

## SECTION 3: DESIGN

### 3.01 Sanitary Sewer System Design Standards:

- A. These design criteria shall govern the engineering design of Public sanitary sewer projects which will be dedicated to South Placer Municipal Utility District, and private sewer systems requiring District approval.

### 3.02 Average Flow Determination:

- A. Flow determination shall be based upon the most recent zoning. The minimum population density used shall be equivalent to that of single-family zoning. The area shall be examined for trends toward population concentration and, if found, an estimate should be made of the probable extent of such concentration. This estimate shall be used as a basis for determining flow.

1. Single Family and Duplex Units

- a) Flow shall be based on 4 persons per residential unit, 100 gallons per person per day, and 4 lots per acre. However, if the number of units is known, and is greater than 4, the actual number shall be used.

2. Single Family, Planned Unit Development

- a) Flow per unit shall be the same as above and the actual number of units per acre shall be considered. However, in the absence of known data, the density shall be assumed to be 12 units per acre.

3. Commercial and Multiple Residential

- a) Flows shall be determined from the curves on Standard Drawing No. 1. However, if the type of planned improvements are known and estimated discharges are available, they shall be used in the design, subject to the approval of the District.
- b) Multiple residential is differentiated from planned unit developments in that the latter contain individually owned residences with the adjacent land owned in common and with maintenance performed by a homeowner's association.
- 1) Multiple residential is designed to be owned by one party with the individual residences rented or leased.
- 2) The average flow from single bedroom multiple residential units shall be 200 gallons per day per unit; from 2-bedroom units, 300 gallons per day; and from 3 or more bedroom units, 400 gallons per day.
- 3) Mobile home flow shall be 300 gallons per day per unit.

- c) Arrangements for the connection of facilities with a high discharge rate or with a type of discharge that could be detrimental to the public system shall be subject to the approval of the District.

4. Schools

- a) The larger flow, as determined from one of the following methods, shall be used:
  - 1) The entire school area shall be assumed to contribute an average flow equivalent to that of an equal area of single family, detached residential units (i.e. 1600 gallons per acre per day.)
  - 2) Average daily flow per school shall be based on the type of school as follows, with the indicated capita limits including ultimate student population plus administration, teaching and operating personnel:

<u>TYPE OF SCHOOL</u>	<u>AVE. DAILY FLOW</u>	<u>CAPITA LIMIT</u>
Elementary (K-5, K-6 or K-8)	0.025 MG	1,000
Upper Elementary (6-8, 7-8 or 7-9)	0.060 MG	1,500
High School (9-12 or 10-12)	0.080 MG	2,000

- b) For enrollments and personnel in excess of that indicated, there shall be added 25 gallons per day per additional capita in elementary schools and 40 gallons per day per additional capita in upper elementary and high school.

5. Industrial

- a) Every attempt should be made to base flows on specific, known industrial development.
- b) In the absence of specific information, the flow shall be determined from the curves on Standard Drawing No. 1.
- c) Special attention shall be given to any facilities with a magnitude or type of discharge that could be detrimental to the public system.

### 3.03 Design Flow:

- A. Average flow, as determined above, shall be multiplied by the peaking factor obtained from the curve on Standard Drawing No. 2 to obtain design flow.

### 3.04 Pipe Slope, Velocity and Size:

- A. Design criteria for collector pipe are as follows:

- 1. Size

- a) Minimum size of collector sewers that serve single family homes shall be 6-inch diameter.
- b) Duplex development shall be 6-inch diameter minimum.
- c) Schools, commercial, industrial, and multiple residential shall be served by lines 8-inch diameter, minimum.
- d) Single commercial buildings which contribute negligible sewerage flow, when among single family or duplex development, may be served by a collector sewer 6-inch diameter minimum with District approval.
- e) For pipe in inaccessible areas or in areas with restricted access, larger diameter pipes may be required by the District.

- 2. Slope and Velocity

- a) Minimum velocity shall be 2.0-feet per second (fps) when the pipe is flowing half full or full. Manning's formula shall be used to determine the relation of slope, design flow, velocity, diameter, and "N" value. The "N" value shall be considered 0.013 for all pipe materials, for design purposes.
- b) Following is a table of 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 District. The slopes indicated are based on a velocity of 2 fps with the pipe flowing full.

