CAMROSA WATER DISTRICT

SANITARY SEWER

DESIGN AND CONSTRUCTION

STANDARDS

CAMROSA WATER DISTRICT

ENGINEERING DEPARTMENT

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SANITARY SEWER STANDARDS

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INTRODUCTION AND GENERAL POLICIES

1.1 SCOPE

The design and construction of wastewater mains and other appurtenances within Camrosa Water District shall comply with these standards herein called, "Sanitary Sewer Design and Construction Standards" and the permit requirements of various governing bodies. **All parts of these Standards and the accompanying Standard Plate Drawings have been examined by the General Manager and the Engineering Services Manager and approved as to content.** A Registered Civil Engineer shall sign all submitted plans and all work shall be in accordance with good engineering practice. This document sets forth the procedure for designing and preparing plans and specifications for wastewater facilities built for the District. Wherever there are differences between these standards and other City, County, State or Federal regulations, the most stringent or highest requirement shall govern

1.2 INTERPRETATION

The General Manager of Camrosa Water District shall decide all questions of the interpretation of "good engineering practice" being guided by the various standards and manuals to include those published by the American Society of Civil Engineers and the Water Pollution Control Federation.

1.3 APPLICABLE CODES AND POLICIES

Ordinances, requirements, and applicable standards of governmental agencies having jurisdiction within the District's service area shall be observed in the design and construction of wastewater systems. Such requirements include but are not limited to the current revisions of the following:

A. The Uniform Building Code.

B. The Uniform Plumbing Code

C. Road Encroachment regulations of the Cities of Camarillo, Moorpark, Thousand Oaks, and the County of Ventura.

D. CalTrans Standard Specification

1.4 POLICIES AND PROCEDURES

These standards establish uniform policies and procedures for the design and construction of the District's sewer system. They are not intended to be a substitute for engineering knowledge, judgment, or experience. These procedures shall be reviewed by the Developer's Engineer and shall be applied as necessary to the project. Proposed deviation to these standards shall be submitted, in writing, prior to tentative map and /or development project approval.

It is the Developer's Engineer's responsibility to be aware of the District's Master Plan for sewer systems improvements and to indicate any main line relocations, extensions, or over sizing on the wastewater plan.

All plans and specifications, reports or documents shall be prepared by a registered Civil Engineer, or by a subordinate employee under his direction, and shall be signed by him/her and stamped with his/her seal to indicate responsibility for them.

Plans approved and signed by the Manager shall be revised or supplemented at any time it is determined that the District's requirements have not been met. However, generally, plans that are signed will not require revisions based upon subsequent revisions to these standards unless in the District's opinion a change is necessary based upon a significant change in the standards or unless the developer does not proceed to construct within the time allowed in the agreement with the District.

1.5 DEFINITIONS AND TERMS

Whenever reference is made thereto of the following terms, abbreviations or definitions, the intent and meaning shall be interpreted as follows:

ABBREVIATIONS

AASHTO	-	**A**merican **A**ssociation of **S**tate **H**ighway and **T**ransportation **O**fficials
ACI	-	**A**merican **C**oncrete **I**nstitute
ANSI	-	**A**merican **N**ational **S**tandards **I**nstitute
ASCE	-	**A**merican **S**ociety of **C**ivil **E**ngineers
ASTM	-	**A**merican **S**ociety for **T**esting and **M**aterials

AWWA	-	**A**merican **W**aterworks **A**ssociation
C/L	-	**C**enter **L**ine
D/R	-	**D**imension **R**atio
EDU	-	**E**quivalent **D**welling **U**nit
P/L	-	**P**roperty **L**ine
R/W	-	**R**ight of **W**ay
RWV	-	**R**esilient **W**edge **V**alve
UBC	-	**U**niform **B**uilding **C**ode
UPC	-	**U**niform **P**lumbing **C**ode
USCGS	-	**U**nited **S**tate **C**oast and **G**eodetic **S**urvey
WPCF	-	**W**ater **P**ollution **C**ontrol **F**ederation

Pipe Types:

ABS	-	**A**crylonitrile **B**utadiene **S**tyrene
ACP	-	**A**sbestos **C**ement **P**ipe (Transite)
CIP	-	**C**ast **I**ron **P**ipe
CMP	-	**C**orrugated **M**etal **P**ipe
DIP	-	**D**uctile **I**ron **P**ipe
HDPE	-	**H**igh **D**ensity **P**oly**E**thylene
PVC	-	**P**oly-**V**inyl **C**hloride Pipe
RCP	-	**R**einforced **C**oncrete **P**ipe
TP	-	**T**russ **P**ipe
VCP	-	**V**itrified **C**lay **P**ipe

DEFINITIONS

"Approved" Unless specifically indicated, this shall mean the approval of the General Manager, Camrosa Water District.

"City" The City of Camarillo, California, and the various agencies and departments thereof. In some cases "City" may mean Thousand Oaks or Moorpark.

"Contract" The contract includes the Notice Inviting Bids, Proposals, Specifications, Agreements, Bonds and Plans.

"Contractor" The individual, partnership, firm or corporation entering into an agreement with the District, or with a developer to perform or execute the contemplated work.

"County" The County of Ventura, California, and the various agencies and departments thereof.

"Developer" An individual or organized group, partnership, corporation, etc. proposing to subdivide or improve land, that will require water from the District.

"Developer's Engineer" The Engineer licensed by the State of California as a Civil Engineer, employed by the developer, under whose direction, plans, profiles and details and cost estimates for the work are prepared and submitted to the District for review and approval.

"District" The Camrosa Water District or its authorized representatives.

"Easement" A recorded document in that the landowner gives the District permanent or temporary rights to construct and maintain water mains and/or facilities across private property.

"Equivalent Dwelling Unit" (EDU) A unit of measure, equal to the output of wastewater from a single family home and adjusted for larger buildings, type of commerce, or other activity.

"Facility" Any conduit, structure, or feature used in the supply of water or collection and distribution of sewage.

"Field Acceptance" When the Inspector approved the physical installation of the water system.

"Final Acceptance" When the Board approves both physical improvements, as well as the administrative items associated with the development.

"Fire Department" Ventura County Fire Department

"Fixture Unit Equivalent" The unit equivalent of plumbing fixtures as tabulated in the Uniform Plumbing Code.

"Horizontal Separation" The least horizontal distance between the centerlines of pipelines laid approximately parallel to one another at their closest point of approach and the least horizontal distance between the centerline of pipelines and the nearest edge of facilities.

"House Plumbing" Plumbing fixtures, devices, and drainage piping within a building or structure.

"Inspector" An employee or agent of the District engaged to observe and record field compliance with design criteria, plans, and construction standards.

"Incremental Cost" The difference in cost between the pipelines and appurtenances necessary to serve a particular development and the larger facility required by the District.

"Main Line Sewer" A sewer that has been constructed to accommodate more than one building sewer and that has been approved by the District.

"Manager" Manager shall mean the General Manager of Camrosa Water District, or the person engaged by the District and authorized to perform the duties assigned to the Manager, and shall include his/her Directors and representatives.

"Offsite or Off-Tract Line" A wastewater line beyond tract boundaries connecting the tract wastewater system with the District's.

"Or Approved Equal" The item referred to may be substituted for another item, if this item is approved by the District for the particular use intended.

"Oversizing Cost" The incremental cost of oversized water or sewer pipelines required by the District.

"Permit" Any written authorization required pursuant to any regulation of the District.

"Plans" The official drawings, profiles, or reproductions thereof, approved by the District that shows the locations, characters, dimensions, and details of work to be done.

"Plate No." When not specified to the contrary, this refers to plates attached to these Standards.

"Required" Unless otherwise indicated, this shall mean a requirement of the District.

"Wastewater " or "Sewer Line" For the purposes of this set of standards, Wastewater, Sanitary Sewer, or Sewer pipeline are interchangeable. Any conduit carrying "sewage" or "industrial waste" as defined in Health and Safety Code Sections 5410(a) and 5410(b); any conduit carrying the effluent of treated sewage or industrial waste; or any conduit carrying agricultural waste or effluent of any treated agricultural waste including, but not limited to, interceptors, outfalls, and force mains.

"Vertical Separation" The difference in elevation between the outside bottom of the higher pipe and the outside top of the lower pipe.

"Work" All of the work for the project contemplated and called for or shown in the plans and contract documents.

1.6 PUBLIC AND PRIVATE SEWAGE SYSTEM

As required by the District Resolution, a public sewer connection is required where any one or more of the following situations exist:

A. "…. any part of a parcel of property is situated within 300 feet from an accessible public sewer".

B. "…. There is a change of ownership and the public sewer is accessible.

C. All new developments (except single family dwellings) not included in a new subdivision and greater than 300 feet away from a public sewer.

1.7 DISTRICT'S JURISDICTION

The District is responsible for the approval of plans and inspection of all public main wastewater lines and laterals within the public right-of-way. The Building and Safety Department of the Cities and County is responsible for all laterals on private property. Where repairs or replacement of a lateral is required subsequent to initial construction, it shall be the responsibility of the property owner, including that section between the curb clean-out or property line and the house connection.

SECTION 2.0

DESIGN CRITERIA

2.1 WASTEWATER CAPACITIES, HYDRAULICS AND SIZING

A. QUANTITY OF FLOW:

Sewage flows shall be determined from maximum potential population of the tributary area. Unless otherwise approved, the following criteria shall be used:

If the number of housing unit is known:

- 3.64 persons/SFD (Single Family Dwelling) 100 gallons/capita/day (GCPD)
- 2.15 persons/MFD (Multiple Family Dwelling) 100 GCPD

If the number of units is not known:

TABLE 1

Type of Zoning	Ground Slope	Persons Per Acre	Computed Average Flow
Residential	0-0.10	12.5	*
Residential	0.10-0.25	7.0	*
Residential	Over 0.25	1.0	*
General Commercial	0-0.10	----	*
Limited Commercial	0-0.10	----	*
Hospital	Any	----	*
School	Any	----	*
Light Industry	0-10	----	*
Other Industry	Any	----	*

Varies* See excerpt of District Ordinance 22-06 at the end of this section for EDU calculation.

After calculating the average flow, a peak factor may be determined by Ratio of Peak to Average Flow.

B. HYDRAULICS:

Sewers shall be designed to accommodate future tributary flows, in addition to those from the project. Pipe capacities shall be determined for peak flow rates by Manning Formula using “n” value of 0.013 for all pipes. Sewers less than 12” in diameter shall be designed to flow half full at peak flow rates. Sewers 12” and larger shall be designed to flow two-thirds at peak flow rate.

C. VELOCITY:

A main line sewer shall be designed to provide a mean velocity of not less than two (2) feet per second flowing one-half full. The District may approve a gradient that will develop a velocity of less than two (2) feet per second in unusual circumstances. Where there is conflict between design by velocity and design using minimum slopes in Section 2.4. the design resulting in the steepest slope shall be used.

D. OVER-SIZING AND EXTRA DEPTH:

Over-sizing of certain tract sewers may be required where such sewers can logically serve an upstream tributary area.

E. MINIMUM DIAMETER:

The minimum diameter for a District sewer main shall be 8”.

F. VITRIFIED CLAY (VCP) PIPES:

VCP sewer pipes shall be furnished in lengths not exceeding 6 feet without approval. The Developer’s Engineer should be familiar with the “Clay Pipe Engineering Manual” as published by the National Clay Pipe Institute.

G. POLYVINYL CHLORIDE (PVC) PIPES:

PVC sewer pipe (DR 35) shall not be greater than 15 inches in diameter and shall be furnished in standard lengths not exceeding 20.0 feet.
Use of 15-inch pipe requires special approval.

In addition, the Developer’s Engineer should be familiar with the “Design and Construction Handbook of PVC Pipe” as published by the Uni-Bell Plastic Pipe Handbook.

H. ACRYLONITRILE-BUTADIENE-STYRENE (ABS) PIPES

ABS sewer pipe shall not be greater than 15 inches in diameter and shall be furnished in standard lengths not exceeding 14 feet. The Developer's Engineer should be familiar with "Truss Pipe Semi-Rigid Sewer Pipe System Design Manual", as published by Armco Steel Corp. Use of 15-inch pipe requires special approval.

2.2 LOCATIONS OF LINES (STREETS)

The sewer centerline, wherever possible, shall be located in public streets parallel to and 5 feet south or east of the street centerline.

However, where storm drains are in the center of the street, the water or wastewater lines should be located to provide a minimum clearance of four (4) feet between the outside of pipe (measured on a horizontal plane). This pertains as well to any case of parallel lines.

Special care is required where storm drains or other pipes cross above flexible pipes to avoid deflection problems when the other lines are installed.

When an area outside the improvements can be logically served by future extension of the sewer, it shall extend to the Improvement boundary or to the end of a paved street in a manner facilitating future extensions.

2.3 SEPARATION OF WASTE WATER LINES AND WATER MAINS

A. CRITERIA FOR THE SEPARATION OF WATER MAINS AND WASTE-WATER (SEWER) LINES:

1. General:

Proper separation of wastewater and water systems is necessary to reduce the potential for an outbreak of waterborne diseases. Sanitary sewers may leak and saturate the surrounding soil with sewage. This is caused primarily by structural failure of the sewer line, improperly encasing conduit. A serious public health hazard exists when the water mains are depressurized and no pressure or negative pressures occur. The hazard is further compounded when, in the course of installing or repairing a water main, existing sewer enters into the water main. Additionally, if a water main fails in close proximity to a sewer line, the resultant failure may disturb the bedding of the sewer line and cause it to fail. In the event of an earthquake or man-made disaster, simultaneous failure of both conduits often occurs. The discussion below is excerpted from the criteria established by the Department of Health Services, State of California, Health and Welfare Agency.

2. Basic Separation Standards:

    a. Parallel Construction:

    The Horizontal distance between pressure water mains and sewer lines shall be at least 10 feet.

    b. Perpendicular Construction (crossing):

    Pressure water mains shall be at least one foot above sanitary sewer lines where these lines must cross.

    c. Common Trench:

    Water mains and wastewater lines must not be installed in the same trench. When water mains and sanitary sewers are not adequately separated, the potential for contamination of the water supply increases. Therefore, when adequate physical separation cannot be attained increasing the structural integrity of both the pipe materials and joints should provide an increase in the factor of safety.

3. Exceptions to Basic Separation Standards.

    Local conditions such as available space, limited slope, existing structure, etc., may create a situation where there is no alternative but to install water mains or sewer lines at a distance less than required by the Basic Separation Standards. In such cases, alternative construction criteria as specified in **Plate S-32/W-55** should be followed, subject to the special provisions outlined below. **Plate S-33/W-56** contains a thorough discussion of various cases where less than 10 feet separation would be allowed.

4. Special Provisions:

    a. A Basic Separation Standards are applicable under normal conditions for wastewater (sewage) collection lines and water distribution mains. The Engineer and / or the District may determine more stringent requirements.

    b. Wastewater lines shall not be installed within 25 feet horizontally of a low head (5 psi or less pressure) water main.

c. In the installation of water mains or sewer lines, measures should be taken to prevent or minimize disturbances of the existing line. Disturbance of the supporting base of this line could eventually result in failure of this existing pipeline.

d. Wastewater Force Mains:

(1) Wastewater force mains shall not be installed within 10 feet (horizontally) of a water main.

(2) When a wastewater force mains must cross a water line, the crossing should be as close as practical to the perpendicular. The wastewater force main should at least be one foot below the water line.

(3) When a new wastewater force main crosses under an existing water main, all portions of the wastewater force mains within ten feet (horizontally) of the water main shall be enclosed in a continuous sleeve.

(4) When a new water main crosses over an existing wastewater force main, the water main shall be constructed of pipe materials with a minimum rated working pressure of 200 psi or equivalent pressure rating.

2.4 LOCATION OF LINES in EASEMENTS

Easements should be avoided where a reasonable alternate solution exists. Unless there are either physical limitations or extreme economic penalties, wastewater lines should be installed within the streets. When easements are required, there shall be careful consideration of how the line is to be maintained and/or replaced, if necessary. Where easements are necessary and where the side slope (perpendicular to the pipe) exceeds 50 percent (1 vertical to 2 horizontal) then the plans shall clearly indicate appropriate contours within the easement.

In general, all manholes within the easement shall be accessible by conventional maintenance vehicle traveling over paved road or driveways unless otherwise approved. Thus manholes within private property are discouraged and subject to special approval, unless the above can be met.

Laterals should not be connected to a mainline within an easement unless specifically approved. This is to avoid root intrusion into the main via the lateral. Specifically, laterals should not be connected into the main where such a tie-in would be between or adjacent to a structure.

A. WIDTH:

Wastewater easements for pipes up to 15 inches in diameter should normally be a minimum of 15 feet wide. However, additional easement width shall be required where the depths of pipe exceed 15 feet or as deemed necessary. The plans should clearly indicate any known block walls, pavement, trees or other obstructions within a proposed easement. Such items are contrary to the District policy and require a special approval. Included with such approval may be a monetary obligation towards the operation and maintenance of the wastewater line within the easement; also, the “As-Built” drawings shall indicate such approval.

