main. No service lateral may cause applicable health standards to be violated.

The curb adjacent to the cleanout shall be marked with an “S” on face of curb, using arial or other similar block letter font letters a minimum of 2.5 inches high and ¼” deep into the concrete.

- H. Joint Trench – If a joint trench is being utilized for other utilities, the plans shall indicate that a joint trench will exist and shall adjust service elevations as necessary.
- I. Special Requirements in Developed Areas – In developed areas, a service lateral shall be provided to each parcel participating in the project which contains a source of sewage less than 200 feet from a sewer. A property owner’s request for service lateral location where existing buildings to be serviced exist, shall be honored whenever practicable. Parcels which have two or more existing dwelling units shall have independent service laterals for each dwelling unit.

7-15 CREEK CROSSING DESIGN – Advance approval of the Director and of other appropriate agencies is necessary prior to initiating design. The criteria for creek crossing design is as follows:

- A. General – In all cases the proposed future creek bed elevation shall be used for design purposes. Crossing details of pipe, piers, anchorage, transition couplings, etc. shall be shown upon a detail sheet of the plans in large scale.
- B. Construction and Material – For sewer sizes ten inches and smaller, ductile iron pipe or other pipe material as approved by the Director shall be used under the full creek width, plus ten feet each side, unless the pipe is four feet or more below the creek bed elevation. For sewer sizes twelve inches and larger, pipe used shall be as directed by the Director. Special care shall be taken to provide a firm base for the pipe bedding. The plans shall specify all soft or organic material within the creek banks shall be replaced with select imported backfill. In addition, a layer of four inch to eight inch cobbles shall be placed and compacted on the top surface of the trench area for the full width of the creek. Unless otherwise directed, a clay plug will be required at the downstream side of the crossing. The plug shall be a minimum of four feet in length, shall extend the full width of the trench, and shall extend twelve inches above and below the pipe.

If the pipe must cross above the creek bed, ductile iron or welded steel pipe shall be used. Steel pipe may be fusion epoxy lined and coated, or glass lined; the Director shall approve the type of coating and lining specified and the gauge, class, or thickness of the pipe. The Director may specify the pipe material to be used.

Reinforced concrete piers of adequate depth shall be located as necessary for adequate support of the pipe. The pipe shall be held in cylindrical cradles, formed in the pier tops, with galvanized steel straps, with galvanized anchor bolts of adequate size. Open cell neoprene 1/8 inch thick cushion material shall be placed between the pipe, clamps, and support. The pipe must be sloped so that there is a continuous downward slope, even when the maximum deflection occurs.

- C. Design – Calculations shall be submitted which clearly indicate the design of the pipe and supports regarding impact, horizontal and vertical forces, overturning, pier and anchorage reactions, etc.

7-16 BORING AND JACKING REQUIREMENTS – Where use of conductor casing is specified, the casing shall be corrugated steel pipe, reinforced concrete pipe, or welded steel pipe. The casing shall be of sufficient diameter to allow dry sand to be blown into the void between the carrier and the conductor and to allow adjustment of the carrier pipe to grade. Normally, an inside diameter six inches greater than the outside diameter of the couplings of the carrier pipe is sufficient. Welded steel conductor pipe shall have a minimum wall thickness of 1/4 inch for sizes up to and including 24 inches in diameter and 5/16 inch for sizes 27 inches to 36 inches in diameter. Corrugated steel pipe conductor shall not be less than 0.138 inches thick for sizes up to 36 inches, and 0.168 inches thick for diameters to 60 inches. Reinforced concrete pipe conductor shall be designed for the loading condition and, if jacked, the additional loading imposed by the jacking operation.

Direct dry boring of reinforced concrete pipe and the portion of sewers and service sewers which pass beneath curbs and gutter, sidewalks, and other obstructions, up to a maximum length of 15 feet, is permissible. Six inch and smaller pipelines may be installed by wet boring where approved by the Director. Pipe material used in the small size dry and wet bores shall be ductile iron pipe. Installation and other material specifications shall conform to the requirements of the Standard Construction Specifications.

Backfill in bore pits shall be given special attention with respect to preventing structural failure of the pipe entering or exiting the conductor, and adequate bedding and initial backfill shall be specified.

7-17 PUMP STATION AND FORCE MAIN REQUIREMENTS – Every phase of pump station design, including force mains, shall be closely coordinated with and shall be under the direction of Sutter County. The plans shall show the testing required prior to acceptance of the pump station.

The firm capacity of the pump station must convey the design PWWF flow. Sewer pump stations shall include the following facilities: a back up pump, piping and valving to allow bypass pumping, flow meter, pressure gage, on-site pump controls ( start, stop, alternate), controls that allow for remote monitoring of pump status and power supply status, ample vehicle accessibility, connection for standby power, and security fencing around the entire site. The director may also require an on-site standby generator and odor control facilities.

Unless otherwise approved by the Director, “fee title” shall be granted to the County or to the appropriate district for the pump station site and any access road thereto.