<b>Pipe Diameter (Inches)</b>	<b>Slope (foot per foot)</b>	<b>Capacity at 0.7 depth (MGD)</b>	<b>Capacity flowing full (MGD)</b>
6	0.0050	0.22	N/A
8	0.0035	0.38	N/A
10	0.0025	0.58	N/A
12	0.0020	0.85	1.00
15	0.0015	1.32	1.60
18	0.0012	1.95	2.35

- c) Any 6-inch line with ten (10) or fewer connections, including connections on contiguous lines upstream, shall have a minimum slope of 0.0075.

### 3. Capacity

- a) Pipe capacity, in all cases, shall be adequate to carry design flow from the entire tributary area, even if said area is not within the project boundaries.
- 1) Structures, tanks, wet wells or other facilities used to provide storage of sewage, peak flows or otherwise are prohibited.
  - 2) No sewer plan in which proposed design flows exceed pipeline peak flow capacity will be approved.
  - 3) The maximum depth of flow at design conditions:
    - (a) In any collector sewer (10-inch diameter or less) shall be 0.7 diameter.
    - (b) Trunk lines (12-inch diameter or larger) may be designed to flow full unless direct service sewer connections to the trunk are planned and approved, in which case the 0.7 diameter maximum depth shall govern.

### 4. Depth

- a) In the design of a system, one of the controlling conditions shall be that the collector sewer shall be at sufficient depth to provide a minimum slope for the building sewer of 1/4-inch per foot (2%), at the same time maintaining a minimum cover of 12-inches over the building sewer at any buildable location within the properties to be served.
- b) The maximum depth of public sewer lines shall be twenty-five (25) feet, provided that easement requirements can be met (reference SECTION 6:) and

subject to approval by the District. Factors to consider when designing sewer alignment include future/proposed improvements, other utilities, topography, etc.

- c) In situations where the proposed depth of the sewer line exceeds twenty-five (25) feet, other alternatives may be required, including construction of a public wastewater pump station (reference Section 4).

#### 5. Material

- a) Pipe material shall be as approved by the District and shall conform to the requirements of the Materials Specifications (SECTION 2:).

### 3.05 Sewer Location and Alignment Requirements:

A. Requirements for location and alignment of sanitary sewers are as follows:

#### 1. General

- a) All sanitary sewers shall be placed within rights-of-way dedicated for public streets unless the use of easements is specifically approved by the District.
- b) Consideration shall be given for future development when locating manholes in new lines.
- c) No manhole shall be located in an area where access would be restricted in a manner preventing routine maintenance.
- d) All utility crossings shall be designed with the crossing being perpendicular, unless otherwise approved by the District. In no case shall pipes cross at less than a 45-degree angle.
- e) There shall be a minimum horizontal clearance of five (5) feet between parallel sewer and all other utilities, as measured between the outside barrels of the pipes and manholes, unless otherwise approved by the District. Additional clearance may be required when the depth of the sewer or other utilities exceeds ten (10) feet.
- f) There shall be a minimum horizontal clearance of ten (10) feet between parallel water and sanitary sewer facilities, as measured between the outside barrels of the pipes and manholes, and the water main shall be higher than the sewer.
  - 1) On crossings, the water line shall be at least 12-inches above the sewer line.
    - (a) If a sanitary sewer force main must cross a water main, the sewer force main shall be installed a minimum of one foot below the water main unless otherwise approved by the governing Health Department and water purveyor.

- (b) In no case shall the requirements be less than called for in the California Department of Health Services Criteria for Separation of Water Mains and Sanitary Sewers, latest edition.

2. Location in New Subdivisions

- a) In new subdivisions, sewers shall preferably be located 6-feet off of street centerline within minor and primary streets.
- b) The outside barrel of the pipes and manholes shall be located at least five (5) feet from the concrete improvements such as the lip of gutter. In the case where there is no gutter, the edge of pavement or face of curb shall be used.

3. Existing Streets

- a) When sanitary sewers are to be placed in existing streets, factors such as curbs, gutters, sidewalks, traffic conditions, pavement conditions, future street improvement plans, and existing utilities shall all be considered.
- b) The appropriate governing agency's approval shall be obtained in every instance.

4. Easements

- a) Easements shall be granted to the District on all District maintained sewer lines, except when sewer lines are located in public streets, or public rights-of-way.
- b) The minimum width of easements shall comply with the requirements of Section 6.04B.
- c) Wider easements may be required depending on location, type of soil, size of pipe, manhole location, depth of pipe or as determined necessary by the District.
- d) The permanent easement shall be all on one side of the property line or fence line.
- e) The sewer pipe shall be installed in the center of the permanent easement unless otherwise approved by the District.
- f) Temporary construction easements of adequate dimensions shall be provided to allow the construction within the permanent easement to be completed in a safe and reasonable manner.