B. PIPELINE LOCATION:

Pipelines shall generally be placed in the center of easements; only in unusual circumstances will a line be approved that is closer than 5 feet from the easement edge. Unless specifically otherwise approved, the line shall be straight without horizontal bends or deflections.

C. EASEMENT LOCATION:

The full easement width shall be on one lot or property in such a manner that walls, trees or permanent improvements will not obstruct access to manholes. Where this requirement cannot be met without interfering with existing buildings, easements may straddle lot lines providing approval is received and the sewer is not located on the lot lines.

D. OVER-SIZING OF LINES:

If a wastewater line within an easement is over 15 feet deep, the District may require the over-sizing (such as from 8 inch line to a 10 inch line) to facilitate future slip lining.

E. DEEDS:

Deeds for easements shall provide for restrictions of permanent construction within the easement to provide ingress and egress for maintenance.

F. EASEMENT PROVISIONS:

Easement shall be provided as follows:

1. For Subdivision Tracts:

   The Owner of land included within the subdivision shall offer to dedicate, for public use, the wastewater easements so designated on the final map. Standard language is included in Section 4.10.

2. For Other Than Subdivision Tracts:

   Dedication of sewer rights of way shall occur by means of deeds of conveyance to the District for all dedications other than those dedications created by subdivision tract maps on a form and as approved

2.5 SLOPES OF LINES

Minimum slope requirements are necessary to assure self-cleaning and self-oxidizing velocities to avoid significant generation of hazardous, odorous, and corrosive sulfur compounds. Where possible, use of the minimum slopes should be avoided and should not be construed as the guidelines for system design.

A. MINIMUM GRADES:

The minimum grades for commonly used pipe size shall be as follows

Pipe Size	V=2.0 ft/sec Foot per foot
8”	.0044*
10”	.0036
12”	.0024
15”	.0016
18”	.0014
21”	.0010

* Unless physically or economically unattainable, the slopes for 8” lines should be above 0.0060 with a predominance of slopes above that value.

B. MAXIMUM GRADES

The maximum grade for sewers shall normally be 15 percent except in steep terrain where the sewer grade may approximate the finished grade

over the sewer. In no case shall the grade exceed 15 percent without special approval. Prior to the design of any sewer on a slope over 15 percent, Section 2.11 and **Plates S-6 through S-17** should be referred to for typical details. To minimize the turbulence in manholes, the grade of any incoming sewer shall not exceed the grade of the outgoing sewer by more than 10 percent. Where this value is exceeded, the designer should check the hydraulic considerations and pay particular attention to the invert drop across the manhole. Refer to Section 2.11 for further discussion of steep grades.

C. SUBSTANDARD GRADES:

If grades below the standard minimum must be used in order to avoid pumping, the designer shall advise the District before proceeding with the design. Grades below the standard minimum may be used only upon specific approval (with approval designated on the improvement drawings), solicited well in advance of completion of design.

2.6 DEPTH OF LINES

Depth of cover is measured as the distance to the top of pipe from the finished grade surface over the sewer centerline.

Sewer lines shall be installed at a depth, that shall provide suitable service to the properties and will allow subsequent installation of water lines, in accordance with the Water/Wastewater Separation per **Plate S-33/W-56**.

A. STANDARD DEPTH OF COVER

Standard depth of cover is 7 feet in paved areas or 5 feet minimum in areas not expected to receive traffic. Where this cover cannot be maintained, other details may be required, such as higher strength pipe, pipe encasements, special backfill, or concrete trench slabs. Whereas depths of cover is less than 7 feet will require approval via the plan check process and are discouraged, the use of concrete encasements or trench slab will in general be reserved for depths of cover below 5 feet in paved areas and 3 feet in non-traffic areas.

B. MAXIMUM DEPTH OF COVER

Maximum depth of cover shall be as detailed in **Plates S-3 and S-4**.

C. STANDARD DEPTH DEVIATION

Designs not in accordance with standard depths shall be submitted to the District for prior approval.

2.7 HORIZONTAL AND VERTICAL CURVES

In curved streets, the sewer shall follow the street curvature, but not crossing the centerline. In general, vertical and horizontal curves will not be allowed between manholes unless it is demonstrated that another solution is nor reasonable feasible. Vertical curves should not be used unless excessive extra depth of excavation would otherwise be incurred.

Allowable joint deflections shall be the more stringent of those set forth below and the manufacturer's recommendations.

A. CURVES- VC PIPE:

Joint deflections for curved wastewater lines, that are VCP, shall conform to the following (based upon ASTM C-425)

TABLE 2

Nominal Pipe Size in Inches	Max. Allowed Deflection in/ft (Angle)	Minimum Radius of Curvature in Feet Without Using Deflection Couplings for Pipe Length, "L" of					
		2'	3'	4'	5'	5-1/2'	6'
6 to 12	½ " (2.4 degrees)	48'	72'	96'	120'	132'	144'
15 to 24	3/8" (1.9 degrees)	64'	96'	128'	160'	176'	196'

B. CURVES – ABS COMPOSITE:

Pulling of joints to achieve curvatures shall be limited as follows:

TABLE 3

Pipe Size in Inches	Allowable Play in Coupling	Minimum Radius of Curvature in Feet			
		12.5' Length No Fittings	6.25' Length No Fittings	12.5' Length 3 deg Defl. Fitting	6.25' Length 3 deg. Defl. Fitting
8"	+ 1.9 deg.	400'	200'	110'	55'
10"	+ 1.5 deg.	500'	250'	130'	65'
12"	+1.25 deg.	600'	300'	140'	70'
15"	+1.0 deg.	750'	375'	169'	80'

No beveling of pipe ends will be allowed. Pipe lengths shown above are preferred over cutting odd-lengths to obtain a special radius.

C. CURVES – PVC PIPE:

Except for perhaps 4 inch and 6-inch diameter PVC pipe, deflection at the joints is very limited due to the joint design. Bending the pipe along its length within the trench can attain curvature. Beveling the pipe ends will not be allowed. The following table should be used as a basis for curvature:

TABLE 4

Pipe Size in Inches	Minimum Radius of Curvature in Feet
6”	175’
8”	225’
10’	275’
12”	325’
15”	400’

The above values are independent of pipe length since curvature is not achieved through joint deflection. Curves with smaller radii require deflection fittings or smooth curve “Sweeps”.

D. VERTICAL CURVES:

Vertical curves in sewers shall conform to the requirements for horizontal curves except that the radius shall not be less than 400 feet. Vertical curves may be either circular or parabolic in profile. An approximate formula for determining the required minimum length of a parabolic curve is:

L = R (S 1- S2) where
L = minimum length of curve
R = minimum radius of curve permitted
S1 and S2 are the two sewer grades being used, with S1, being the steeper grade.

2.8 SELECTION OF PIPE MATERIAL

The designer is referred to Section 3.3 and 3.4 Materials, for discussion of the subject.

2.9 MANHOLES

The maximum distance between manholes shall be 400 feet from centerline to centerline. The approved distance for any particular reach may be modified by the items listed below. Brick and mortar block-outs for future extensions are preferred over stub and capped lines except where the exact orientation and slope of the future extension is known at the time of plan submittal.

Unless otherwise approved, all members should be accessible to standard maintenance vehicles. Therefore, manholes placed in back or side yards will not normally approved. Every reasonable effort should be made to provide a paved or gravel roadway to manholes in open space areas.

Section 3.9 Materials, discusses appropriate manhole materials.

A. LOCATION:

Manholes shall be located at the following:

- At all abrupt grade change (too large for a vertical curve)
- At all changes in horizontal alignment (except on curves)
- At all change in pipe sizes
- At the terminal end of all lines exceeding 200 feet in length from the next downstream manhole. Manholes will be required in cul-de-sacs, that have three (3) or more fronting lots.
- At all junctions of main sewers
- At the point of tangency of each reverse curve (No reverse curves will be allowed between manholes, except where the District determines that the nature of the reverse curve is not significant or detrimental to the system).

Manholes shall generally be located no less than 15 feet from the curb line when within a cul-de-sac. Also, manholes shall not be located within the street such that rainfall runoff is directed to the manhole.

Manholes (and cleanouts) shall generally be located at least 10 feet past the downstream property line of the last property served. Where future extensions of the wastewater line will be required, the manhole shall be located parallel with the upstream property line, if required (i.e. within the street along the property's entire frontage).

B. SLOPE OF MANHOLE CHANNELS:

When sewers of uniform size and slope pass through a manhole, the slope shall be maintained and the invert at the center of the manhole shall be given. In sewers that change slope but are uniform in size, the slope of the incoming sewer(s) shall be carried through to the outlet and the invert elevations at the inlet(s) and the outlet shall be given. Where diameters of sewer pipes change, and in junctions involving major direction or slope changes, the various elevations shall be selected to match water surfaces under average (not maximum) flow conditions at ultimate tributary area development.

The slopes in manhole channels indicated below are minimum values and must be increased where required by hydraulic considerations within the manhole.

TABLE OF ADDED DROP THROUGH MANHOLES (in feet)

Diameter of Inlet Pipe	Diameter of Outlet Pipe				
	8”	10”	12”	15”	18”
8”	---	.08	.33	.50	.67
10”	---	---	.25	.42	.58
12”	---	---	---	.17	.33
15”	---	---	---	---	.17

When the incoming sewer makes an angle of 45 to 90 degrees with the outlet sewer, add 0.10’ to the above values with the exception that the minimum drop shall be 0.20’. When the angle is 15 to 45 degrees, add 0.05 to the tabulated value with a minimum drop of 0.10’.

C. DROP MANHOLES:

While not encouraged, drop manholes may be required because of some physical constraint; they should not be used to merely avoid extra depth in trench unless unusual circumstances exit. Where approved, the drop shall not exceed 10 feet and shall be constructed in accordance with **Plate S-17.**

D. UNDEVELOPED AREAS:

Manholes in undeveloped areas require special protection as discussed in Section 3.9 Materials.

E. RIM ELEVATION OF MANHOLES:

Top elevations for all manholes shall be shown on the profile. In paved areas, the manhole rim elevation shall match the finished grade. In other than paved areas or traveled way, the height of the manhole rim will normally be 18 inches above the finished grade, high water mark, or above the top of future fill areas. The elevations shown for the tops of manholes on the design plans shall not relieve the contractor from making final adjustments to match street surfaces.

F. DESIGN (SIZE):

Standard manholes shall be in accordance with **Plate S-9**, a 4' diameter for 8" to 21" pipes. Over 21" requires a 5' diameter manhole. Shallow manholes shall be in accordance with **Plate S-8**. Normally, manholes will be 4' diameter; 5'diameter manholes are required for lines 18" and larger or where the depth to pipe inverts exceeds 18 feet. Where the depth exceeds 18 feet, the cover (lid) shall be 30" for safety reasons.

G. PROTECTION:

Where new sewers are to be connected to a manhole that is in active use, the designer shall require such protection as is necessary to prevent construction debris from being washed into the active sewer. Plugged inlets or other suitable protection shall be required for the active manhole before beginning manhole modification or cleaning of new sewers. Bypass methods shall be to the satisfaction of the District.

2.10 CLEANOUTS

Dead end lines less than 200 feet in length may terminate in a cleanout unless a manhole is required in Section 2.8. If a future extension of said end line will include a manhole within 400 feet of the uppermost manhole, a temporary cleanout is permitted.

A. LOCATION:

Refer to applicable portion of Section 2.8

B. DESIGN

Cleanouts shall be constructed in accordance with **Plate S-13**.

2.11 SERVICE LATERALS

The District will inspect the construction of service laterals from the main sewer line to the property line; also, the tie-in to the lateral from the building or from the house. The latter is to make sure rain water or irrigation water is not plumb into the sewer and that the lateral from the building or house is watertight.

Wherever it is known or can be reasonably assumed that a building sewer connection is required, a service lateral shall be shown on the plans and installed to the property line as a part of the street sewer construction prior to paving. An independent service lateral shall be provided for each owner. Service laterals shall be installed in general conformity with **Plate S-22**.

A. SIZE:

Service laterals for single-family dwellings shall normally be 4" minimum diameter unless otherwise required by the Uniform Plumbing Code. Condominiums or townhouses shall normally be required to have a separate 4 inch minimum diameter laterals, rather than one 6 inch minimum diameter lateral per building. All other laterals for commercial or industrial uses shall be no less than 6 inches minimum diameter.

Pipe lengths for laterals shall not exceed manufacturer's recommendations. The maximum size lateral connection by wye or tee fitting to a large diameter sewer shall be six (6) inches. A manhole shall be installed when an eight (8) inch or larger sewer is connected to an equal or larger diameter sewer.

B. DEPTH:

Service laterals from the main sewer to the property line shall be constructed at a 2.0 percent grade unless otherwise approved. In addition, the depth at the curb or property line shall normally be six (6) feet minimum from the top of pipe to the ground surface.

The grade of laterals within the property should be a minimum of 2.0 percent from the property line to the point of connection to the house.

C. FUTURE CONNECTION:

Unused opening shall be tightly sealed and supported in a manner to facilitate their future location and use. Developer's Engineer shall select appropriate service lateral locations and shall instruct Contractor to locate lateral according to the design elevations and locations. Likewise, the Owner/Developer prior to future connection shall verify the adequacy of such in-place laterals.

D. LATERALS IN CUL-DE-SAC STREETS:

Where numerous laterals connect to the end of a sewer, they shall be brought into a standard manhole. Two such laterals may enter each of three inlet channels in preference to installing numerous wye branches in series downstream from the terminal manhole.

E. BACKFLOW PREVENTION:

It is the designer's responsibility to recognize the possibility to recognize the possibility of reverse flow in service laterals serving lots or buildings with plumbing fixtures below the nearest upstream sewer manhole rim (device required where pad elevation is below upstream manhole rim). In such instances, a suitable backflow or overflow device shall be provided. The lots where prevention is required shall be indicated on the plans; the device or valve used shall be approved and inspected by the Inspector. See Plate No.28 for details and installation.

2.12 STRUCTURAL REQUIREMENTS

A. UNDER ROADS:

All structures and pipe placed under the public roads shall be of sufficient strength to support, with an adequate factor of safety, the backfill, road surfacing and H-20 per AASHTO Standard Specifications, truck loading with impact. Higher loading may be as specified by the Public Works Department or as required by good design.

B. OTHER PIPES AND STRUCTURES:

Sewers designed to cross under or over other pipes or structures shall be protected from damage and shall be constructed to prevent endangering the other pipe or structure. In this regard, particular attention should be given to the possibility and prevention of settlement-caused damage. Also, where future replacement of any line may be extremely difficult due to the pipe or structure, special design consideration may be required. Any of the plates, that detail various encasements or other protection, may be required in such instances.

C. FLEXIBLE JOINTS:

Flexible joints that will allow for differential settlements or other movement of sewer pipe, sewer structures, adjacent pipe and adjacent structures shall be provided where sewer lines enter encasements, manholes or other structures. Flexible joints shall be within a minimum of 24 inches of such structure, except for ABS Composite pipe for which this requirement does not pertain.

D. STEEP GRADES:

Sewers laid on grades steeper than 10 percent, that are not under, nor intended to be under pavement should be examined for possible erosion protection. Where the slope exceeds 30 percent (3.33 horizontal to 1 vertical) a redwood check dam, **Plate W-9** shall be installed across the trench line at 20 feet intervals to prevent erosion.

Slopes above 35 percent (2.86 horizontal to 1 vertical) shall required sand/cement bags be placed along the trench line at intervals specified to reduce the flow of water within the pipe trench.

Concrete anchors in accordance with **Plate S-19** will only be required in special instances, where such anchorage is deemed necessary to prevent pipe movement.

2.13 PRIVATE (RESIDENTIAL) PUMPING SYSTEMS

General District policy is to avoid private residential pumping systems except in those cases where such a system is either:

- In the District's best interests or
- The only method for sewering a lot that cannot be adapted to a gravity system or eliminated.

In any case, the use of a private pumping system requires a special District approval.
Where such a system is employed, the District will not accept responsibility for the satisfactory operation and maintenance of the private system; a document recorded against the property shall confirm this. However, while the design responsibility rests with the Developer/Owner, the following are considered to be minimum standards:

A. All equipment and accessories shall be standard manufactured items with those in contact with sewage being specifically manufactured for sewage use.

B. The Engineer shall submit, if required, a listing of satisfactory installations using the same products.

C. Individual systems shall meet the requirements shown below. Of particular importance are the following:

- The sump shall have a minimum 400 gallon capacity
- The system shall be of the duplex type (2 pumps) and have duplex controls that will automatically alternate the pumps and energize both pumps and an alarm during high liquid level.
- Pumps shall be heavy-duty centrifugal non-clog type with mechanical seals and cast iron construction. Each pump shall have a minimum 60-gpm capacity when pumping against a total dynamic head of 20 feet. The impeller shall have a 2-inch solids handling capacity. The motors shall be completely oil filled and fully submersible.
- Discharge line shall be 3-inch in diameter with a working pressure of not less than 150 psi. All underground discharge piping shall be PVC schedule 40 and above ground piping shall be PVC schedule 80.
- The shutoff valve shall be either the ballcentric or eccentric type with a working pressure of not less than 150 psi and suitable for wastewater use. The check valve shall be a rubber swing non-slamming type with a working pressure of not less than 150 psi and suitable for wastewater use.