7-18 WASTEWATER STORAGE FACILITIES - Wastewater storage facilities normally will not be allowed. However, the Director may allow (in writing) wastewater storage facilities if there is no other feasible alternative. The Director may require an engineering study to verify that no other feasible options exist. If allowed, the storage facility shall be sized, planned, designed, and constructed as required by the Director.

7-19 SEWER IMPROVEMENT PLAN REQUIREMENTS – Plans for the construction of sanitary sewers whether in conjunction with other improvements or for a sewer project only, shall conform to the following standards, as well as other standards contained in the General and Plan Sheet Requirements of these Improvement Standards.

A. Study Map – A study map may be required prior to review of the sewer design if there is a possibility upstream or adjacent areas might require service through the subject property. The map should show the entire service area including upstream tributary and adjacent areas, and all other data necessary to determine anticipated sewage flows. The method of sewerage the entire service area, including pipe sizes and slopes, shall be shown to the extent necessary to determine the requirements within the subject property.

B. General Requirements – Plans for sewer improvement projects should include a layout sheet, plan and profile of each sewer line, and any necessary detail drawings. The plans shall be clearly legible and conform to accepted practice with respect to drafting standards. All information which in the opinion of the Director is necessary for the satisfactory design, review, construction and maintenance of a project shall be provided and, where applicable, shall be shown on the plans.

C. Layout Sheet – All sewer improvement plans shall include an overall map which shows the project boundaries, sewer lines, manholes, flushing branches, and other important items of the work. Where pavement will be cut in several locations, the pavement replacement requirements shall be shown on the layout sheet.

A parcel or area which benefits from and financially participates in a sewer construction project, but is not included within the project boundaries, shall have a note to effect placed on the layout map and on the plan and profile sheet if the parcel appears thereon. Parcels which make use of those facilities may be subject to additional fees at the time of connection, if the participation has not been so noted.

D. Plan and Profile Sheets – Sewers which will be maintained by a district shall be shown in both plan and profile views on approved plan and profile sheets. The following standards, with respect to drafting and the information to be included

on the plan and profile sheets, generally apply to projects in developed areas. In new subdivision, only the requirements which are applicable shall apply.

1. Sewer lines to be constructed shall be indicated on the profile by parallel lines spaced the pipe diameter at the pipe invert for ten inch diameter and smaller lines only. Manholes shall also be indicated by parallel lines spaced according to scale. Slope shall be printed 1/8 inch above and preferably parallel to the pipe line, or between the parallel lines. The length, size, and type of pipe material between each manhole shall be printed parallel to the horizontal grid lines and approximately halfway between the ground surface and pipe line. All pipe inverts at manholes and other structures shall be indicated on the profile. The invert elevations shall be printed parallel to the horizontal grid lines and shall be underscored by a line which then runs at a 45 degree angle to the corresponding pipe invert. When manholes, manholes with drop connections, flushing branches, or other appurtenances will be constructed, the profile shall be so noted. Existing facilities shown on the profile shall be cross-hatched. Manhole identification on the plan view may be oblique. Stationing shall appear at the lower edge of the profile grid directly under the manhole.
2. In approved areas, the location of each service sewer proposed to be constructed shall be indicated on the plans by stationing or by reference to a permanent, well-defined structure, if available. In new subdivisions the service sewers shall be located by stationing unless the situation exists, such as at the end of a cul-de-sac, where stationing is not an adequate description of location. In such cases, a dimension to a lot line may be used. The invert elevation of the service sewer at its upstream end shall be shown on the plans whenever the standard depth is inadequate to serve the property. Standard depth shall conform to the conditions set forth on Standard Drawing No. S-2.

Improvements or lots shown on a plan sheet but served to a line shown on another plan sheet shall have the direction of service shown by a small triangle and letter "S". "As-built" plans shall also show the service sewer location measured from the nearest downstream manhole. Both permanent and working easements shall be shown to scale on the plans. Easement dimensions shall be given and each easement shall be tied to both the property line and the sewer line. Each permanent easement shown on the plans shall be identified by a box or table, on the same plan sheet, which gives the property owner's name and the book and page number in which the easement is recorded. The Consulting Engineer shall provide the book and page number.

3. Indicate the limiting maximum trench width as measured at the top of the pipe on the plans between well-defined points of application; the pipe material and class, if more than one class is available; and the bedding-

backfill type. Type I bedding when used and unlimited trench width when allowed need not be shown on the plans. If more than one combination of pipe material or class, maximum limiting trench width, or bedding type is available, a practical range of such combinations shall be shown on the plans.