5. Water Well Clearance

- a) No public sanitary sewer shall be placed nearer than one hundred (100) feet to any water well, public or private, unless the well has been abandoned in full

accordance with County Health Department standards, or the location otherwise approved, in writing, by the appropriate health agencies.

- b) If a clearance of less than one hundred (100) feet is approved, all pipe within that distance from the well shall be of ductile iron or of other material approved by the District.
- c) In no case will a clearance of less than fifty (50) feet be allowed.

6. Alignment

a) Alignment of all sewer pipe and structures shall be designed as follows:

1) Horizontal Alignment

- (a) Alignment shall be parallel to the street centerline wherever possible.
- (b) Sewer pipe shall not be placed in excavations that would fall within an imaginary plane projecting downward at an inclination of 1H:1V from the nearest edge of adjacent structures.
- (c) Minimum radius for sanitary sewers shall be per manufacturer's recommendations, but in no case less than 200-feet for vitrified clay pipe or PVC pipe, and 205-feet for ductile iron pipe. A larger radius shall be used whenever practical.
- (d) A manhole shall be placed at any abrupt change in alignment.
- (e) Changes in alignment of pipe 27-inches in diameter and larger shall be by use of manholes, or by other methods as approved by the District.
- (f) All utility crossings shall be designed with the crossing being perpendicular, unless a variance is approved by the District. In no case shall pipes cross at less than a 45-degree angle.
- (g) Sewer facilities shall not be placed in any joint trench with other utilities.

2) Vertical Alignment

- (a) Alignment shall provide a constant slope between manholes.
- (b) If a change in grade is necessary, construction of a manhole will be required.
- (c) Vertical curves shall not be used unless specifically approved by the District.
  - (1) In such case, elevations shall be shown at 10-foot intervals throughout the length of the vertical curve.

- (2) The maximum algebraic difference in grades shall be 2 percent at each 10-foot interval.

### 3) Clearance Requirements

- (a) All sewer pipe and structures shall be designed to provide a minimum 12-inch vertical clearance from all other utilities and/or improvements, unless otherwise approved by the District.
- (b) Whenever clearance between the new sewer and utilities is less than 12-inches, extra strength pipe shall be used for the entire run, manhole to manhole.
- (c) In the case of new development, whenever any new utilities are at an elevation below the sewer and are or can/will be installed after the sewer, the sewer shall be ductile iron pipe.
- (d) In the cases where new utilities will cross an existing sewer, the existing sewer shall be potholed in the presence of the District to determine and verify location, depth, and clearance between the sewer and the new utility.

### **3.06 Trench Loading Conditions and Pipe Design:**

- A. The loading condition and pipe design criteria for conduits are as follows:

1. Rigid Conduit Loading

- a) On rigid conduits, Marston's formula shall be used to determine the load placed on the pipe by the backfill.
  - 1) The procedure for rigid pipe is described in the ASCE Manual of Engineering Practice No. 37, the Clay Pipe Engineering Manual, and in similar handbooks.
- b) In the absence of specific soil data, as determined by a registered engineer specializing in soil mechanics, soil weight of 120 pounds per cubic foot (pcf) and a Ku factor of 0.11 shall be used.

2. Safety Factor

- a) On rigid conduits, a safety factor of 1.5 shall be used for all pipes.
- b) Only the three edge bearing strength of the pipe shall be used in the computations for rigid pipe.

3. Bedding and Initial Backfill

- a) Bedding types and factors shall be as per Standard Drawing No. 4.



- b) 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.
- c) 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.
- d) Any special backfill requirements shall be noted on the plans.
- e) Unless otherwise noted on the plans, bedding and initial backfill shall be Type II with an unlimited trench width allowable for loading purposes, but subject to limitations relative to trench width for construction purposes as set forth in these Specifications.
- f) The minimum trench width shall be pipe O.D. plus 12-inches.
- g) Type III and IV pipe bedding and initial backfill shall require specific approval of the District before use.
  - 1) These bedding types are intended primarily for emergency field use and their use shall normally not be specified on the plans.

#### 4. Special Pipe Strength Requirements

- a) Ductile iron pipe with approved lining or other high-strength pipe with engineered bedding, as designed by a licensed engineer and approved by the District, shall be used whenever cover is 20-feet or greater or extra support strength is required, as determined by the District.
- b) Ductile iron pipe with approved lining or other high-strength pipe approved by the District shall be used whenever cover is less than 3-feet, or less than 12-inches of clearance exists between the sewer pipe and other utility pipelines. Manholes, vaults, structures, footings, etc. are not permitted to be constructed over sewer pipelines.
  - 1) Localized mounding to achieve three (3) feet of cover will not be acceptable.
- c) The District may require the use of ductile iron pipe in other situations.