D. The discharge lines shall be arranged such that there is gravity flow into the main sewer from the property line.

E. Where a unit serves a number of homes, it shall be sized to handle daily flows of at least 500 gallons per day and a peak discharge into the unit to reflect the number of residences.

F. All controls shall be non-fouling type and all mechanical and electrical equipment shall equal or exceed pertinent codes.

G. Backflow prevention devices as required to prevent water system contamination shall be installed.

H. Where pumping unit is proposed, it shall be requested prior to tentative tract map approval, except for those cases where the District may decide to approve the unit on a later dated.

2.14 FORCE MAINS AND LIFT STATIONS

All sewage shall reach the system by gravity flow, in a fresh (non-septic) condition susceptible to conventional sewage treatment processes. Where extreme hardship conditions prevail and a substantial area cannot be sewered by gravity sewers in accordance with these requirements, a sewage pumping station may be considered. No pumping facilities shall be designed or incorporated in sewer plans without prior approval.

A. LIFT STATIONS DESIGN:

Lift stations, where permitted, shall be of the dry pit type incorporating the following features:

1. Pumps or other devices shall be provided in duplicate, arranged for Positive priming.

2. Capacity shall be provided to handle ultimate peak flow from the tributary area with the largest pump out of service. Stage installation of pumps will be permitted if space is provided for future pump units.

3. Access shall be provided to site for removal and repair of equipment.

4. A means for dewatering force mains shall be provided.

5. Holding capacity in the wet well equivalent to a 24-hour accumulation of sewage from the fully developed area tributary to the pump station.

6. Bottom of wet well shall slope to suction lines at least 1.75 vertical to 1.0 horizontal. It is recommended that the width of the flat bottom in the wet well not exceed twice the diameter of the suction pipes.

7. Pump stations for newly developed areas shall not be located in road right of way, but shall be located on a separate parcel of land and shall include a fence, gates and landscaping, etc. Pump stations located in road right of way will only be considered when it can be demonstrated to the District that no other site out of the road right of way is possible and such facility is not temporary.

8. Pump station shall be suitable adjustable level control sump pump, dehumidifier, ventilation, locking entrance door, running time meters, and cathodic corrosion control.

9. Pump and fittings shall be designed to permit the passage of a three (3) inch diameter sphere through the pump.

10. Standby power with automatic pump drive transfer shall be provided. Consideration should be given to using natural gas engines.

11. Compressor to inject air into the force main at a point outside of pump station so that air will not collect back of check valve with possibility of air locking pump.

B. FORCE MAINS:

Force mains shall be laid on a continuous positive grade and to grades designed to eliminate air pockets in the line.

C. CONSTRUCTION OF SPECIAL STRUCTURES:

Design criteria for special facilities (i.e. junction boxes, etc.) that are not covered in previous sections are to be prepared individually for each specific job, and shall be as approved.

2.15 INDUSTRIAL WASTE DISCHARGE

The Developer/Engineer should be aware that the District regulates the physical and chemical content of wastewaters discharged to the sewerage system. These regulations are contained in an industrial waste ordinance, Ordinance 22-06.

Typically, this ordinance only applies to those developments that produce a discharge other than domestic wastewater. However, the ordinance should be reviewed if wastewater will contain any hazardous toxic materials, heavy metals, or any other substance that may be harmful to the operation and maintenance of the sewerage system. The ordinance then requires either the substance be prohibited from discharge or pre-treated prior to its discharge to the sewer.

Also, Plate No.29 details a sampling well that may be required of any industrial discharges.

2.16 ABANDONMENT OF WASTEWATER LINES

Refer to Section 8.0

2.17 EXCERPT FROM ORDINANCE 22-06 RELATING TO SANITARY SERVICE

CAMROSA WASTER DISTRICT INDUSTRIAL WASTE ORDINANCE 22-06

CHAPTER VI SANITARY SERVICE INFORMATION

SECTION 38. Sanitary Service Area:

Camrosa Water District has facilities capable of providing Sanitary Service to approximately 50% of its customers. The boundaries of the existing service area are:

1. North of the 101 Freeway to Worth Way and;
2. Calleguas Creek on the West to Morongo Drive on the East.
3. California State University, Channel Islands
4. Casa Pacifica, Las Posadas, Villa Calleguas

There are a few homes within this service area that do not currently have Sanitary Service because, either main line sewers are not yet immediately accessible, or the homes were built and used septic systems prior to the installation of sewer facilities. These customers will become part of the sanitary system as soon as facilities are either extended to their properties or their septic systems become unserviceable.

Sanitary Service south of the 101 Freeway, and within the Camrosa Water District boundary, is provided by the City of Camarillo while Camrosa provides the Water Service. The only exceptions are listed as #3 and #4 above.

SECTION 39. Connection to District Facilities:

Connection to District is unrestricted provided all fees have been paid and the type of discharge is not detrimental to either the collection system or the treatment process.

***SECTION 40. Construction Materials*:**

District sewer mains are fabricated of either Vitrified Clay Pipe(VCP) or Polyvinyl Chloride(PVC). Proper connecting material must be used relative to each type of pipe. Check with the District prior to excavation. Laterals from the building to the main are generally acceptable if fabricated of VCP, PVC, Acrylonitrile-Butadiene-Styrene(ABS), or High Density Polyethylene(HDPE) but care must be taken to ensure that the proper coupling is used when making the connection to pipes of differing materials.

SECTION 41. Contractors:

It is advised that customers utilize the expertise of contractors experienced in sewer line installation whenever a connection to a District main or lateral occurs. The Sewer Permit Fee is required and includes the inspection of connection work, but only in the case of experienced contractors. Should the District be required to provide unreasonable additional advice or inspection, an invoice will be sent covering the additional time needed to complete the job to District Standards.

SECTION 42. Equivalent Dwelling Unit:

Equivalent Dwelling Unit (EDU) is the assumed amount of discharge from a standard single-family dwelling. In most residential cases whether apartments, condominiums, townhouses, duplexes, or single-family dwellings, an assumed EDU of 1 is assigned.

For Industrial and Commercial customers, the assigned EDU figure will be based upon one of the following criteria:

1. Fixture count provided by the customer where each group of 25 fixture units is equal to 1 EDU;
2. If a known quantity of discharge is available, it will be divided by the current gallons per day average for all sewer accounts as defined in the current schedule of rates, fees, and charges.
3. Standard factors for Municipal and Industrial users are listed in Section 44.

<u>If the originally assigned EDU becomes inadequate due to a change in operation, ownership, or any other factor, the District reserves the right to recalculate the EDU at any time based upon the change in discharge.</u>

SECTION 43. Amendments to Rates:

Rates and Fees are under the administration of the District Board of Directors and will be changed periodically as circumstances dictate. The Board of Directors of Camrosa Water District reserves the right to investigate the appropriateness of Rates and Fees from time to time and make any modifications that are deemed necessary to maintain the effectiveness of District wastewater collection and treatment facilities. Any changes will be brought about by a Resolution of the Board and in accordance with the laws and regulations governing such action.

SECTION 44. Rates & Fee Charges:

The “Customer” shall pay all assigned rates, fees, and charges, for the type and class of service provided, in the manner and within the time-frame set forth in the Camrosa Water District “Schedule of Rates, Fees and Charges for Water and Sanitary Services” as established and amended from time to time by the Camrosa Board of Directors.

SECTION 45. Calculation of Connection & User Fees:

STANDARD FACTORS
USED in THE DETERMINATION of RESIDENTIAL, COMMERCIAL, and INDUSTRIAL CONNECTION and SERVICE FEES*

CATEGORY	FACTOR
RESIDENTIAL	
1. Single Family Residence Detached	1.00
2. Single Family (per unit):	
(a) Condominium	1.00
(b) Apartment	1.00
(c) Airspace Townhouse	1.00
(d) Duplex	1.00
3. Mobile Home (per unit)	1.00
4. Granny Flat:	
(a) if to be sewered separately	0.50
(b) if to be connected to existing sewer	1.00 per 25 Equivalent fixture units (Recalculate equivalent fixture units of existing house plus Granny Flat.)

Commercial - Dry	FACTOR
1. RV & Construction Trailer (if to be connected to sewer)	$125.00 flat fee
2. Banks & Financial Institutions	$0.30 per 1,000 SF of GFA
3. Barber and Beauty Shops	0.10 per each Barber/Beauty Chair
4. Dry Cleaners	1.7 per 1,000 SF of GFA
5. Flower Shops	0.50 per 1,000 SF of GFA
6. Halls, Lodges, Auditoriums w/ Public Restrooms	0.30 per 1,000 SF of GFA
7. Medical and Dental Offices	0.40 per 1,000 of SF of GFA

8. Mortuaries	**0.80 for each slumber room**
9. Office Buildings	**0.20 per 1,000 SF of GFA**
10. Retail Stores	**0.20 per 1,000 SF of GFA**
11. Service Stations – without Garage	**0.10 for each gas pump**
12. Warehouses	**0.10 per 1,000 SF of GFA**
13. Industrial/Manufacturing – Dry	**0.36 per 1,000 SF of GFA**

COMMERCIAL- WET

1. Auto Dealerships	**0.2 per 1,000 SF of GFA**
2. Bakeries, Donut Shops	**0.50 per 1,000 SF of GFA**
3. Bars	**0.70 per 1,000 SF of GFA**
4. Bowling Alleys	**0.40 for each bowling lane**

5. Car Washes:

(a) Automatic	**1.00 per 12,000 gallons of water used each month**
(b) Self-service	**0.70 for each washing stall**

6. Garages / Service Stations with Garages	**0.10 for each service bay + 0.10 for each pump if present**
7. Health Clubs and Gymnasiums	**0.30 per 1,000 SF of GFA**
8. Hospitals	**1.0 per 12,000 gallons water used each month**
9. Rest and Convalescent Homes	**0.30 per bed**
10. Hotels & Motels	**0.30 for each sleeping room**

11. Laundries:

(a) Self- service	**0.50 for each machine**
(b) Commercial/ Industrial	**1.00 per 12,000 gallons water used each month**

SECTION 45. CALCULATION OF CONNECTION AND USER FEES: (Continued)

COMMERCIAL- WET (cont.)	**FACTOR**
12. Restaurants:	
(a) Dine-In	**2.00 per 1,000 SF of GFA**
(b) Dine-in and Take-out	**1.70 per 1,000 SF of GFA**
(c) Take-out (no public bathrooms)	**1.50 per 1,000 SF of GFA or 1.00 per 12,000 gallons water used whichever is less**
13. Markets, Grocery Stores:	
(a) With garbage disposal units	**0.60 per 1,000 SF of GFA**
(b) Without garbage disposal unit	**0.20 per 1,000 SF of GFA**
14. Theaters	**0.30 per 100 seats**

INDUSTRIAL	**FACTOR**
15. Industrial/Manufacturing	**0.3 per 1,000 SF of GFA**
(a) Wet Industrial -	**Uses and discharges water as part of manufacturing process or listed as a categorical industry in 40 CFR**

SECTION 45. CALCULATION OF CONNECTION AND USER FEES: (Continued

INSTITUTIONAL

1. Places of Worship	**0.20 per 1,000 SF of GFA**
2. Public Agencies	**0.60 per 1,000 SF of GFA**
3. Schools	
(a) Primary	**1.00 per 200 students**
(b) Secondary (Jr. High, High School)	**1.00 per 150 students**
(c) College or University	**1.00 per 100 students/faculty and support personnel combined, or** **1.00 per each calculated Equivalent Dwelling Unit (EDU) based upon known usage factors, or 1.00 per 12,000 gallons of water used each month, whichever is less.** **On-campus housing will be factored based upon the EDU, if a Fixture Unit Count form is submitted. The resulting EDU will be ***added*** to the result of one of the preceding methods.**

***In no case will the connection fee or service factor be less than (1) one when used with regard to individual connections. The factors are used to calculate additional total fees and service factors when the expected quantity of discharge will exceed the standard for (1) one Equivalent Dwelling Unit (EDU).**

SECTION 3.0

MATERIALS

3.1 GENERAL REQUIREMENTS

Materials shall be chosen for their strength, durability and ease of maintenance, with due consideration for dead and live loads, beam strength and resistance to corrosion. Pipe joints shall be selected to provide positive protection against entrance of roots and ground water, with sufficient flexibility to adjust to the trench bedding. All materials, unless specifically approved otherwise, shall be new and unused.

This section establishes the material requirements for pipe products, backfill materials, and manholes. Approval to use any of these materials on a specific project is subject to the constraints imposed by other pertinent sections of these standards or as required by the District.

In general, pipe installations for most projects will use PVC, VCP, DIP or ABS products. Unless the District takes exception during the plan checking process, it can be assumed that any of the four products is acceptable. However, if exception is made, such shall be reflected in the next plan check. Where alternate materials are shown, the corresponding pipe material must indicate the various load factors for each reach.

3.2 TESTING AND FINAL ACCEPTABILITY OF MATERIAL

The District shall require such tests and certification as deemed necessary to show that the specified materials have been employed. Not-withstanding prior factory or yard inspections, the District shall have the right to reject any damaged or defective materials found on the job that will affect the durability of the installation and order its removal from the site.

3.3 RIGID PIPES

Rigid pipe, fittings and joint materials specified consist of Vitrified Clay (VC), Reinforced Concrete (RC) and Ductile Iron (DI).

A. VC PIPE AND FITTINGS:

All VC pipe and fittings shall conform to the quality and strength requirements of ASTM designation C700 and C301 as it pertains to extra strength, unglazed vitrified clay pipe. Each section of pipe shall be stamped with either “ES” or “Extra Strength” designating the strength

class. VC pipe joints shall either plain end or bell and spigot, with joints conforming to ASTM C425.

"Bandseal" joint is acceptable provided:

1. A heavy duty, corrosion resistant shear ring is used

2. Clamps and bolts are supplied by manufacturer (type 316 stainless steel)

3. Collar is Butadiene Styrene synthetic rubber as supplied by manufacturer.

4. Bolts should be tightened with a special torque wrench as recommended by the pipe and manufacturer.

B. DI PIPE AND FITTINGS

Ductile Iron pipe and fittings shall conform to ASTM A746. The tensile or ultimate strength shall be 60,000 psi, minimum with a yield strength of 42,000 psi minimum. All pipes and fittings shall be of sufficient thickness to withstand the designed working pressure and depth of cover. Each pipe length shall be marked with "DI" or "Ductile Iron" and either a strength class or thickness.

If required, the pipe shall have a polyethylene liner complying with the requirements of ASTM D1248 and having a thickness of approximately 20 mils. Such a liner shall be similar to that manufactured under the trade name "Polyband"

All ductile iron pipe and fitting together with connecting ferrous-bodied fittings, that are to be buried shall be encased in polyethylene film prior to backfilling area. Polyethylene encasement (baggy) shall conform to AWWA C 105 (ANSI A21-5)

3.4 PLASTIC PIPES

Plastic pipe, fittings and joint materials specified herein consist of Polyvinyl chloride(PVC), Acryclonitrile Butadiene Styrene (ABS), and Polyethylene (PE). The pipe manufacturer shall supply all material incidentals to plastic installations such as gasket, joint lubricants, cements etc. All plastic pipes shall be bedded and backfilled as specified in **Plates S-2 and S-3**.

All plastic pipes entering or leaving a manhole shall have a standard gasket supplied by the pipe manufacturer firmly clamped around the pipe exterior and cast into the concrete structure base or near the structure wall center as a water stop.

A. PVC PIPE AND FITTINGS:

Pipe and fittings shall conform to the quality requirements and strength characteristics of ASTM D3034 'Type PSM Poly Vinyl Chloride (PVC) Sewer Pipe and Fittings". The Standard Dimension Ratio (SDR) shall be 35 minimum where the SDR is the ratio of pipe diameter to wall thickness. Pipe straightness shall be a minimum of 1/16th inch per foot unless otherwise approved. Pipe shall have an Integrated Bell Gasket Joint. Rubber sealing gaskets shall meet the requirements of ASTM D3212. Pipe bells shall have the rubber ring present in the bell groove at the factory. No solvent cement joints will be allowed.

Pipe shall be clearly marked as follows at intervals of five feet or less:

- Manufacturer's name or trademark
- Nominal pipe size
- PVC cell classification (12454-B or 12454-C or 13364-B)
- Legend "Type PSM SDR-35 PVC Sewer Pipe
- ASTM D3034

Fittings shall be clearly marked as follows:

- Manufacturer's name or trademark
- Nominal Size
- Material Designation "PVC"
- "PSM"
- "ASTM D3034"

PVC solid wall laterals shall conform to ASTM D3034, Type PSM, as well as the following:

Inside Diameter (I.D.)	SDR	Minimum Wall Thickness
4"	35	0.125
6"	33.5	0.180"

B. ABS PIPE AND FITTINGS:

ABS pipe, fittings and cement specified herein shall conform to quality requirements and strength characteristics of ASTM D2680 as it pertains to composite pipe.