4. Proposed sewer lines shall be adequately dimensioned from street centerline. If the sewer is to be located in an easement, sufficient dimensions and bearings from physical features to locate the line in the field shall be shown on the plans.
5. Gas, water, storm sewers, and all other main utility lines above or below ground shall be determined and shown on the plans with accuracy as great as practicable. The location of any utility line which is parallel to and within five feet of the sewer line or which crosses the sewer line at an angle of 30 degrees or less shall be determined with an accuracy of + 1.0 foot and the clearance shown on the plans. Service lines such as water and gas normally shall not be shown.
6. Trees and other objects within 10 feet of construction centerline shall have their correct location shown on the plans and the clearance from construction centerline shown. The diameter of tree trunks and interfering heavy tree branches shall be noted. Removal of a tree or object, or other special handling shall be noted on the plans. The Consulting Engineer shall assume full responsibility for such notes as it is assumed he has made all necessary arrangements with the owner of the object to be handled. Written documentation of any special arrangements regarding preservation of property made between property owners and the Consulting Engineer shall be supplied to the Director if no easement document is involved. If an easement is negotiated, all special arrangements shall be included in the easement document. Tree removal within public rights-of-way or easements shall be approved by the Director.
7. Culverts shall be shown on both plan and profile when crossed by the construction or when parallel and within 20 feet of the construction line. The size and type of all such culverts shall be indicated and when the culvert crosses or is perpendicular or nearly so and within 20 feet of the construction line, the invert of the culvert end nearest the construction line shall be shown.
8. Address of buildings shall be shown on the plan view, within the outline of the building. Only the front line and indication of side lines of buildings need be shown.

- E. Detail Drawings – Items of a special nature shall be shown with detail drawings, either on the plan sheet or on a separate detail sheet.
- F. Connection to existing facilities where bypassing or stoppage of existing flow will be required – When improvement plans require connection to an existing facility which will require bypassing or stoppage of existing flows, a note shall be placed on the plans which provides an estimate of the existing flow to be bypassed (in gpm), or the times between which the flow may be stopped. Coordination with Sutter County is required in developing these numbers. The note shall also require the contractor to contact the Department of Public Works at least two working days prior to initiating the bypass/stoppage operation so the temporary facilities and equipment can be evaluated for adequacy. Where the bypassing/stoppage operation will be accomplished on a major trunk line, submittal of a work plan for review will be required prior to initiation of the operation.

7-20 MULTIPLE-OWNERSHIP RESIDENTIAL DEVELOPMENTS – The "on-site" portion of the sanitary sewer collection system connected to a public treatment works serving more than one residential unit in a multiple ownership residential development that is not within a public sewer easement or a public right-of-way, and is therefore privately-owned, shall meet the following requirements.

- A. Multiple Residential Structures – Residential developments where separate lots and structures are sold and adjacent land is owned in common and maintenance is performed by a homeowner's association.
  - 1. General – Sanitary sewers shall meet all requirements for public sewers contained in these Improvement Standards, except as specified herein.
  - 2. Manhole Spacing – Maximum spacing of manholes on laterals shall be 300 feet for all straight runs of pipe.
  - 3. Laterals. Sewer laterals serving each structure shall be constructed under separate building permit conforming to building code requirements. Only "Wyes", not Tees shown on Drawing S-5, shall be used for connecting on-site laterals to the on-site collection mains
  - 4. Minimum Depth on Streets – All lines located within vehicular traffic areas shall have a minimum cover of three feet to finish grade. If the cover over a section of pipe must be less than two feet due to utility conflicts, ductile iron pipe shall be used for that section.
  - 5. Plan and Profile Sheets. On-site improvement plans may be prepared without the sanitary sewer profile otherwise required in these Standards, unless specifically required by the Director. Final on-site grades and

drainage facilities shall be shown on the plans on the same sheet as the plan view of the sanitary sewers.

6. Location – Wherever possible, sewer collection mains shall be located in streets.
7. Review and Approval – Plans shall be reviewed and approved by Public Works Department.

Small sewer systems utilizing dispersal system or on-site treatment works shall be designed and constructed in accordance with the requirements of building code, and the County Environmental Health Division.

- B. Single Structure Condominiums or Cooperative Developments. Multiple dwelling unit structures where dwelling units within the total development are sold. On-site sanitary sewers shall be constructed under separate building permit conforming to building code requirements.

7-21 MULTI-PARCEL COMMERCIAL AND INDUSTRIAL DEVELOPMENTS – The "on-site" portion of the sanitary sewer collection system serving more than one commercial or industrial that is not within a public sewer easement or a public right-of-way, and is therefore privately-owned, shall meet the requirements of Multiple Residential Structures in the preceding section. Otherwise, each separate parcel within a multi-parcel commercial or industrial development shall have its own separate connection to the public sewer system.

7-22 SEWER LINE TESTING - All sanitary sewers shall be tested.

- A. Leakage Testing shall be performed in accordance with ASTM C828 and the Standard construction Specifications.
- B. Obstruction Testing and Pipeline Inspection shall be conducted by closed circuit television in accordance with the Standard Construction Specifications.
- C. PVC and ABS Pipe shall also be tested for deflection by a Go-No Go mandrel in accordance with the Standard Construction Specifications.