#### 5. Design Guide

- a) A table which relates cover, pipe diameter, trench width, and bedding and initial backfill type for vitrified clay pipe, according to Marston's formula, is provided on Standard Drawing No. 3.

### 3.07 Manhole Criteria:

- A. The design criteria for manholes are as follows:

1. General

- a) Manholes shall be placed at:
  - 1) The intersections of all sanitary sewer lines
  - 2) At all changes in pipe size
  - 3) At the end of any line terminating with a cul-de-sac
  - 4) At the end of all permanent lines with any building sewer connections
  - 5) At the end of any temporary line more than 200-feet in length.
- b) 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.
- c) All manholes shall be located in such a manner as to be readily accessible by maintenance equipment/vehicles at all times, as determined by the District.

2. Spacing

- a) Maximum spacing of manholes shall be 400-feet for all straight lines.
- b) A line with a radius greater than 400-feet shall be considered as straight for purposes of this section.
- c) Manhole spacing on lines that are on a continuous curve of 200-foot radius shall be 200-feet.
- d) 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.
- e) Reverse curves require a manhole at the point of tangency or along the tangent line between the curves.
- f) A manhole shall be required at any change in vertical alignment, unless use of a vertical curve is approved by the District.
- g) A manhole shall also be placed at any change in horizontal alignment.

3. Elevations Criteria

- a) Where the flow of a single line must change direction 20 degrees or more the invert of the exit pipe shall be at least 0.10-foot below that of the entrance pipe.
- b) Where two or more lines of the same size enter a manhole, the invert of the exit pipe shall be at least 0.10-foot below that of all the entrance pipes.

- c) If any entering pipe is smaller in diameter than the exit pipe, the minimum invert differential shall be based on the crown of that entering pipe matching the crown of the exit pipe.
- d) In cases where the exit pipe diameter is 12-inch or larger, the minimum invert of all 6-inch and 8-inch pipe entering the manhole shall match the crown of the exit pipe.
- e) When the entering pipe slope is 7.5 percent or steeper, the invert of the exit pipe shall be at least 0.30-foot below the invert of all the entrance pipes.

#### 4. Size Criteria

- a) Precast reinforced concrete manholes shall be 48-inch inside diameter when the largest size pipe entering the manhole is 21-inches in diameter, and (minimum) 60-inch inside diameter for pipe sizes 24-inch and larger in diameter.
- b) Larger diameter manholes may be required as determined by the District.
- c) When pipe sizes 18-inch and larger enter a manhole such that the flow of one must change direction by more than 20 degrees, a (minimum) 60-inch manhole shall be used.
- d) Sixty-inch manholes or larger shall be used whenever 3 or more 12-inch or larger pipes intersect at a manhole.

#### 5. Construction Requirements

- a) Manhole construction shall conform to the provisions of Standard Drawings No. 5 and No. 6.
- b) Bolt down type frames and covers with 1/4" O-ring secured with adhesive shall be used on manholes located in areas subject to flooding.
- c) Bolt down type frames and covers shall be used on manholes located in unimproved or backyard easement areas.
- d) Where the manhole depth is less than four feet, an 18-inch high cone, as shown on Standard Drawing No. 6, shall be used.
- e) The plans shall note that the frame on manholes located in unimproved areas shall be set 6-inches above existing ground level and 12inches above any designated 100-year flood plain.
- f) The area adjacent to the manhole shall be designed and graded to drain away from the manhole.
- g) Manholes shall have a lining per Section 2.11 installed under the following conditions:

- 1) The discharge manhole of force mains.
- 2) Manholes at significant transitions in pipe slopes.
- 3) As directed by the District.

### **3.08 Drop Connection:**

- A. Drop connections shall only be installed as approved by the District.
- B. A drop may be installed whenever a pipe does not enter a manhole in conformance with Section 3.07.
- C. Drop connections shall conform to Standard Drawing No. 7 or 8.
- D. If the drop of the entrance sewer is less than the minimum drop specified in Standard Drawing No. 8, the free drop shall be eliminated by increasing the slope of the entrance sewer.
- E. The desirable invert differential shall be the crown of the entrance sewer matching the crown of the exit sewer.
- F. The outside drop connection shall only be used as directed by the District.
- G. The inside drop connection shall be made in 60-inch and larger manholes.
- H. There shall be no more than one 6-inch or 8-inch inside drop connection or two 4-inch building sewer drop connections into a 60-inch diameter manhole. A larger diameter manhole shall be required for additional or larger diameter drop connections.
- I. Drop connections with pipe diameters greater than 8-inch require District approval.