Jointing of pipe shall be in strict accordance with the manufacturer's recommendations (See Section 7.6). Deviation of pipe straightness shall be a maximum of 1/16th inch per foot unless otherwise approved.

Joint solvent cement shall conform to ASTM D2235 and pipe shall have a home mark to indicate full penetration of the spigot when a joint is made.

Pipe shall be clearly marked as follows at intervals of five (5) feet or less:

- Manufacturer or principal supplier's name
- Nominal pipe diameter
- Material designation "ABS"
- "ASTM D2680)"

ABS laterals shall be solid wall type conforming to ASTM D2751 with the minimum wall thickness being 0.125" (SDR 33.5) for 4" and 0.180" (at SDR 35) for 6", or as recommended by the manufacturer.

Lettering on the fittings as well as pipes shall be legible and permanent under normal conditions of handling and storage.

C. PE PIPE AND FITTINGS:

Unless otherwise approved, all polyethylene pipe and fittings shall conform to the quality and strength requirements of ASTM D1248 Type III with PPI recommended designation of PE3406. The pipe material shall contain ingredients to provide protection against ultraviolet degradation during processing and subsequent weather exposure. Approved method of joining pipe and fittings to one another shall be by the thermal butt fusion system. Personnel trained by the pipe supplier must do all fusion, or other qualified persons, using approved tools and equipment. In addition, pipe lengths, fittings and flanged connections to be used shall be of the same type, grade, and class of polyethylene compound and supplied by the same raw material supplier. Pipe class or thickness shall be the higher of the manufacturer's recommendations or as required by the District.

Marking on the pipe shall include the following at intervals of five (5) feet or less:

- Manufacturer's name or trademark code
- Nominal pipe size
- Type of plastic material "PE3406"

Polyethylene pipe usage is reserved for special conditions; therefore, no installation specifications need be included here.

3.5 OTHER PIPE MATERIALS

Other pipe materials may be approved by the District for a specific project.

3.6 PIPE TRENCH MATERIALS

Refer to Plate No.3 for trench cross- section terminology.

The materials listed below should be considered as standards unless specific approval is received to deviate from the values shown. In such instances, the request should be made prior to any installation. All sand/gravel mixtures shall be free of vegetable matter or other deleterious substances.

A. TYPE A MATERIAL:

Shall be well- graded imported sand with varying sizes within the following range:

Sieve Sizes	Percent Passing
No. 4	100
No. 8	80-95
No. 200	0-10

B. TYPE B MATERIAL:

Shall be an imported sand/gravel mixture as follows:

Sieve Size	Percent Passing
¾"	100
No. 4	35-65
No. 200	0-10

And have a sand equivalent (SE) value of not less than 30.

C. TYPE C MATERIAL:

Shall be an imported sand/gravel mixture that may be approved as an alternate to type B material as follows:

Sieve Size	Percent Passing
¾"	100
½"	90-100
3/8"	40-100
No. 4	30-80
No. 8	0-45
No. 200	0-5

D. TYPE D MATERIAL:

Shall be imported gravel/rock mixture as follows:

Sieve Size	Percent Passing
¾"	100
½"	90-100
No. 4	10-30
No. 8	0-15

E. TYPE E MATERIAL:

Shall be an imported gravel/rock mixture as follows:

Sieve Size	Percent Passing
1"	100
¾"	90-100
3/8"	20-55
No. 4	0-10
No.8	0-5

The above material corresponds to ASTM D448, Size #67 and AASHTO M-43 Size #67.

F. TYPE F MATERIAL:

Shall be native material removed from the trench excavation or nearby surroundings, that is free from vegetable matter, trash or other rubbish, and other deleterious matter. The material shall meet the following:

- Within pipe zone to 6” (where approved) - 1” max. size
- Within pipe zone to 12” (above pipe) - 1-1/2” max. size
- Above pipe zone - 6” max. size or as required by PW whichever is more stringent.

G. TYPE G MATERIAL:

Shall be rock as follow:

Sieve Size	Percent Passing
2-1/2”	100
¾”	0-20

This material is primarily intended where the trench has been over-excavated so that a firm foundation can be made in areas of excessive groundwater flow. In such cases, transition material must be used to separate the pipe from the coarser type G material.

3.7 SPECIFIC USES OF PIPE TRENCH MATERIALS

The following can be used as a guide for the selection of proper trench materials, along with the information contained on the plates. However, if the designer feels that more stringent backfill materials should be specified, thus this should be done.

MATERIAL TYPES

	VCP		PVC			ABS COMPOSITE		
	LF	LF	LF	LF	LF	LF	LF	LF
Zone	1.5	1.9	1.5	1.7	1.9	1.5	1.7	1.9
Foundation			G or	Same	As	Bed	ding	
Bedding	A	E	A	B	Conc.	A	D, E	Conc.
Haunching	A	E	A	B	Conc.	A	D, E	Conc.
Initial Backfill	A	A, E	A	B	B	A	A, D, E	A, D, E
Final Backfill	F	F	F	F	F	F	F	F

Refer to the plates for additional details. Also the selection of any pipe trench material should consider a well-graded product within the limits specified above. This will lessen the incompatibility of adjacent materials and subsequent trench settlement.

3.8 ROADWAY MATERIALS

Pavement materials for resurfacing of trenches cut into existing pavement shall comply with the requirements of the City or County or CalTrans, whoever has jurisdiction. Asphalt, aggregate base and aggregate sub-base specifications are those set by the latest published edition of State of California, Department of Transportation Standard Specifications.

3.9 MANHOLES

Manhole materials shall conform to those listed in **Plates S-7 through S-11**, in addition to the following:

A. DESIGN AND CONSRUCTION

The Design and pre-cast construction of manhole sections shall conform to ASTM C478 that include the following (for information):

- Concrete shall be a minimum 4,000 psi compressive strength.
- Access opening shall be a minimum of 24 inches in diameter.
- Barrel diameter shall be a minimum of 48" in diameter for sewer lines up to 21" in diameter. Lines larger than 21" require 60" barrel sections.
- Eccentric cones shall be used with the offset pointing in the direction of sewerage flow.
- Rejection of the manhole section may be made if:
    (1) There are damaged or cracked ends, where such damage would prevent making a satisfactory joint.
    (2) Any continuous crack having a surface width of 0.01 inches or more and extending for a length of 12 inches or more regardless of position in the wall.
    (3) Fractures or cracks passing through the wall except for a single end joint that does not exceed the joint depth, or
    (4) Surface defects indicating honeycombed or open texture.

B. HANDHOLD

Upper handhold is to be ¾" minimum diameter and shall be stainless steel or hard rubber.

C. JOINTS

Joints between riser sections shall be cleaned and a preformed plastic or "mastic" sealing gasket or joint filler shall be installed prior to setting the next barrel or cone section. Cement grouting will only be allowed for the joint between the bottom ring and the base.

D. UNDEVELOPED AREAS:

When manholes are constructed in natural or man-made drainage courses or flood channels, the manhole covers shall be watertight and shall be fitted with a composition gasket and bolted down with eight (8) stainless steel cap screws. In other undeveloped areas above the high-water level, bolt-down vandal-proof manhole covers shall be used as specified on **Plate S-12**.

Where required to prevent an extremely visible manhole in an area, that is otherwise improved, additional camouflaging may be required.

3.10 MANHOLE INTERIOR COATING

The interior of all new manhole sections shall be lined with a polyurethane coating system. The polyurethane coating system shall result in a dry film thickness of 100 mils. The top-coat material shall be 100% solid, non-solvented, elastomeric polyurethane as manufactured by Zebron Corporation, P.O. Box 2874 Newport Beach, California 92659, or approved equal. Surface preparation, priming and application shall conform to the manufacturer's recommendations. Any plastic lining sheets, lining cast-in–place concrete, shall be protected and shall not be coated or over-sprayed with the polyurethane coating.

3.11 MANHOLE EXTERIOR COATING

If water table is encountered during pipe laying, the exterior bottom 4 feet of all wastewater manholes shall be coated with 2 coats of Henry's 508 or Sealant Products, Inc BG-50 or an approved equivalent in accordance with the manufacturer's recommendations for application. Coating shall be cured as recommended by the manufacturer prior to placement of backfill against the coated surfaces.

3.12 MANHOLE /CLEANOUT COVERS

All public manhole covers shall have "Camrosa Water District" or "CWD" cast around the perimeter of the top with a minimum 1-1/2" inch letters followed by the word "Sewer" indicating the use of the manhole. Two inch letters are preferable but not required. For private sewers, omit "Camrosa Water District" or "CWD" on the lid and substitute "Private". Cleanout lids shall include the word "Sewer".

3.13 CONCRETE MATERIAL

Approved concreter material shall be based on the 28 day compressive design strength and shall be chosen according to the following chard showing its intended use:

Class	Application	28 Day Compressive Strength, PSI, minimum	Maximum Aggregate Size, Inches	Slump Inches	
				Min	Max
A	Walls, drip structures and reinforced structural encasement	3,500	1-1/2”	3	6
B	Manhole bottoms, drop pipe encasement, pipe bedding, non-structural use	3,000	1-1/2”	2	6
C	Pump mix for abandoning lines	2,000	3/8”	-------	-------

3.14 REINFORCING STEEL

A. BAR REINFORCEMENT:

Shall be grade 40 minimum deformed bars conforming to ASTM A615, accurately placed and secured in position to accomplish the intent of the design plans. Where bars are spliced they shall be lapped at least twenty (20) diameters or butt welded, except where otherwise shown on the plans.

B. MESH REINFORCEMENT:

Mesh reinforcement shall conform to the requirements of ASTM A185, wire gauge and mesh dimensions will be as shown on the plans.

SECTION 4.0

REQUIREMENTS FOR PREPARATION OF PLANS

4.1 GENERAL:

Camrosa Water District has established procedures that must be followed in the preparation of plans. Deviations from these requirements, unless specifically authorized, will be cause for rejection by the District.

4.2 SHEET SIZE

Overall dimensions 24” x 36”

4.3 MARGINS

Two (2) inches on the left, all others ½ inches.

4.4 SIGNATURE BLOCK

All sheets of the plans shall have an approved signature block, see Plate No. ___. The approval blocks shall be signed before any construction can occur. Any changes to the plans after the initial approval shall be shown as revisions and shall be approve by the District.

4.5 COVER SHEET

This shall be the first sheet in the set and shall contain:

A. INDEX MAP:

An index map with an overall plan at a scale of 1” = 300 feet, showing general layout of sewer lines, sizes, manhole locations and numbers, flow direction arrows, named streets, tract boundaries, lot boundaries and numbers, sheet index, and other pertinent information. Care must be exercised to make sure scale and orientation is correct since these index maps are used to produce wastewater atlas and incorrectly drawn maps will have to be redrawn.

B. VICINITY MAP:

A vicinity map with a scale of 1” = 1,000 feet showing tract boundary, streets, adjacent tracts, major streets outside of tract boundaries and the location of the bench mark.

C. BENCH MARKS:

All benchmarks used in the project shall be graphically shown on this sheet and the elevations, descriptions, locations, etc., spelled out as illustrated below:

B.M. _____ Elev. _____ F.B. _____ Page _____

Type of Marker _____

Location _____

All elevations used in preparation of standard plans shall be based on United States Coast and Geodetic Survey (U. S. C. & G.S.) mean sea level datum ,Adjusted to 1961.

D. GENERAL NOTES:

The General Notes shall be shown on the key map sheet and need not be shown on the other sheets. The General Notes shall include the following:

GENERAL NOTES

1. Before any work can be started, the Contractor must obtain a permit to excavate from the agency having jurisdiction. The Contractor shall pay all costs for said permit including Plan Checking (if any) and Inspection costs

2. Grades to which these improvements are to be constructed are shown on Plans and Profiles. Grade Points for sidewalk at the property line, centerlines of the streets, or centerlines of alleys and easements are shown by circles on profiles. At all points between designate points, the grade shall be established so as to conform to a straight line drawn between designated points.

3. Elevations are in feet above U.S.C & G. S. mean sea level datum adjusted to 1961.

4. This drawing and the data hereon are hereby made a part of the Standard Specifications. Work shall be constructed according to the District's Specifications and in the presence of the District's Inspector.

5. No revisions shall be made in these plans without the approval of the District's General Manager.

6. No representative of the District will survey or lay out any portion of the work.

7. The Contractor shall notify District five (5) working days prior to starting any work on this project, and 24 hours advance notice for inspection service.

8. All known interferences in existing streets have been shown on the plans. The Contractor shall use due care and assume responsibility for any damaged done to existing facilities.

9. Vertical trench shoring shall conform to the Orders of the State of California, Division of Industrial Safety.

10. Resurface and backfill all trenches within paved are shall meet the requirement of the agency having jurisdiction.

11. If work is to be done in a State Highway, an Encroachment Permit must be obtained by the Contractor from the State of California.

12. Location of existing utilities shown have been determined from available information, however, it shall be the responsibility of the Contractor to determine the true location of any existing utilities and to exercise proper precaution to avoid injury or damage there to.

13. The facilities constructed under this project shall <u>not</u> be connected to the District's sewer system until accepted by the District.

14. Developer/Owner shall obtain the Wastewater Will-Serve Letter prior to construction.

15. Developer's/Owner's Engineer must furnished the District one set of Mylar drawings and two sets of prints prior to construction.

16. Acceptance of the constructed facilities shall be in accordance with the terms and conditions set forth in the current "Water and Wastewater Rules and Regulations" of the District

E. WASTEWATER OR SEWER NOTES:

The Wastewater or Sewer Notes shall be shown on the key map sheet and need not be shown on the other sheets. The Wastewater Notes shall include the following:

WASTEWATER NOTES

1. Wastewater specifications and standard construction drawings of the Camrosa Water District shall govern the materials and installation of the project.

2. All pipes shall be PVC C900 SDR 35 or VCP conforming to ASTM C200.

3. The Developer's/Owner's Engineer shall furnish the District with Grade Sheets and stationing for all house laterals and "Y" branches and shall provide stakes for them at their proper locations with stationing plainly marked. Any change in location shall be requested in writing.

4. All sewer stationing shall be along the centerline of the sewer.

5. The Engineer shall furnish the house lateral depth from the sidewalk elevation at the property line for each house lateral on the grade sheet.

6. House laterals to be constructed with invert elevations at the property line four (4) below sidewalk elevation.

7. Minimum clearance between sewer and waterline shall be per Ventura County Ordinance # 1457 and 1596.

8. Manholes shall be pre-cast concrete per District Standard S-2.

9. Use standard manhole frames and covers per District Standard S-7 except as noted.

10. Manhole tops in unimproved rights-of-way are to be six (6) inches above finish grade.

11. No construction will be permitted in filled areas unless acceptable certification is submitted to the District that relative compaction is greater than 80 percent of maximum; if compaction is less than 90 percent of maximum, cradling or special manhole bases will be required.

12. The Contractor shall keep strict record of the location of all wyes, tees and laterals so their final location may be shown on the “As-Built” plans. Where yard cleanout is located under a pavement, District Standard Plate S-16A applies.

13. No connections for the disposal of industrial waste shall be made to sewers without written permission from the District.

14. All sewer line testing shall be in accordance with the District’s Specifications.

15. All pipe bedding shall be import material unless Developer furnishes soil reports or survey satisfactory to the District that the native soils are suitable for pipe bedding.

16. Contractor shall mark the location of all sewer services on the face of the curb by chiseling the letter “S” two (2) inches high and “1/8’ deep on the concrete. Contractor shall be liable for damages caused by wrongfully marked sewer service.

17. After pressure testing and cleaning but prior to final acceptance, all sewer lines eight (8) inches in diameter and larger, will have a video taped record of the interior performed. The Developer has the option of hiring a Contractor to accomplish this requirement or can pay through development fees to the District to accomplish this.

18. The interior of all new manhole sections shall be lined with a polyurethane coating system. The polyurethane coating system shall result in a dry film thickness of 100 mils. The top-coat material shall be 100% solid, non-solvented, elastomeric polyurethane as manufactured by Zebron Corporation, P.O. Box 2874 Newport Beach, California 92659, or approved equal. Surface preparation, priming and application shall conform to the manufacturer’s recommendations. Any plastic lining sheets, lining cast-in–place concrete, shall be protected and shall not be coated or over-sprayed with the polyurethane coating.

19. If water table is encountered during pipelaying, the exterior bottom 4 feet of all wastewater manholes shall be coated with 2 coats Sealant Products, Inc BG-50 or an approved equivalent in accordance with the manufacturer’s recommendations for application. Coating shall be cured as recommended by the manufacturer prior to placement of backfill against the coated surfaces.

4.6 PLAN AND PROFILE DETAILS

A. PLAN AND PROFILE DRAWINGS REQUIREMENTS:

a. All plan and profile sheets shall contain:

- A graphic scale, horizontal as well as vertical, illustrated such that a true representation is produced when the plans are reduced in size, and they shall be as follows:
  Horizontal 1" = 40 feet
  Vertical 1" = 4 feet *

  * Double scale drawing, i.e. 1"= 80' may only be submitted where the pre-dominant slope of the existing ground surface exceeds 15 percent. In such cases the words " Double Scale" shall be boldly shown.

- A north arrow oriented toward the top or to the right only. Generally, north shall be oriented towards the top or right side of the sheet.

b. Plan drawings shall show locations of wastewater mains, lateral locations and other structures in relation to survey lines and stations.

c. Provide all data for horizontal deflections or curves and indicate limits of easements.

d. Any known pad locations that are adjacent to an easement be shown as well as fences, walls, etc. that are within the easement.

e. Show and label on the plans the size and ownership of all existing and/or proposed underground utilities that cross or parallel the waterline.

f. Profiles shall show the grade, including any vertical curve data, size and type of pipe and the distances involved with pipe types or sizes.

g. Any special encasement required to carry loads on the pipe shall also be shown.

h. Items such as manholes and other structures or appurtenant features shown on the plan shall also be shown on the profile.

i. Profiles of centerlines of all pipes are to be plotted directly above the plan views.

j. The grade of major paralleling lines within (4) feet of the wastewater line shall be shown.

k. Any pipeline that crosses the wastewater line, especially water, gas, telephone, power, storm drains, cable TV, and oil lines shall be shown and labeled on the plan and profile.

l. The District is not responsible for the accuracy of the location of the existing underground utility lines and approval of the water plans by the District does not constitute a representation as to the accuracy of the location of, or the existence or non-existence of any underground utility, pipe or other structure within the limits of the project.

m. All water and sewer main crossings shall be shown in profile to assure compliance with Ventura County Water-Sewer Separation Ordinance.

n. Water and sewer main crossing shall have a minimum of three (3) feet vertical separation or comply with Standard Plate W-35.

o. Water and sewer mains and lateral crossings shall have a minimum of two (2) feet horizontal separation or comply with Standard Plate W-35.

p. No water main shall pass beneath a sewer pipe without the approval of the District. There shall be a minimum ten (10) feet separation between parallel water mains and sewer mains. This separation shall also be required for all parallel water service and house sewer laterals.

q. Service laterals are to be installed at near right angles to the main except at the cul-de-sac.

r. Street centerline stations shall be used as reference for wastewater mains.

s. Signature block shall appear on each sheet of plans for approval purposes by the Manager.

4.7 COST ESTIMATE

A cost estimate utilizing the District's current Estimate of Costs Form must be submitted with the wastewater plan on the first plan check.

4.8 PLAN CHECK FEES

The Plan Check Fee, that is 1-1/2 % of the total construction cost, must be paid prior to the first plan check.

4.9 PROCEDURE FOR APPROVAL

Approval of wastewater improvement plans consists of a series of requirements, that must be met before the District signs the plans.

4.10 Wastewater Service Certification:

Wastewater service certification is required and shall be worded as follows:

CERTIFICATION

I hereby certify that the wastewater system as shown on drawing number(s) _____ Sheets _____ through _____ has been designed to adequately service each and every lot or facilities shown on said plans.

_____

Registered Civil Engineer RCE No. Date

If the project does not involve specific lots, then substitute the words "… designed to adequately provide for the development, said system is intended to serve".

4.11 "AS-BUILT" CERTIFICATION;

As-built certification is also required. The wording shall be as follows:

"AS-BUILT" CERTIFICATE

I hereby certify that the work shown on Drawing Number _____

Sheet _____ through _____ inclusive, marked "As-Built" has been

Constructed in conformance with the lines and grades as shown on said plans and referred specifications.

_____

Registered Civil Engineer RCE No. Date

4.12 PLAN OF WASTEWATER SYSTEM

Plan drawing shall show the locations of wastewater mains, laterals and other structures in relation to survey lines and stations. Provide all data for horizontal deflections or curves and indicate limits of any easements. Any known pad locations that are adjacent to an easement should be shown as well as fences, walls, trees, etc. that are within the easement. Show and label, on plans, the size and ownership of all existing and/or proposed underground utilities that cross or parallel the sewer.

4.13 PROFILE OF WASTEWATER SYSTEM

Plan shall show the grade, including any vertical curve date, size and type of pipe and the distances between manholes and other structures. Also, show depth and elevation of laterals at main and property line or at edge of easement. The type of bedding or encasement required to carry loads on the pipe shall also be shown. For each section of sewer, the profile shall show alternate acceptable pipe materials that are permissible or whether only one material is acceptable. Show elevations to 0.01 foot of sewer invert. Manhole rim elevations are also required. Any pipe two inches or more in diameter that crosses the sewer and especially water, gas, telephone, power, storm drains, TV and oil lines, shall be shown and labeled in the profile. The grade of major paralleling lines within five (5) feet of the sewer shall be shown as dashed lines.

The District is not responsible for the accuracy of these underground lines, and approval o sewer plans by the District does not constitute a representation as to the accuracy of the location of, or the existence or non-existence of any underground utilities, pipe, or structure within the limits of the project.

4.14 EASEMENTS

Provide all necessary descriptions so that Grants of Easement may be executed on District forms prior to the start of construction of any facilities that will become a part of the District's Wastewater system.

4.15 PROCEDURE FOR APPROVAL

Approval for Improvement plans consists of two phases. Each phase consists of a series of requirements that must be met before final acceptance.

A. Requirements for Authorization of Construction (See Section 5.0)
B. Requirements for Final Acceptance (See Section 11.0)

4.16 PLAN CHECKING LIST

CHECK LIST
PLAN CHECKING AND PROJECT REQUIREMENTS
WASTEWATER

Title Block		Laterals for recreation buildings	
Bench Mark		Obtain CFS calculations	
Key Map (1"=300')		End of Curve (EC), Beginning of Curve (BC), Point of Reverse Curve (PRC) on plan and profile	
Vicinity Map (1"=1,000')		Check requirements for vertical curve sewers	
North Arrows (right or up)		House lateral cleanouts not on driveways and long enough to clear other utilities	
Size of Sheets (24" x 36")		Check street names on tract map, plans and street address	
Margins around drawing		Cost Estimate	
General Notes and others		Separate laterals for each ownership	
Design Certificate (signed)		Existing drawing numbers	
As-Built Certificate		Existing and proposed surfaces	
Graphic Scales (plan & profile)		Easements and APN	
Location of lines referring to center of streets		Deep lines load factor	
No wastewater main under the sidewalk		Maximum and minimum pipe lengths	
Crossing of other lines e.g. SD		Existing laterals installed by other tracts or previous construction	
Pad Elevations		Check Master Plan	
Overflow Devices		Condominium individual laterals	
Manhole spacing (no manhole on private property)			

4.17 STANDARD LANGUAGE FOR DEDICATION OF FACILITIES TO THE DISTRICT

A. GRANT DEED, QUITCLAIM DEED, BILL OF SALE OR OTHER:

All of its rights, title and interests in and to the wastewater system, pipelines, manholes, and appurtenances thereto as located in, on, over, under, and across streets, easements and rights of way shown on Tract _____ as per map thereof recorded in Book _____, Page _____ and shown on the easement(s) as per Book _____ Page _____ of Official Records, in the Office of the County Recorder, County of Ventura, State of California.

B. EASEMENT DEED:

An easement and right of way to lay, construct, repair, maintain, operate, renew, and replace pipeline and appurtenances incidental thereto for the transportation of wastewater with rights of ingress and egress to and from same, in, over, under and across the following described real property in the County of Ventura, State of California.

SECTION 5.0

FEES AND REQUIREMENTS FOR AUTHORIZATION OF CONSTRUCTION

5.1 PLAN CHECK FEE

When wastewater plans are first submitted, the Developer shall pay a Plan Check Fee to the District. This fee shall be the current rates using the Developer's Engineer's cost estimate of the cost of improvements. Under no circumstances shall refunds of the above fee be made. However, the plan check fee may be increased if actual or subsequently estimated costs exceed that used for the initial fee calculation. The minimum plan check fee shall be $30.00.

5.2 SUBMITTAL OF BLUE-LINE PRINTS

Three sets of the blue-line prints of the proposed wastewater improvements, one copy of the final tract map, one complete set of the street improvement plans, one copy of the grading plans and three copies of the material cost estimate, together with the plan check fee, which is 1-1/2% of the cost estimate shall be submitted. Plans illustrating an incomplete design and drafting detail may not meet minimum standards and may be just cause for a rejection of the first plan check. The Developer's Engineer shall submit preliminary plans completed in accordance with these Standards. Required will be a study of the tributary sewer area above the subject property and the criteria and calculations used in determining the size of the lines.

5.3 SPECIAL PROVISIONS

If there are unusual conditions, that would require substantial deviation from the District Standards, particularly with respect to slopes, pipeline cover, or crossings, such deviations should be submitted, in writing, prior to tentative map and/or development project approval, or in any case prior to submittal of the first plan check.

5.4 INSPECTION FEE

Staff shall analyze the plans and materials as submitted and prepare and send comments to the Developer's Engineer. Upon receipt of revised plans, the Engineer will prepare a final cost estimate for the proposed improvements, using the most current rates (percentage figures) and unit prices applicable at that time. Also the following is applicable:

A. MINIMUM FEE

A minimum Inspection Fee shall be twenty-five dollars ($25).

B. CONSTRUCTION INSPECTION FEES FOR SPECIAL SITUATIONS,

As determined by the District, such as inspections of Saturdays, Sundays, or District's holidays or beyond normal working hours shall be charged as follows:

1. For inspections of special situations during normal working hours, the current inspectors rate per hour worked, plus an allowance for fringed benefits, plus 30% for overhead.

2. For inspections during overtime periods, the current inspector rate per hour worked multiplied by a factor of 1-1/2, plus fringe benefits, plus 30% overhead.

3. For inspections during Sundays and Holidays, the current inspector rate per hour worked, multiplied by a factor of 2, plus fringed benefits, plus 30% overhead.

5.5 EASEMENTS

Any easements with their corresponding Attachments "A" and "B" must have deeds submitted for checking at this time

5.6 AGREEMENTS, BONDS, AND INSURANCE CERTIFICATE

Staff will provide Developer with the proper forms and the Developer shall submit the following:

A. Agreement for Construction of Wastewater Facilities (in triplicate with notarization)

B. Insurance Certificate with limits as stated in the "Agreement"

C. A Faithful Performance Bond (in triplicate and notarized) equivalent to 100% of the estimated cost including contingencies of construction.

D. A Labor and Material Bond (in triplicate and notarized) equivalent to 100% of the estimated costs.

5.7 APPROVAL FOR CONSTRUCTION

Upon receipt of all documents, bonds, fees, and checking of all documents, bond, and fees, the staff shall prepare a resolution for the Board's action, which accompanied by the following materials:

- Tract original plans
- Agreement for construction of sewer facilities
- Easement Deeds
- Faithful Performance Bond
- Labor and Material Bond

The District will sign the plans after approval by the Board and notify the Engineer that the plans are signed and available. The Engineer will then provide the District with two sets of blue-line prints, and the original drawings will be returned to the Engineer until they are 'As-Built", at which time the original become the District's property.

No construction should occur before the plans are signed and before the five-day District notification has been given. This notification will allow time for a pre-construction meeting of all interested parties.

5.8 CONNECTION CHARGES

No parcel of property shall be connected, or building permit issued, until the District's wastewater system until a connection charge has been paid. The charge is based upon either a single-family residence or upon fixture units for commercial and industrial buildings.

5.9 SPECIAL CHARGES

If there are items requiring special approval, the District may require deposition of funds or agreements for funds in the future to provide for operation and maintenance of the substandard system.

SECTION 6.0

CONSTRUCTION STAKING

6.1 GENERAL REQUIREMENTS

Construction staking is the responsibility of the Developer, its Engineer or Contractor. Stakes will be set parallel to the sewer alignment at an offset distance and direction agreed upon with the Contractor, but in no case shall construction stakes be offset more than ten (10) feet. Stakes will be set at no greater interval than fifty feet (50') on straight alignments when the sewer slope is 0.6% or more. For horizontal curve sewers at less than 0.6% slope the stake interval shall be ten (10) feet and for curved sewers above 0.6% slope and for straight sewers below 0.6% slope the stake interval shall be twenty-five (25) feet.

6.2 PRESERVATION OF STAKES

Construction stakes shall be carefully preserved by the Contractor until after the District has accepted the completed work. If two or more consecutive stakes are knocked out during construction, new stakes shall be set at the Contractor's expense.

6.3 SERVICE LATERALS

For each lateral, a stake shall be placed near the property line, referenced to show its horizontal and vertical distance from the lateral invert at the property line.

6.4 "AS-BUILT" PLANS

For all street sewers, regardless of alignment or slope, the Developer's Engineer shall determine "As-Built" elevations at the invert of centerline of each manhole and shall provide a written record of such elevations to the Inspector. Also the stationing for each lateral is required on the "As-Built" drawings.

SECTION 7.0

CONSTRUCTION

7.1 GENERAL REQUIREMENTS

This section describes the use of materials and workmanship to be employed in construction of the wastewater system. The Developer's Engineer shall prepare such general and special specifications as are necessary to define the nature and location of work, contractual arrangements, payment for work, and any other matters concerning the owner or his Contractor; these items are not discussed within the Standards presented herein.

A. QUALITY OF MATERIALS:

Materials and equipment to be incorporated into the work shall be new and unused unless otherwise approved. In case a reference is not clear as to which of several available grades is desired, the highest quality material shall be used. When construction bids are received directly by the District such bids shall show the proposed pipe material and the manufacturer's name, if more than one type is allowed.

Contractor shall have at the job site or be able to supply upon request, certified copies of factory or laboratory test reports showing the strength characteristics of any materials used in the work. For all reinforced concrete work, he shall furnish, in advance of pouring concrete and if requested, the mix design and calculated concrete strength as prepared by the concrete supplier.

B. SUBSTITUTION:

Where articles or material are specified by brand or trade name, alternate materials or articles equal to those specified may be approved provided the request for approval is in writing accompanied by supporting data, in ample time to permit investigations without delaying the work. Unless substitutions are approved, no deviation from the Standards will be allowed.

C. QUALITY OF WORKMANSHIP:

All work will be done by persons experienced in the specific work, under competent supervision and in a first class manner to the District's Inspector's satisfaction. When work is being done directly for the District, the Contractor in the proposal shall name each Sub-contractor, and no substitution will be permitted without prior approval.

D. DEFECTIVE WORK:

Any defective materials or workmanship that shall become evident within one year after field acceptance of completed work shall be replaced or repaired without cost to the District. Refusal of the Contractor to correct defective work that is clearly his responsibility will be considered just cause for exclusion from performing future work to be connected to the District's system. Such exclusion does not impair the District's right to bring legal action to the correct the deficiencies.

E. DISTRICT INSPECTION, FIELD ACCEPTANCE AND GUARANTEE PERIOD:

The District is responsible for the inspection of all excavation, pipe laying, trench backfill within the pipe zone and testing. All such work shall be available for inspection at all times. It will be the Contractor's responsibility to provide a five (5) day notice to the District prior to the start of any work. Such notification will allow for scheduling a pre-construction meeting between interested parties. Failure to proper notification may delay the starting date since the District may not be able to inspect the work and cannot accept any work for which inspection has not been arranged.

Field acceptance is made by the Inspector and most often will not coincide with the date of District's Board's acceptance of the work. However, the one-year guarantee period for all the work begin on the Board's acceptance date. As mentioned in Section 7.1 D, any defective work discovered during this period shall be repaired or replaced and a new one-year period will begin for that corrected work. Minor repairs or replacement, however, will not affect exoneration of the Bonds and acceptance by the District as originally scheduled.

All holiday or weekend inspection will be subjected to additional charges as discussed in Section 5.4.

F. PUBLIC RELATIONS:

The Contractor shall conduct its affairs in a manner that will lessen the disturbance to residents in the vicinity of the work. In this regard, standard working hours as specified in the Cities or County's Code should be observed unless prior approval is received. The job site shall be maintained in a condition that shall bring no discredit to the District or its personnel, and all affected private improvements shall be restored to at least their original condition.

G. TELEVISION INSPECTION:

In general, unless waived, the District will require television inspection of the newly installed wastewater lines to determine acceptability. Such testing will not replace other standard tests such as air testing. Television inspection will be performed after the line has been cleaned (balled) and air tested. If defects are noted through this or other testing, the Contractor must repair or replace defective materials or installations. The District may require re-inspection by television of the defective section.

7.2 PERMITS

The following may be required of the Contractor:

A. ENCROACHMENT PERMIT:

Where construction will encroach into the public right of way, the Contractor shall obtain all necessary encroachment permits at the City or County or CalTrans Office.