### **3.09 Test Manhole:**

- A. A test manhole may be required to be installed on all sewer outfall lines at the subdivision boundary when the sewer outfall will be located in unimproved areas.
- B. The test manhole will be used to test the sewer outfall before and after the construction of the unimproved areas.
- C. Test manholes may be required by the District in other circumstances.

### **3.10 Flushing Branch:**

- A. With the approval of the District, a flushing branch may be used in lieu of a manhole as follows:
  1. At the end of a line less than 200-feet long if the line extends to the subdivision boundary and there are definite plans for extension of the line.

2. At the end of a temporary line less than 200-feet long.

B. Flushing branches shall conform to Standard Drawing No. 9.

### **3.11 Building Sewer Lower Lateral Design:**

A. The design criteria for lower laterals are as follows:

#### **1. General**

- a) Lower laterals shall conform to Standard Drawing No. 10 and No. 11 and shall be constructed normal to the collector sewer using Inspection Cleanout as shown on Standard Drawing No. 11 unless otherwise approved by the District.
- b) The lower lateral shall extend from the collector sewer to the edge of public right-of-way or edge of easement.
- c) Lower laterals shall extend one foot beyond edge of pavement of any private road.
- d) A plan and profile of any lower lateral shall be supplied to the District upon request.
- e) All lower laterals entering a manhole shall be installed with the lower lateral invert elevation matching the crown elevation of the exit collector sewer.
- f) A backwater valve shall be provided on any building sewer where the building pad elevation is lower than the top of manhole immediately up stream on the collector sewer serving the parcel or in instances where the manhole immediately up stream will not provide relief.
  - 1) The parcels or lots requiring backwater valves shall be indicated on the plans.
- g) A property line cleanout, conforming to Standard Drawing No. 12, shall be constructed on the lower lateral during building construction at the time of the upper lateral installation, unless otherwise directed by the District.

#### **2. Sizing**

- a) Residential lower lateral size is 4-inch minimum.
- b) Schools, commercial and industrial developments shall be served by 6-inch or larger lower laterals.
- c) A 6-inch lower lateral shall enter a 6-inch collector by means of a manhole but may enter an 8-inch or larger collector by means of a factory wye.
- d) Eight-inch diameter and larger lower laterals shall be connected to the collector sewer by use of a manhole.

### 3. Connection Limitations

- a) Lower laterals shall not directly connect to 12-inch diameter or larger pipe or to lines more than 20-feet in depth without the approval of the District.
- b) A separate and independent lower lateral shall be provided for every lot, building or structure.
- c) Two or more buildings located on the same parcel shall have separate lower laterals and each shall be independently connected to a District maintained collector sewer and conform to the requirements of Section 3.04., "Pipe Slope, Velocity and Size", unless otherwise approved or required by the District.
- d) No more than five 4-inch lower lateral connections into precast manhole bases or four 4-inch lower lateral connections into cast-in-place manhole bases will be allowed.

### 4. Material

- a) If the lower lateral has 3-feet of cover or less over the top of pipe, measured from the gutter flowline, ductile iron pipe, or other high strength pipe approved by the District, shall be used.
- b) In situations where a VCP lower lateral at the right-of-way line/easement line has more than 7-feet of cover over the top of pipe, as measured from existing ground surface or edge of adjacent roadway, ductile iron pipe, or other high strength pipe approved by the District shall be used.
- c) In all other cases, the lower lateral shall be of the same material as the collector sewer to which it connects.
- d) Lower laterals shall not have less than 12-inch vertical clearance minimum between any wet utility unless ductile iron pipe is used. In no case shall the vertical clearance be less than 6-inches.

### 5. Location

- a) When sanitary sewers are constructed as part of new subdivision improvements, a lower lateral shall be constructed to each parcel.
  - 1) In new subdivisions or developed areas, unless specifically requested otherwise in writing by the property owner or Consulting Engineer, lower laterals shall be placed on the low side of any typical subdivision lot or similar parcel with two percent or greater slope across the front or shall be placed in the center of lots of lesser slope.
- b) Consideration shall be given to trees, improvements, other utility service points or other natural barrier, so as to minimize interference when the service building sewer upper lateral is extended to serve the building.

- c) If the property is located such that service is available both to a line located in an easement and in a street right-of-way, service shall be to the line located within the street unless otherwise approved by the District.
- d) No lower lateral shall be located such that future onsite construction will result in the line being in such proximity to a water well or water main or service where applicable health standards will be violated.
- e) Lower laterals shall not be placed in any joint trench with other utilities.

#### 6. Depth

- a) The Consulting Engineer shall verify the adequacy of the normal lower lateral depth at the edge of the easement or right-of-way to serve the intended parcel.
  - 1) A depth of 4-feet to crown of pipe, measured from existing ground surface or edge of adjacent roadway at the right-of-way line/easement line, whichever is lower, shall be considered normal lower lateral depth.
  - 2) Lower laterals shall not exceed 7-feet in depth, as measured at their terminus at the right-of-way line/easement line, unless otherwise approved or required by the District.
  - 3) The Consulting Engineer shall designate the invert elevation of the lower lateral at the edge of the right-of-way or easement on the construction plans.
- b) At locations where gravity service is impossible or impractical to obtain, the Consulting Engineer shall clearly indicate on the plans the parcels that will require a privately owned and maintained pump station.
- c) If a joint trench is being utilized for other utilities, the Consulting Engineer shall indicate on the plans that a joint trench will exist and shall adjust lower lateral elevations as necessary.
  - 1) It shall be the responsibility of the Consulting Engineer to arrange for coordination of the grade of utilities located in the joint trench and the lower laterals.

#### 7. Slope

- a) The 4-inch lower lateral slope shall be 1/4-inch per foot minimum; 1/8-inch per foot slope may be used with the approval of the District.
- b) Lower lateral slope for 6-inch or larger services may be engineered slopes with a minimum velocity of 2-feet per second with the pipe flowing full or half full.

#### 8. Regulations and Fees

- a) For regulations and fees regarding the installation of an individual lower lateral, contact the South Placer Municipal Utility District.

### 3.12 Creek Crossing Design:

A. The design criteria for creek crossings are as follows:

1. General

- a) In all cases, the proposed future creek bed elevation shall be used for design purposes.
- b) If the pipe must cross above the creek bed, a design for the crossing shall be submitted by a registered engineer, competent in the field, for District approval.
- c) Crossing details of pipe, piers, anchorage, and other pertinent items shall be shown upon a detail sheet of the plans in large scale.

2. Construction and Materials

- a) For all line sizes, ductile iron pipe shall be used.
- b) Special care shall be taken to provide a firm base for the pipe bedding.
  - 1) The plans shall specify that all soft or organic material within the creek banks shall be replaced with select imported backfill.
  - 2) The top 2-feet of backfill within the full width of the creek banks shall be placed and compacted gravel 3/4-inch to 1 1/2-inch size.
- c) Unless otherwise directed, a trench plugs shall be required around the pipe at the downstream side of the crossing.
  - 1) Trench plugs (cutoff collars, cutoff walls) shall be two-sack sand-cement slurry and shall be 4-feet long, shall key 18-inches into the trench walls and bottom, and shall extend 18-inches above the pipe crown. Trench plugs shall be installed at crossings of streams, ditches, canals, or other sources of groundwater, or as requested by the District, and shall include drains.
- d) As determined by the District, sewer pipes at all creek crossings and drainage swales may require concrete erosion protection per Standard Drawing No. 18 to reduce erosion and subsequent exposing and undermining of the pipe.
- e) At all above ground creek crossings, provisions shall be made to discourage pedestrian traffic on the pipeline, subject to District approval.

3. Design

- a) 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.

4. Permits



- a) The Developer and Contractor shall be in possession of all necessary state and/or federal regulatory agency permits prior to the construction of any creek crossing.
- b) Improvement plans that incorporate a creek crossing will not be approved for construction by the District until copies of the permits have been provided to the District.

### **3.13 Boring and Jacking Requirements:**

- A. Boring and Jacking operations shall be between the limits as shown on the plans as approved by the District and the other entities involved.
  1. The Consulting Engineer shall determine the minimum strength of the pipe, casing or conduit to be jacked in place and determine the vertical load and minimum thickness permitted.
  2. Any additional strength or thicker material shall be determined by the Consulting Engineer and approved by the District.
- B. Unless otherwise approved by the District, steel casing shall be used in the jacking operation.
  1. The size (I.D.) shall be as shown on the plans and in no case shall the pipe wall thickness be less than 1/2".