B. EXPLOSIVE:

Where the Contractor anticipates the use of explosives in conjunction with the wastewater construction, a blasting permit shall be first obtained from the County's Sheriff's Department, and all nearby property owners shall be notified.

7.3 CLEARING AND GRUBBING

A. GENERAL:

Clearing and grubbing that consists of removal of objectionable material from the right of way shall be done with caution such that existing wastewater improvements, other utilities and adjacent property; trees and shrubbery that are not to be removed shall be protected from injury or damage.

Within the sewer easements or right of way, trees, shrubs, fences and all other improvements that have been removed to permit construction, shall be replaced in kind or size (excluding native trees under two (2) inches in diameter or native brush) or with approved substitutes unless permission to exclude such replacement is obtained from the owner or agency.

B. REMOVAL AND DISPOSAL OF MATERIAL:
The Contractor shall be responsible for leaving the site in a neat and finished appearance, free form debris or inflammable material.

7.4 UTILITIES, EXISTING FACILITIES, AND CONCRETE REMOVAL

A. ABANDONMENT:

Refer to Section 8.0 regarding abandonment of existing wastewater lines and/or structures.

B. UTILITIES AND EXISTING FACILITIES:

The existing utilities and/or facilities shown on the drawings or the location of which is made known to the Contractor prior to excavation shall be protected from damage during the excavation and backfilling of trenches and if damage, shall be repaired by and at the Contractor's expense. Any existing utility or facilities not shown on the drawings or the location of which is not shown to the Contractor in sufficient time to avoid damage, if inadvertently damage during excavation, shall be repaired by the Contractor and adjustment in payment, if any, shall be subject to negotiation between the Contractor and the Developer, without any Districts liability.

In case it shall be necessary to remove any such utilities, facilities or any portions thereof, the Contractor shall notify the District and the owner of the structure.
The Contractor shall not interfere with said utility and/or facility structures until disposition of the obstruction to the work has been determined and/or notice to relocate or remove has been given by the District or authorized agent of the owner of the utility and/or facility affected.

The fact that any underground utility and/or facility is not shown on the plans shall not relieve the Contractor's responsibility to comply with these Standards. It shall be the Contractor's responsibility to ascertain prior to commencing work the existence of any underground utilities or facilities that may be subject to damage by reason of his operations.

C. CONCRETE, MASONRY, OR MORTARED CONSTRUCTION REMOVAL:

At locations shown on the plans, portions of existing concrete pavements, curbs, gutters, sidewalks, foundations, and other concrete or mortared structures shall be removed to the lines and elevations specified. Concrete structures or objects not shown or noted on the plans shall be removed where necessary and disposed of by the Contractor.

Concrete removal operations in connection with the reconstruction of existing structures, shall be performed without damage to any portion of

the structure that is to remain in place. If damage occurs, the Contractor shall repair any such damage at this own expense, to the satisfaction of the District. Where existing reinforcement is to be incorporated in new work, such reinforcement shall be protected from damage and shall be thoroughly cleaned of all adhering material before being embedded in the new concrete.

7.5 EXCAVATION AND TRENCHING

A. GENERAL:

Trench excavation shall consist of all excavation involved in the grading and construction of the wastewater line as shown on the plans. The Contractor shall perform all excavations of every description and of whatever substances encountered, to depths indicated on the drawings or otherwise specified or required. During excavation, material suitable for backfilling shall be stockpiled in an orderly manner a sufficient distance from the banks of the trench to avoid overloading and to prevent slides or cave-ins. All excavated materials not required or suitable for backfill shall be removed. Such grading shall be done as may be necessary to prevent surface water from flowing into the trenches or other excavations, and any water from any source accumulating therein shall be removed by pumping or by other approved methods. Such sheeting and other shoring shall be done as may be necessary for the protection of the work and for the safety of personnel. Unless otherwise indicated, excavation shall be by open cut except that short sections of a trench may be tunneled if, in the opinion of the District, the pipe or duct can be safety and properly installed and backfill can be properly tamped in such tunnel sections.

If blasting is necessary, the Contractor shall notify the District of his blasting schedule and procedures and obtain a blasting permit, and shall observe all reasonable precautions in protecting life and property.

B. EXCAVATION:

Excavation for sewers shall be made only after pipe and other necessary materials are delivered on the work site. After such delivery, trench excavations shall proceed as rapidly as possible, and the pipe installed and the trench backfilled without undue delay.

Coupling holes and depressions for the bells and couplings shall be excavated after the trench bottom has been graded and shall be only of such length, depth, and width as required for properly making the particular type of joint. Where rock excavations is required, the rock shall be excavated to a minimum over-

depth of 4 inches below the trench depths indicated on the drawings or specified. Over-depths in the rock excavation and unauthorized over-depths shall be backfilled with the same material as the bedding zone. Whenever wet or otherwise unstable soil incapable of properly supporting the pipe, as determined by the District, is encountered in the bottom of the trench, such soil shall be removed to the depth required and the trench backfilled to the proper grade with an appropriate material between coarse sand and a crushed rock to provide a stable foundation.

C. TRENCH WIDTH AND GRADE:

The width of the trench within the pipe zone shall be such that the clear space between the barrel of the pipe and the trench wall shall not exceed the amount detailed in the same Standard Plates. In general, this will be eight (8) inches. The width of the trench above the level may be as wide as necessary for sheeting and bracing and the proper performance of the work. The bottom of the trenches shall be accurately graded to provide uniform bearing and support for each section of the pipe on the proper bedding material as prescribed in the plans or by appropriate details on the plates.

D. SHORING:

All shoring for open excavations shall conform to the State of California, Department of Industrial Relations, Division of Industrial Safety "Construction Safety Orders".

The Contractor shall be responsible for adequately shored and braced excavations so that the earth will not slide, move, or settle, and so that all existing improvements of any kind will be fully protected from damage.

No shoring once installed, shall be removed until the trench has been approved for backfill operations. Removal of shoring shall only be accomplished during backfill operations and in such a manner as to prevent any movement of the ground or damage to the pipe or other structures.

The Contractor shall obtain and pay for all the permits for any excavations over five (5) feet depth into which a person is required to descend or any excavation less than five (5) feet in depth in soils where hazardous ground movement may be expected and into which a person is required to descend.

7.6 PIPE BEDDING AND LAYING

A. GENERAL:

This portion of the work includes the furnishing of all materials and their proper assembly to result in a first-class wastewater line installation true to line and grade and free from leaks, cracks, and obstructions. Where choices are allowed, the Contractor shall select such materials and construction methods that will result in a completed project in full conformance with this Standard. In this regard, refer to Section 3.0 – Materials, and the Plates for additional details.

The Contractor is warned that the approved wastewater design is based upon a proper combination of pipe strength and pipe support. No acceptance will be given unless the work of trenching, bedding, laying, backfilling and compaction is conscientiously done in accordance with the procedures outlined in these Standards.

Except as otherwise approved or included in permits, the maximum length of open trench shall be 500 feet, or the distance necessary to accommodate the amount of pipe installed in a single day, whichever is greater.

Experienced workmen, using not less than three consecutive grade points in common, shall transfer grades from the ground surface to the bottom of the trench so that variations from a straight grade may be readily detected. Each length of pipe shall be laid on compacted, approved bedding material as specified and shall have full bearing for its entire length between bell holes excavated in said bedding material to allow for undistracted assembly of all joints. Adjustments of pipe to line and grade shall be made by scraping away or filling in and tamping approved material under the body of the pipe. No wedging or blocking with wood or soil to support the pipe will be permitted. Under no circumstances will a Contractor be allowed to dump backfill materials on top of a pipe that is not continuously supported in its final grade position.

Pipe laying will proceed up-grade with the spigot ends of bell and spigot pipe pointing in the direction of flow. Each pipe shall be laid true to line and grade and in such a manner as to form a close concentric joint with the adjoining pipe following manufacturer's instructions for the specific jointing method being used. Pipe shall not be joined, unless specifically approved by 'stabbing" "swinging in" or "popping on" spigot ends of pipe into the bell ends. Also where there is a "home" mark on the pipe, the joint shall be fully engaged to that mark. Pipe shall not be laid when the Inspector determines that the condition of the trench or weather is unstable. As the work progresses, the interior of the sewer pipe shall be

cleared of all dirt and superfluous materials of every description. If the maximum width of the trench at the top of the pipe is exceeded, the Contractor shall install such concrete cradling, pipe encasement, or other bedding as may be required to support the added load of the backfill. Trenches shall be kept free from water until sufficient backfill has been applied to keep the pipe in place. At times when work is not in progress, open ends of pipe and fittings shall be securely closed to the satisfaction of the Inspector so that no trench water, earth or other substance will enter the pipe or fittings. Pipe or fittings damaged during assembly shall be removed and replaced.

Normal bedding shall be excavated at least three (3) inches below sewer invert, and sufficiently bell or coupling holes shall be hand dug to provide one (1) inch clearance under the bell or coupling. Granular bedding material as specified shall be placed in the trench and carefully shaped to receive the pipe. Pipe shall be set to exact grade on the bedding in firm contact with the pipe for a circumferential distance equal to ½ the outside pipe diameter. Each pipe section shall be individually supported.

B. INSTALLATION OF FLEXIBLE PIPES (PVC OR ABS SOLID WALL);

Unless otherwise modified in these Standards, all flexible pipes shall be installed per ASTM D2321 entitled, “Underground Installation of Flexible Thermoplastic Sewer Pipe”. Bedding for such pipes is highly critical. Attention is also directed to **Plates S-2, S-3, and S-4** of these Standards as well as the information in “A” above. Further note the following:

1. Pipe stored outside and exposed to periods of sunlight exceeding 45 days shall be covered with canvas or other opaque material, and provided with air circulation under the protective cover.

2. PVC pipe is a flexible conduit and derives its resistance to vertical loads by pushing against the sides and bottom of the trench. This force can only be resisted by a firm trench wall and bottom and properly placed “bedding” and ‘haunching” material. Vertical trench walls will be required in the region from the trench bottom to above the pipe. The width of the trench at any point below the top of the pipe should not be greater than necessary for joining the pipe and compacting the bedding and initial backfill.

3. An approved water seal (gasket) shall be placed around the pipe in the manhole concrete base prior to pouring the concrete.

C. INSTALLATION OF ABS COMPOSITE PIPE;

The following are in addition to details covered in Section 3- Materials, and under Section A above.

4. Unless herein modified, all installations shall be kept in strict accordance with the manufacturer's recommendation, particularly with regard to jointing and safety.

5. It is expected that jointing shall be accomplished by applying a coating of cement to both ends of the pipe to be jointed in sufficient quantity that when the spigot is fully inserted into the socket, a head of excess cement will form around the entire circumference of the outside juncture of spigot and socket. Excess cement shall then be removed. The cement shall be provided by the manufacturer at no cost to the Contractor.

6. All ends of the pipe shall be thoroughly coated with solvent cement prior to installation.

7. Unless specifically otherwise approved, manufactured fittings shall be used for lateral connections instead of cutting-in-saddle connections.

8. Items 7.6B 91) Pipe Storage and 7.6B (2) Installation of Flexible Conduits pertain to ABS composite pipe as well, although ABS composite pipe can be considered a semi-flexible pipe. Also item 7.6B (3) should be followed.

9. Minimum radius of curvature below which three (3) degrees deflection fittings and shorter pipe lengths may be required and are discussed in Section 2.7, Design Criteria.

10. When repairing composite pipe, there shall be no discontinuity of the pipe inner wall. Ruptures in the pipe outer wall may be required if the damage is limited to an area that can be encompassed by a three (3) inch diameter circle superimposed over the damage. Cell filler repair is unnecessary. A solvent welded ABS repair patch, at least equal to the thickness of the pipe outer wall, shall extend at least one (1) inch beyond the damage. When damage exceeds these limits, the damaged section shall be cleanly cut off the pipe.

7.7 BACKFILL AND COMPACTION

A. GENERAL:

Trench backfilling consists of all materials returned to the excavation in the process of wastewater line construction. Backfill and compaction in existing streets shall be in full conformance with the City or County Encroachment Permit issued for the specific work, and with the City or County land development specifications. In both cases, the filling of trenches shall be subject to the approval by the City or County Public Works Inspector who shall have full authority to order compaction tests to demonstrate the actual backfill density.

The sequence of backfilling and compaction above the pipe zone (that extends from six (6) inches, depending upon the case, above the top of the pipe) shall be as directed by the City or County PW Inspector, but in the absence of such instruction, the following procedure shall govern:

- Testing of pipe and joint leakage will be done after consolidation of the backfill to the top of the sub-grade zone and after all the laterals have been installed to the property lines.

Backfill, compaction, and resurfacing shall be scheduled so that existing public streets may be opened to normal traffic in accordance with the City or County Encroachment Permit, and so that the backfill operations closely follow the pipe laying avoiding open trenches overnight.

The trenches or excavations shall not be backfilled without prior inspection by the District. Such inspection does not relieve the Contractor form compliance with the testing of the wastewater line, that should be conducted after final assembly of the main sewer, laterals, manholes and consolidation of backfill as described above. Contractor shall assume the cost of removal and replacement of backfill necessary for correction of defective conditions revealed by testing.

B. BACKFILLING RIGID PIPES:

For normal bedding, the space around the pipe, known as the “pipe zone” shall be filled with the appropriate material with the pipe in proper alignment and at the prescribed slope on granular bedding per Standard Plates. Backfill in the pipe zone may be either compacted by hand tamping methods or flooded into place in a single lift without hand working. In no case, shall sufficient water be applied to float the pipe. Acceptability of compaction in the pipe zone will be determined primarily by visual inspection and probing by the Inspector to determine that no voids exist in

the backfill. The backfill within the pipe zone shall meet the requirements of 90 percent relative compaction.

The backfill zone, between the top of the pipe zone and the bottom of the sub-grade zone or ground surface (if no pavement is to be placed), may be filled with approved native material. It shall be placed in lifts not exceeding three (3) feet in uncompacted thickness, and compacted by water or mechanical means so as to obtain 85 percent relative density, except for the subgrade zone, consisting of the space under the pavement and/or shoulder to at least 2.5 feet below finished road grade that shall be filled and compacted to the prevailing City or County requirements, without flooding or jetting.

C. BACKFILLING PVC, ABS SOLID WALL OR COMPOSITE PIPES:

Compaction of bedding, haunching and initial backfill can be either by mechanical means or flooding. Jetting will not be allowed unless specifically approved by the Inspector. Flooding should be attempted only where the trench drains naturally and in fairly rapid manner. If flooding is used, sufficient time shall be allowed for the puddle or flooded mass in each layer to solidify until it will support the weight of a man before any overburden is placed on the pipe. Apply only enough water to give complete saturation of the haunching and backfill material. Drain off excess water or it will retard the drying and consolidation of the materials. Flooding, if used, shall be applied after haunching is in placed. However, to prevent floating of the pipe, some material should be placed adjacent to and over the pipe to add weight.

Final backfill shall be compacted by mechanical means or by jetting. If jetting is used, care must be taken not to disturb the already compacted materials below.

If hydro-hammer is used for compaction of overlying materials, at least four (4) feet of backfill must be placed over the top of the pipe prior to its use. This is required to insure that the pipe is not damaged or egg shaped.

Relative compaction requirements are the same as those for rigid pipes.

D. FINAL BACKFILL:

If the work is in private property and not subject to public agency requirements, excavations shall be final, backfilled, compacted and finished to match original conditions as interpreted by the District as further described in Section 10 – Final Clean-up.

7.8 BORING AND JACKING OPERATIONS

A. GENERAL:

Placement of pipe by boring or jacking methods requires special District approval for each instance. However, for general guidelines, the following shall pertain:

1. Except for the use of air or water, the methods and equipment used in boring and jacking operations shall be optional to the Contractor provided that the District reviews them prior to any work.

2. The placement of pipe shall be to the lines and grades shown on the plans.

3. Voids remaining outside the pipe (or carrier pipe if applicable) shall be filled with sand.

4. Where a casing pipe is used, it shall be no less than eight (8) inches greater in diameter than the sewer pipe to be installed.

5. The placement of pipe in casings shall be supported with redwood skids, shims, or wedges to the lines and grades shown on the plans.

B. BORES:

The boring machine shall cut a true circular bore to the required line and grade. The bored tunnel shall be not more than two (2) inches larger in diameter than the maximum outside diameter of the casing or sewer pipe to be installed.

C. JACKED STEEL CASING:

In addition to applicable portions above, the following shall pertain:

1. Where casings are used, the size and wall thickness of the casing shall be at the Contractor's option except that the minimum casing thickness shall be not less than 3/8".

2. Field joints of steel casings shall be welded with a continuous circumferential weld.

3. The placement of pipe in the casing shall be supported with redwood skids, shims, or wedges to the lines and grades shown on the plans.

4. Prior to backfilling, the annular space between the pipe and the casing, the pipe shall be tested in accordance with Section 9-0, Testing.

5. The annular space shall be backfilled with washed concrete sand blown or rammed into place until the entire cavity is filled. Concrete bulkheads shall be placed at each end of the cased section to retain the backfill material.

7.9 RESURFACING AND RESTORATION

If the wastewater work shall occur in the streets where no paving exists, the Contractor shall, in accordance with the City or County requirements, leave the completed trenches in a suitably compacted condition for finish grading, placement of base material, and paving by others.

If the work is within the existing City or County streets, any required resurfacing shall be in accordance with the City or County Encroachment Permit.

If the work has disturbed or damaged existing private streets, alleys, driveways or other improved surfaces, the damaged portions shall be removed and restored, including the provision of adequate sub-grade where these operations have disturbed the original material.

Structures removed or damaged on public or private property shall be restored or replaced unless such structures are designated on the plans as “to be abandoned”. Such structures include, but are not limited to, trees, bushes, plantings, ground covers, mailboxes, fences and sprinkler system.

Any temporary paving, barricades, or special provisions required by public agencies shall be furnished by the Contractor as required.

7.10 CONCRETE AND MORTAR WORK

A. CONCRETE:

1. Material:

Concrete used for manholes, encasement, filling, blocking, piers and other typical wastewater construction applications shall be transit-mixed concrete from a supervised batch plant that issues certified delivery tickets with each load, showing the mix proportions, mixing time, truck departure time and water added. Such certified tickets will be handed to the Inspector at the time of

delivery. Ready –mixed concrete shall be limited to that needed for patching and minor non-structural uses requiring one sack of cement or less. In these cases, the materials and workmanship shall be the same as if transit-mixed concrete had been used. The 28-day compressive design strength of concrete shall be chosen according to its intended use as outlined in Section 3 of these Standards.

2. Placement:

Concrete shall be placed in clean forms before initial set begins, using the minimum amount of mixing water required for good workability. Concrete shall be worked into forms by rodding or vibrating to secure a dense homogenous mass free form voids and rock pockets. All concrete shall be vibrated unless the Inspector approves solely rodding to avoid having the concrete run out of the forms or trench.

3. Finish:

Concrete surfaces to be in contact with sewage shall be steel trowelled to a smooth hard surface free from ridges, holes, and surface roughness. Exposed walls shall be left with a surface finish comparable to that obtained with new plywood forms. Slabs and walkways shall be finished with a wood float unless otherwise specified. Corners and edges shall be neatly beveled. Surface defects shall be repaired to match the surrounding concrete.

B. MORTAR:

Mortar shall consist of one part Type II Portland Cement, and two parts of sand, by volume, thoroughly mixed in a dry state from adding sufficient water to give the mortar a proper toweling consistency.

7.11 MANHOLE BASES

A. GENERAL

Manhole bases for pre-cast manholes are intended to be poured against native undisturbed material that has been excavated to the dimensions shown on the plans and plates. If the contractor over-excavates beyond the horizontal dimensions shown, it will be necessary to construct forms and pour the base to the specified dimensions.

B. CONCRETE POUR

Concrete shall be poured to a level ring-section seating surface, with the base centered over the sewer intersection unless otherwise specified. In order to provide for a watertight manhole, a metal forming ring is recommended to form a level joint groove in the fresh concrete. This groove will be used to receive the first barrel section of the manhole.

C. FLOW CHANNELS AND SHELVES

Flow channel and shelves shall be either completed at the time the manhole base is poured or shall be left sufficiently low and wide so that the finish mortar work will be an integral layer at least 2 inches thick. The flow channel shall be completed in a uniform U shape to fit the dimensions of the pipes being joined. Channel sides shall rise vertically to the full interior height of the outlet, and clearly defined working shelves sloping at least one (1) inch per foot toward the main channel shall surround channels.

D. ALL EMBEDMENT MATERIALS

All embedment materials under, around, and at least three (3) inches over the pipelines located within five (5) feet of structure bases shall be compacted without jetting prior to barrel sections placements.

E. CONCRETE POUR

Concrete in the manhole bases for PVC and ABS pipe shall be extended along the pipes to the defined trench unless it can be demonstrated that there is sufficient compaction in this region.

7.12 MANHOLES

A. GENERAL:

All materials for pre-cast manhole sections shall conform to the requirements set forth in Section 3. The applicable plate will depend upon the depth of the manholes as listed on the plates.

Pre-cast manholes shall have a minimum wall thickness of six (6) inches. Where there is a question of quality and conformance to the material specification, the District will render the decision.

B. ASSEMBLY OF PRE-CAST MANHOLE:

All wall and floor joints shall be cleaned prior to settling any manhole sections. These sections shall be set into the position using a preformed plastic sealing gasket (Federal Specification SS-S-00210) or mastic sealing gasket. If the plastic gaskets are used, they shall be in strict conformance with the manufacturer's recommendations including application of a primer coat, drying the joint and careful use of the gasket to avoid displacement. If mastic is used, it shall be first approved by the Inspector and shall be of sufficient size and placed to provide a tight joint. Grouting with mortar will only be allowed for the joint between the manhole base and the first barrel section, and then the grout shall be placed to tightly exclude groundwater.

Each section shall be placed in alignment with the previous section such that the steps are aligned and opposite to the main sewer outlet. The top of the eccentric cone section shall be set at such elevation that no more than eighteen (18) inches height of entrance, or manhole throat is present with the manhole at the finish grade.

C. ADJUSTMENT TO STREET GRADE:

The Contractor shall set the transition section after the finished street elevation is known. The Developer or his agent shall coordinate the fitting of entrance sections, top steps and covers with the final paving so that the finished manhole covers blend neatly with the street surface. Successful completion of the testing of wastewater line does not relieve the Contractor from making these final adjustments. The Contractor shall also be required to make any adjustments in the manhole sections during the one-year guarantee period if there is additional paving work. During final grading, paving and manhole adjustment, all debris shall be excluded from the completed work.

D. TRANSITIONS, FLOW CHANNELS:

Mainline grade changes at manholes shall occur in the outlet sewer at the outside face of the manholes. Alignment changes shall be made in smooth curves, and size changes shall taper uniformly between inlet and out pipe walls. Also refer to Section 7.11- Manhole Bases for further discussions.

E. OTHER REQUIREMENTS:

All PVC or ABS pipes entering or leaving concrete structures, including manholes, shall have a rubber sealing gasket, as supplied by the pipe manufacturer, firmly seated perpendicular to the pipe axis, around the pipe exterior and cast into the structure as a water stop.

7.13 CLEANOUTS

A. GENERAL:

Contractor shall be brought to finish grade in smooth turns having the same internal diameter as the sewers that they serve. Cast iron frames and covers having clear openings at least equal to the internal pipe diameter shall be independently supported over the cleanout opening, in accordance with appropriate plate.

7.14 SERVICE LATERALS

A. GENERAL:

Contractor shall install only those service laterals shown on the plans or called for in writing by the District or by the Developer with the written approval of the District. Workmanship shall be equal to the specified for the street sewers. No service lateral shall be covered until the Developer's Engineer has recorded this location.

The Contractor shall mark the location of all sewer laterals with the letter "S" at least two (2) inches high engraved into the curb. In laterals for vacant lots where there is no concrete curb exist, the Contractor shall furnish and place 2" x 2" x 12" long hubs at the property line directly above the end of the pipe with the letters "H.L." and the depth to the lateral marked on the hub with a paint. Trenches shall be compacted in accordance with Section 7.7 of these Standards.

B. RESIDENTIAL HOUSE LATERALS:

Unless otherwise shown on the plans, laterals shall be installed from the street sewer to the lot line in accordance with **Plate S-22**, and plugged at the lot line in preparation for the leakage test. Laterals shall consist of factory-made standard wye-branch or tee fitting with ends to suit the street sewer pipe, tilted 30 degree upward and plugged with a factory –made removable plugs. Wyes shall face in a logical manner to facilitate future installation of house laterals to the properties to be served. The branch portion shall be firmly bedded in damp imported sand under, over, and around the future inlet.

C. LATERALS FROM CERTAIN COMMERCIAL AND INDUSTRIAL PREMISES:

These require special features and access for sampling as described in **Plates S-30 and S-31** of these Standards. Refer to Section 2.13 for discussion of the wastewater ordinance.

D. DEEP LATERALS OR CHIMNEYS:

No lateral connected to a street sewer shall slope more steeply than 45 degrees unless it shall be constructed as a vertical chimney as shown on **Plate S-18**. Laterals sloping more than 30 degrees, but less than 45 degrees shall be cradled in concrete as shown on Alternate A, **Plate S-19**. Lateral sloping 30 degrees or less shall be bedded and laid to the same standard as street sewers, without the need for cradling in concrete. Up to four services may be connected to a single chimney, providing all connections are made to standard single or double wye fittings.

E. BACKFLOW PROTECTION:

Where the Contractor's work includes backflow devices on private property, as specifically called for in the plans, such devices are to be placed in well drained locations near the premises being protected, with unobstructed access for observation and repair.

7.15 SAFETY

Wherever the Contractor is aware of an unsafe operation, such operation should be discontinued immediately. Also, if the Inspector is aware of such conditions and informs the Contractor of the same, it will be the Contractor's responsibility to comply. In such instances, the advice shall not be construed as implying any District responsibility or liability.

With regards to entering manholes, the Contractor should be aware of the following:

1. Unconsciousness may be caused by lack of sufficient oxygen in the manhole or sewer atmosphere. (See Appendix D, Camrosa's Confined Space Policy, below). This unconsciousness can occur suddenly and with no warning causing unconsciousness and possibly death within three (3) to five (5) minutes.

2. All manholes, unventilated for any considerable time, are deficient in oxygen, particularly terminal manholes. Also, manholes on large sewers are often dangerous because of toxic and corrosive gases in addition to deficient in oxygen.

3. Because the sewer atmosphere may be explosive due to the leakage into the sewer from nearby conduits transporting gas, gasoline, or other explosive materials, the use of an open flame in or near the top of an open manhole is dangerous.

4. All manholes shall be ventilated before entering. In shallow manhole on small sewers removing the manhole cover and waiting for at least five (5) minutes allowing ventilation by air currents across the top of the manhole may accomplish this. In manholes on large sewers, it may be necessary to use blowers on upstream or downstream manholes to secure adequate.

5. Warning devices to provide adequate warning to motorists of the work progress should be used where the manhole is in a traveled roadway.

APPENDIX D

Subject: Camrosa Water District's Confined Space Policy

Dear Contractor/or Developer:

Camrosa Water District is highly committed to provide a safe working environment for their employees and their contractors. The District is also aware of the hazards of working in a confined space such as a manhole, a metering vault, or a pump station wet well. There are six major categories of hazards a person may encounter when entering a permitted confined space. These hazards are listed in order of known frequency of accidents and deaths to workers:

1. Atmospheric
2. Physical injury (slips, falls, falling objects, sharp objects, bumps and structural failures)
3. Infection and Disease (in sewer manholes)
4. Insects and other biting critters
5. Toxic exposure
6. Drowning

Thus, the contractor working for the District must exercise extreme care and professionalism in order to accomplish the task safely and survive potential hazards.

Permit Required Confined Spaces are the most hazardous facilities in the District.

In order to comply with the California Code of Regulations Title 8, Division 1, Chapter4, Sub-chapter 7, Article 108, and Joint Powers Insurance Association Directive, the District has now classified a list of their facilities that includes their sewer manholes as " full permit required" confined spaces. As such, entry into them requires a special written authorization (Full permit or C5 Permit) from the District. A permit must be obtained and

signed before anyone can enter the space. The permit shall be at the job site at all times until the work is completed or the permit expires. If the permit expires, a new permit must be obtained before continuing work. Upon completion, the permit is to be turned in to the District. A list of the permitted facilities is available in the District Office upon request.

If and when the Contractor is doing work for the developer such as installing new sewer manholes, wet wells or vaults that will subsequently be dedicated to the District upon completion, the Developer shall be responsible for the Contractor's compliance of the California Code pertaining to confined space entry. If the contractor was required by the District Inspector to enter a confined space to accomplish a specific task for the District, the District is responsible for the Contractor's compliance of the said California Code although the facility have not been accepted by the District,

The following are some instances wherein the District Inspector may require the contractor to enter a confined space:

- In order to final and accept the tract, the sewer lines must be pressure tested, mandrel pulled, balled and video taped.
- To correct a deficiency, a mistake or to clear an obstruction(s).
- To clean the manhole base, trough, and shelf
- To band the shaft joints.

If the Developer is responsible for the contractor's compliance of the Code, the Inspector may or may not advise the Contractor or the Developer's Tract Superintendent to comply with the code. His advice to do so or his presence in the vicinity of the job shall not relieve the Developer of their responsibility.

Permit Acknowledgement Form follows this page.

CAMROSA FULL PERMIT ACKNOWLEDGMENT FORM

Has tailgate safety meeting been held with the contractor?_____

I, the contractor, understand that this space is a permit required confined space._____

I, the contractor, have a "permit required confined space program" that will be followed._____

Work location:_____

_____

_____

Date:_____

CAMROSA Entry Supervisor:_____

Name of Contractor: _____

Doing Work For: _____

Contractor Representative: _____

7.16 CLEANING OF SEWERS

See Section 10.1

7.17 GREASE TRAPS:

1. When, in the judgment of the District, waste pretreatment is required, an approved type grease trap complying with the provisions of this section (see Appendix H) shall be installed in the waste leading from sinks, drains, and other fixtures or equipment in establishments such as restaurants, cafes, lunch counters, cafeterias, bars and clubs, hotel, hospital, sanitarium, factory, or school kitchens, or other establishments where grease may be introduced into the drainage or sewage system in quantities that can effect stoppage or hinder sewage treatment or private sewage disposal. A grease trap is not required for individual dwelling units or for any private living quarters.

2. No grease trap shall be installed that has an approved rate of flow of more than fifty-five (55) gallons per minute, or less than twenty (20) gallons per minute, except when specifically approved by the District.

3. Each plumbing fixture or piece of equipment connected to a grease trap shall be provided with an approved type flow control or restricting device installed in a readily accessible and visible location in the tailpiece or drain outlet of each such fixture. Flow control devices shall at no time be greater than the rated capacity of the grease trap. No flow control device having adjustable or removable parts shall be approved.

4. Each grease trap required by this section shall have an approve rate of flow that is not less than that given in Table 7-2 for the total number of connected fixtures. The total capacity in gallons of fixture discharging into such grease trap shall not exceed two and one-half (2-1/2) times the certified gpm flow rate of the grease trap as per Table 7-2.

   Any grease trap installed within the inlet more than four (4) feet lower in elevation than the outlet of any fixture discharging into such grease trap shall have an approved rate of flow that is not less than fifty (50) percent greater than that given in table 7-2. Not more than four (4) separate fixtures shall be connected to or discharged into any one (1) grease trap.

   For the purpose of this section, the term “fixture” shall mean and include each plumbing fixture, appliance, apparatus or other equipment required to be connected to or discharged into a grease trap by any provision of this section.

5. Each fixture discharging into a grease trap shall be individually trapped and vented in an approved manner. An approved type grease trap may be used as a fixture trap for a single fixture when the horizontal distance between the fixture outlet and the grease trap does not exceed four (4) feet and the vertical tailpipe or drain does not exceed two and one-half (2- ½) feet.

6. Grease trap shall be maintained in efficient operating condition by periodic removal of the accumulated grease. No such collected grease shall be introduced into the drainage piping, or public or private sewer.

7. No water-jacketed grease trap or grease interceptor shall be approved or installed.

8. Each grease trap shall have an approved water seal of not less than two (2) inches in depth or the diameter of its outlet; whichever is greater.

TABLE 7-2 Grease Traps

Total Number Of Fixtures connected	Required Rate Of flow per Minute, Gallons	Grease Retention Capacity, Pounds
1	20	40
2	25	50
3	35	70
4	50	100

APPENDIX H

Recommended Procedures for Sizing Grease Interceptors for Commercial Kitchens

H1- Waste Discharge Requirements

(a) Waste discharge for fixtures and equipment in establishments that may contain grease, including but not limited to, scullery sinks, pot and pan sinks, dishwashing machines, soup kettles and floor drains located in areas where grease-containing materials exist, may be drained into the sanitary waste through the interceptor when approved by the District.

(b) Toilets, urinals and other similar fixtures shall not waste through the interceptor.

(c) All waste shall enter through the interceptor through the inlet pipe only.

H2- Design

(a) Interceptors shall be constructed in accordance with the design approved by the District and shall have a minimum of two compartments with fittings designed for grease retention.

(b) There shall be an adequate number of manholes to provide access for cleaning all areas of an interceptor, minimum of one (1) per ten (10) feet of interceptor length. Manhole covers shall be gas tight in construction having a minimum opening dimension of twenty (20) inches.

(c) In areas where traffic may exist the interceptor shall be designed to have adequate reinforcement and cover.

H3- Location

(a) Each grease interceptor shall be so installed and connected that it shall be at all times easily accessible for inspection, cleaning and removal of the intercepted grease. A grease interceptor may not be installed in any part of a building where food is handled. Location of the grease interceptor shall meet the approval of the District.