### **3.14 Crossing Culvert Pipe:**

- A. Sewer collectors and lower laterals shall have 12-inches vertical clearance minimum between any culvert unless ductile iron sewer pipe is used and approved by the governing agencies.
- B. The Consulting Engineer shall check all culvert crossings with the appropriate governing agency to determine if future changes in culvert size or location are anticipated.

### **3.15 Access Roads:**

- A. All-weather access roads shall be constructed over all portions of every mainline sewer pipe, including manholes as required by this section.
- B. Purpose
  1. Inaccessible sewer facilities are defined as all manholes, pipelines, building sewer connections, pumping facilities, and any other appurtenances used or useful in the collection and conveyance of wastewater that are located outside of publicly travelled rights-of-ways in unimproved areas, "back or side yard" easements and other locations as determined by the District.

C. Location

1. Unless otherwise approved by the District, access to inaccessible sewer facilities shall be provided by the Developer by constructing all-weather access roads along, across, over and to inaccessible sewer facilities so that all sewer facilities are accessible for District operation, maintenance, cleaning and repair.

D. Design

1. An all-weather access road shall consist of 8-inches of compacted aggregate base (95% relative compaction) topped with a minimum of 3-inches asphalt concrete.
2. AC surface shall be a minimum 12-feet in width on straight sections and on turns, shall conform to the turning dimensions depicted in Standard Drawing 13 of these specifications.
3. AC paved roads shall have a minimum 2-foot wide shoulder backing of properly compacted AB material, a minimum of 11-inches thick.
4. AC surface shall be constructed to drain away from manhole lids.
5. Other all-weather surfacing may be used in place of asphalt concrete with the approval of the District.

E. Conditions for Easement

1. Permanent easements will be required for all access roads and turnaround spaces as shown on the Standard Drawing Nos. 13, 14, and 15.
2. The hammerhead turnaround and right turn access road detail shall be reversed and used for left turn vehicular movements.
3. Unless otherwise approved by the District, hammerhead or intermediate turnaround spaces shall be constructed at the end of all access roads exceeding 120-feet in length and at intermediate locations as determined by the District.
4. Access roads 120-feet or less in length without a turnaround shall be with approval of the District.
5. Reference Section 6 for specific easement requirements.

F. Grade

1. The maximum access road grade shall not exceed 10 percent and shall be shown in the profile view.
2. The access road shall not block a natural or artificial drain and shall conform to the requirements of the governing agencies.

G. Controlled Use

1. District access roads shall not serve as joint use with driveways or for other private access purposes unless otherwise approved by the District.
2. Measures shall be taken to prevent unauthorized joint use and/or blocking of the access road.
3. The preventative measure taken shall be as approved by the District.
4. In certain cases, the creation of a separate parcel or lot to accommodate the access road may be required.

H. Security

1. All access roads shall have a gate or removable, lockable, flush mounted bollards per Standard Drawing 16 or 22 installed in locations approved by the District. Gates and bollards shall be secured with a District furnished lock. Other locks may be added in series to the District lock, but in no case shall the District be locked out or the District lock removed.

**3.16 Grease Control Devices and Sand Oil Separators:**

A. Definitions

1. The terms used in this section shall have the intent and meaning as defined in Chapter 3 – “Fats, Oils, and Grease” of the latest edition of the District Sewer Code.

B. Codes and Standards

- a) Grease control devices (GCDs) shall comply with the latest edition of the following code(s) Uniform Plumbing Code (UPC)
2. GCDs shall comply with at least one of the following standards:
  - a) American Society of Mechanical Engineers (ASME) A112.14.3
  - b) CSA B481.1
  - c) Plumbing and Drainage Institute (PDI) Standard G 101

C. In all sewer lines leading from sinks, drains and other fixtures or equipment in the following types of establishments:

1. Food Service Establishments including, but not limited to restaurants, cafes, lunch counters, cafeterias, bars, clubs, coffee shops, specialty drink shops, ice cream parlors, delis, grocery stores, and bakeries,
2. Hotel, hospital, sanitarium, factory or school kitchens.

3. Other establishments where grease may be introduced into the sewage system in quantities that can affect line stoppage or hinder sewage treatment as determined by the District.

D. Accessibility

1. Grease control devices shall be installed at locations where it shall be readily accessible at all times for inspection, cleaning, and maintenance.
2. Grease control devices shall not be located in drive-thrus, parking stalls, and landscape areas, unless otherwise approved by the District.

E. Design

1. All drainage fixtures within food preparation areas shall drain through a grease control device.
2. Grease control devices shall be sized in accordance with the manufacture's recommendations and calculations.
  - a) GGIs shall not be oversized to accommodate future development,
3. Sizing of hydromechanical grease interceptors shall conform to provisions of the Uniform Plumbing Code, latest edition and be sized based on a two-minute drainage period.
4. All grease control devices shall be properly vented according to manufacturer recommendations and building code requirements.
5. Depth of grease control device shall be taken into consideration during design to facilitate inspection, maintenance, and testing.
6. Maximum depth of grade rings shall not exceed thirty-six (36) inches.
7. Two-way cleanouts shall be installed upstream and downstream of the GCD at a maximum distance of five feet (5) unless otherwise approved by the District. See Section 7.08.A.3 of these specifications for the installation of two-way cleanouts.
8. Proposed grease control devices shall have efficiency documentation that specifies how efficient the device captures FOG at the design flowrate.

F. Location

1. Gravity grease interceptors (GGIs)
  - a) GGIs shall be located outside of the building.
  - b) GGIs shall be considered to be part of the building plumbing, therefore part of the private service line, subject to maintenance by the Developer or Owner and not by the District.

2. Hydromechanical grease interceptors (HGIs)
  - a) HGIs shall be located outside of the building unless otherwise approved by the District. In addition, the following requirements shall be met:
    - 1) HGIs may only be located inside the building if Placer County Department of Environmental Health’s requirements are met and are approved by the District.
    - 2) HGIs located inside the building shall also meet all the requirements of the building department having jurisdictional authority.
3. Grease Removal Devices (GRDs) / Automatic Grease Removal Devices
  - a) GRDs may only be used on a case-by-case basis as approved by the District and shall be located inside the building. In addition, the following requirements shall be met:
    - 1) GRDs may only be used with approval of the Placer County Department of Environmental Health.
    - 2) GRDs located inside the building shall also meet all the requirements of the building department having jurisdictional authority.

#### G. Maintenance

1. GCDs shall be located in a manner that allows for required maintenance as described in Chapter 3 – “Fats, Oils, and Grease” of the latest edition of the District Sewer Code.
2. Gravity grease interceptors shall have three (3) access manholes, adjusted to grade, so that all compartments, piping, baffle walls, etc. shall be readily accessible for maintenance, inspection, cleaning and removal of intercepted grease, unless otherwise approved by the District.
3. GGIs shall have its entire contents pumped out at a minimum frequency of once every six (6) months or at a frequency as determined by the District.

#### H. Inspection

1. A sampling box shall be installed downstream of the grease control device to allow sampling of the effluent against the fats, oils, and grease (FOG) discharge limitation in Chapter 3 – “Fats, Oils, and Grease” of the latest edition of the District Sewer Code.
2. Gravity grease interceptors shall have three (3) access points so that all compartments, piping, baffle walls, etc. shall be readily accessible for maintenance, inspection, cleaning and removal of intercepted grease, unless otherwise approved by the District.

### **3.17 Controlled Low Strength Material:**

- A. Minimum Cement Content: 50 pounds per cubic yard.
- B. Use fly ash to improve flow-ability of the fresh CLSM and to regulate the strength. Do not use more than 300 pounds per cubic yard.
- C. Unit Weight Requirements
  - 1. Density of CLSM when used as backfill of excavations: Between 100 pounds per cubic foot and 130 pounds per cubic foot in the as-placed condition as determined by ASTM D6023.
- D. Compressive Strength Requirements
  - 1. Mix designs used for pipe bedding and backfill: Compressive strength at 28 days between 50 psi and 100 psi as determined in accordance with ASTM D4832.
- E. Consistency and Mixing
  - 1. Consistency: Similar to that of a thick liquid so that it flows readily and fills spaces and voids around pipes and structures.
  - 2. Slump: Between 6 inches and 8 inches when tested in accordance with ASTM C143.
  - 3. Uniform consistency and appearance.
  - 4. Mixing Method and Time: As required to produce a uniform mixture of cement, fly ash, aggregate, admixtures, and water.
- F. Measurement of Materials
  - 1. Use weighing equipment to determine the amount of cement, fly ash, and aggregate entering into each batch. Where batches are proportioned to contain an integral number of conventional sacks of cement, and the cement is delivered at the mixer in the original unbroken sacks, the weight of the cement contained in each sack may be taken without weighing as 94 pounds.
  - 2. Use a suitable water meter or other acceptable method of measuring the quantity of water entering the mixer.