(b) Interceptors shall be placed as close as practical to the fixtures it serves.

(c) Each business establishment for which a grease interceptor is required shall have an interceptor that shall serve only that establishment.

H4- Sizing Criteria

(a) Parameters- The parameters for sizing a grease interceptor are Hydraulic loading and grease storage capacity, for one or more fixtures.

(b) Sizing Formula- The size of the interceptor shall be determined by the following formula:

Nos. of meals		Waste Flow		Retention		Storage		Interceptor
▼	X	▼	X	▼	X	▼	X	▼
Per Peak Hour*		Rate**		Time***		Factor****		Size (liquid capacity)

(c)

* Meals served at Peak Hour

** Waste Flow Rate

a. With dishwashing machine	6 gallon flow
b. Without dishwashing machine	5 gallon flow
c. Single service kitchen	2 gallon flow
d. Food waste disposer	1 gallon flow

***	Retention Times	
	Commercial kitchen waste	
	Dishwasher	2.4 hours
	Single service kitchen	
	Single serving	1.5 hours
****	Storage Factors	
	Fully equipped commercial kitchen	8 hours operation:1 16 hours operation:2 24 hours operation:3
	Single service kitchen	1.5

H5- Effluent Sampling

An effluent sampling box on grease interceptors shall be required by the District.

H6- Abandoned Grease Interceptors

Abandoned grease interceptors shall be pumped and filled as required for abandoned sewers and sewage disposal facilities.

SECTION 8.0

ABANDONMENT

8.1 GENERAL

The Engineer shall indicate all existing wastewater lines or structures that are to be abandoned on the drawings. In general, abandoned lines that are in service will be replaced with a parallel line of equal or larger size. The Engineer shall demonstrate in any case that the abandonment does not adversely affect the wastewater system.

All abandonment and construction techniques shall be discussed with the District Inspector and approved prior to any such work.

8.2 WASTEWATER LINES

Wastewater lines to be abandoned shall be entirely filled by pumping concrete into them. The pump mix shall be a mixture sufficiently workable for the purposes intended and shall be a concrete mix design of 2,000 psi minimum. Laterals to be abandoned shall be plugged at the property line or as directed by the District.

8.3 STRUCTURES

Structures to be abandoned shall have all openings, inlets and outlets sealed off as set forth in Section 8.2 of these Standards. The structure shall then be removed to a minimum depth of nine (9) feet below the proposed finished grade and filled with imported sand (see Materials Section) if structure is within street right of way or filled with earth and compacted if outside of street right of way.

8.4 SALVAGED MATERIALS

Disposal of salvaged metal castings such as frames and covers and other metal appurtenances, unless otherwise specified, shall be the Contractor's responsibility.

Section 9.0

TESTING

9.1 WASTEWATER LINES

All completed sewers, force mains and building laterals, will be tested by and at the expense of the Contractor in the presence of the Inspector prior to field acceptance of the work, and prior to connection of any house sewer. The Contractor must correct all defects in workmanship or materials that become evident by inspection or testing at any time during the work. Testing will be done after the complete installation and compaction of all underground utilities.

A. AIR TEST:

Due to the evolution of pipeline materials, the District has developed a simplified method of air testing that satisfies the testing requirement and saves the contractor a considerable amount of time. PVC is the most common pipeline material in use for the construction of sewer pipelines. It is essentially a pressure pipe with ring gasket joints similar to water pipelines. The pipe, if installed properly should be air and leak tight. When testing between manholes and after plugging all openings and providing thrust blocking as necessary, air shall be admitted to the section under test to an inlet pressure of five (5) psi from a source regulated by an adjustable pressure control valve and measured by a sensitive pressure gauge calibrated from 0 to no more than 10 psi. When the internal pressure has reached 5 psi under stabilized temperature conditions, the air supply to the test section shall be cut off. If the pressure remains at 5 psi after 5 minutes the section will be deemed as having passed the air test. Any significant drop (as determined by the Inspector) in pressure during the 5-minute test period shall be cause for failure of the pipe section or of the plugs isolating it. After checking the plugs, a retest will be done under the same testing requirement.

The new District's test is fair, simple, and easy to remember: 5psi for 5 minutes, regardless of pipe size or length. We adopted this method several years ago and it has worked well for the District and the contractor.

1. Failure of Meet Air Test Requirements:

If the air test shall indicate leakage greater than allowable, the Contractor shall locate the defects by inspection and shall make sure such repairs and replacements as are necessary. To locate the section of sewer that fails the air test, various methods may be used such as: remote cameras, adjustable low pressure air devices or the line filled with water by plugging the inlet of the downstream manhole and maintaining at least a two (2) feet depth over the outlet of the upstream manhole until the leaks are located by observing wet spots along the trench. Water shall be drained in a manner approved by the Inspector. Under no conditions shall clay, cement or other sealer be applied inside the pipe in order to meet the test requirements. All defective portions shall be exposed and repaired or replaced, including defective bedding, to the satisfaction of the Inspector.

B. LEAKAGE TEST:

In special cases, a water ex-filtration test may be required as described below:

Wastewater line shall be tested between successive manholes by plugging the lower end and the inlet of the upper manhole. The pipe and manhole shall be filled with water to a point four (4) feet above the invert at the center of the upper manhole, or in the presence of groundwater, four (feet above the average adjacent groundwater level. The allowable leak shall be computed as follows over a period of at least a one-hour test:

E = 0.00002 LD Square Root of H

L = Length of line being tested including laterals in feet
D = Internal diameter of pipe in inches
E = Allowable leakage in gpm
H = Elevation between Upper manhole water surface and invert of pipe at Lower manhole (or if ground water present, upper manhole water surface and groundwater level at lower manhole).

C. PIPE DIAMETER RING DEFLECTION TEST OF ABS AND PVC PIPES:

Upon completion of the backfill and road sub-base (if applicable), and prior to acceptance of the air test, each main pipe line shall be checked for ring deflection by pulling a template or mandrel through the main pipeline. This test shall be a minimum of four (4) days after backfilling operations are completed. The mandrel shall be cylindrical in shape with a diameter as follows:

Nominal Pipe Diameter	PVC Minimum Mandrel Size	ABS Minimum Mandrel Size
6”	5.50”	----
8”	7.37”	7.47”
10”	9.23”	9.40”
12”	10.98”	11.33”

The above mandrel size are based upon four (4) percent deflections for ABS composite and five (5) percent deflections for PVC pipes including allowances for out-of-roundness due to manufacturing plus statistical manufacturing tolerances. The mandrel length shall be a minimum of one nominal pipe diameter. The mandrel shall be constructed so as not to “hang-up” at joints and shall be “nine pointed”. If it does not pass through the pipe, it is assumed that the pipe deflection exceeds the allowable and as such, the pipe section or sections shall be removed and replaced at no District’s expense to the satisfaction of the District. If requested, the mandrel shall be checked by the Inspector to determine if it meets the size requirements.

In addition, the District reserves the right to check the ring deflection in the pipe line at any time during the period up to one year from the date of the field Inspector’s acceptance of the work. If required, the contractor shall be responsible for this additional testing with the limitation that the District will be responsible for testing in excess of one additional passing test per any one section of pipe between adjacent manholes. Any defective pipelines shall be repaired or replaced at no District expense.

9.2 BACKFILL MATERIALS

A. GRADATION CURVES AND SAND EQUIVALENCY DETERMINATIONS:

Sieve analyses gradation curves and sand equivalency determinations shall be made by an independent testing laboratory on representative materials for the bedding and haunching materials. If requested, written results are to be submitted to the District for approval prior to backfilling with any of the tested material.

9.3 COMPACTION TESTS

These tests will be required for PVC and ABS pipes along the pipeline in the haunching area. A minimum one test per 800 feet of pipeline spaced approximately equidistant along the pipeline shall be taken by an independent testing laboratory. The compaction requirement is as discussed in Section 7 (ASTM D698 or better). If requested, written results including the compaction curve shall be submitted in writing to the District.

9.4 TELEVISION INSPECTION

In general, unless waived, the District will require television inspection of the installed wastewater lines to determine acceptability. Such testing will not replace other standard tests such as air testing. Television inspection will be performed after the line has been cleaned (balled) and air tested. If defects are noted through this or other testing, the Contractor must repair or replace defective materials or installations. The District may require re-inspection by television of the defective section.

A copy of this requirement is included in Section 7.1-G

SECTION 10.0

WASTEWATER SYSTEM AND WORK AREA CLEAN UP

10.1 CLEANING OF NEW WASTEWATER SYSTEM FACILITIES

Upon satisfactory completion of the air test and after all necessary repairs and adjustments have been made, including setting manhole frames to final elevations, the entire new system of sewers and manholes shall be cleaned. Before beginning the cleaning operation, a standard sand trap (Southwest Flexible Co. or equal) shall be placed in the manhole where the new work connects to the District's system, and it will remain in place until all solid matters have been removed. Under no conditions shall material other than clear flushing water be discharged into the District's system before final acceptance of the new work. Splattered mortar and all irregularities shall be removed from the flow channels, leaving smooth dense uniform surfaces finished in a thoroughly first class manner.

A hydraulically propelled ball will be used to clean the entire system of new sewers. Those sections that cannot be visually inspected by mirroring between manholes will be cleaned only in the presence of the District Inspector. Prior to the beginning of this work by the District, excessive amount of debris shall be removed by the Contractor.

Solid material washed into the lowest manhole(s) shall be removed from the system. The standard sand trap between the new work and the District's system shall be removed only after the District has given final approval of all phases of the work.

10.2 FINAL PROJECT CLEAN UP

Upon completion of all backfilling, paving, or repaving, manhole cover adjustments, testing, and sewer cleaning, the Contractor will clean the work site of all construction debris. All private improvements damaged during construction shall be restored to at least the original condition of said improvements including but not limited to trees, shrubs, curbs, gutters, sidewalks, fences, grass, etc. Filled excavations in private property shall be neatly finished in a manner to facilitate natural drainage and eliminate hazards to persons or property.

The project shall be left in a final condition that brings no discredit to the District.

SECTION 11.0

REQUIREMENTS FOR FINAL ACCEPTANCE

11.1 FIELD ACCEPTANCE

After satisfactory completion of the improvements, the District Inspector will provide a field acceptance letter to the Manager of the District's Engineering Section. However, it shall be the Developer's responsibility to initiate this action.

11.2 "AS-BUILT" ORIGINALS

Original 'As Built" drawings and two (2) sets of blue-line prints shall be submitted to the District. The As-built shall reflect the actual improvements made and give the accurate location of all new/or relocated facilities. The following certificate shall be signed and shall appear on the cover sheet of the wastewater plans:

"AS-BUILT" CERTIFICATE

I hereby certify that the work shown on drawing _____

Sheet _____ through _____ marked "AS-BUILT" has been constructed

in Conformance with lines and grades and requirements as shown on

said Plans, Drawings and referred Specifications.

_____

Registered Civil Engineer Number Date

11.3 WASTEWATER CONNECTION FEES

Developer shall pay, or make arrangements, satisfactory to the District to pay wastewater connection, capital fees, inspection, and plan check fees before any construction can start.

11.4 ON-SITE PLUMBING FIXTURE PLANS

An approved plumbing plan of on-site plumbing fixtures must be submitted to the District by the Developer to compute EDU (s) (Equivalent Dwelling Unit) for sewer capital and connection fees.

11.5 GRANT DEED

The Developer shall submit the original unrecorded grant deed executed by the Developer conveying the system to the District; this includes notarization of all signatures.

11.6 STATUS DURING MAINTENANCE AND GUARANTEE PERIOD

The Developer/Contractor is responsible for all the full guarantee period for the proper cleaning and maintenance of the wastewater system. Should the District crews have to perform any of this work, the costs for it will be invoiced to the Developer/Contractor.

July 23, 1998

Subject: Camrosa Water District's Confined Space Policy

Dear Contractor/or Developer:

Camrosa Water District is highly committed to provide a safe working environment for its employees and contractors. The District is also aware of the hazards of working in a confined space such as a manhole, a metering vault, or a pump station wet well. There are six major categories of hazards a person may encounter when entering a permitted confined space.

These hazards are listed in order of known frequency of accidents and causes of death to workers:

1 Atmospheric
2. Physical injury (slips, falls, falling objects, sharp objects, bumps and structural failures)
3. Infection and disease (in sewer manholes)
4. Insects and biting critters
5. Toxic exposure
6. Drowning.

Thus, a contractor working for the District must exercise extreme care and professionalism in order to accomplish the task safely and survive potential hazards.

Permit Required Confined Spaces are the most hazardous facilities in the District.

In order to comply with the California Code of Regulations Title 8, Division 1, Chapter4, Sub-chapter 7, Article 108, and Joint Powers Insurance Association Directive, the District has now classified a list of their facilities that includes their sewer manholes as " full permit required" confined spaces. As such, entry into them requires a special written authorization (Full permit or C5 Permit) from the District. A permit must be obtained and signed before anyone can enter the space. The permit shall be at the job site at all times until the work is completed or the permit expires. If the permit expires, a new permit must be obtained before

7385 Santa Rosa Road ▪ Camarillo, CA 93012-9284
Phone: (805) 482-4677 ▪ FAX: (805) 987-4797
Website: www.camrosa.com

continuing work. Upon completion, the permit is to be turned in to the District. A list of the permitted facilities is available in the District Office, upon request.

If and when the Contractor is doing work for the developer such as installing new sewer manholes, wet wells or vaults that will subsequently be dedicated to the District upon completion, the Developer shall be responsible for the Contractor's compliance with the California Code pertaining to confined space entry. If the Contractor was required by the District Inspector to enter a confined space to accomplish a specific task for the District, the District is responsible for the Contractor's compliance with the said California Code although the facility have not been accepted by the District,

The following are some instances wherein the District Inspector may require the contractor to enter a confined space:

- In order to final and accept the tract, the sewer lines must be pressure tested, mandrel pulled, balled, and video taped.
- To correct a deficiency, a mistake or to clear an obstruction(s).
- To clean the manhole base, trough, and shelf
- To band the shaft joints.

If the Developer is responsible for the contractor's compliance with the Code, the Inspector may or may not advise the Contractor or the Developer's Tract Superintendent to comply with the code. His advice to do so or his presence in the vicinity of the job shall not relieve the Developer of responsibility.

APPENDIX D

CAMROSA FULL PERMIT ACKNOWLEDGMENT FORM

Has tailgate safety meeting been held with the contractor?_____

I, the contractor, understand that this space is a permit required confined space._____

I, the contractor, have a "permit required confined space program" that will be followed._____

Work location:_____

_____

_____

Date:_____

CAMROSA Entry Supervisor:_____

Name of Contractor: _____

Doing Work For: _____

Contractor Representative: _____

SECTION 13

GREASE TRAPS

1. When, in the judgment of the District, waste pretreatment is required, an approved type grease trap complying with the provisions of this section shall be installed in the waste leading from sinks, drains, and other fixtures or equipment in establishments such as restaurants, cafes, lunch counters, cafeterias, bars and clubs, hotel, hospital, sanitarium, factory, or school kitchens, or other establishments where grease may be introduced into the drainage or sewage system in quantities that can effect stoppage or hinder sewage treatment or private sewage disposal. A grease trap is not required for individual dwelling units or for any private living quarters.

2. No grease trap shall be installed that has an approved rate of flow of more than fifty-five (55) gallons per minute, or less than twenty (20) gallons per minute, except when specifically approved by the District.

3. Each plumbing fixture or piece of equipment connected to a grease trap shall be provided with an approved type flow control or restricting device installed in a readily accessible and visible location in the tailpiece or drain outlet of each such fixture. Flow control devices shall at no time be greater than the rated capacity of the grease trap. No flow control device having adjustable or removable parts shall be approved.

4. Each grease trap required by this section shall have an approve rate of flow that is not less than that given in Table 7-2 for the total number of connected fixtures. The total capacity in gallons of fixture discharging into such grease trap shall not exceed two and one-half (2-1/2) times the certified gpm flow rate of the grease trap as per Table 12-2.

   Any grease trap installed within the inlet more than four (4) feet lower in elevation than the outlet of any fixture discharging into such grease trap shall have an approved rate of flow that is not less than fifty (50) percent greater than that given in table 12-2. Not more than four (4) separate fixtures shall be connected to or discharged into any one (1) grease trap.

   For the purpose of this section, the term “fixture” shall mean and include each plumbing fixture, appliance, apparatus or other equipment required to be connected to or discharged into a grease trap by any provision of this section.

5. Each fixture discharging into a grease trap shall be individually trapped and vented in an approved manner. An approved type grease trap may be used as a fixture trap for a single fixture when the horizontal distance between the fixture outlet and the grease trap does not exceed four (4) feet and the vertical tailpipe or drain does not exceed two and one-half (2- ½) feet.

6. Grease trap shall be maintained in efficient operating condition by periodic removal of the accumulated grease. No such collected grease shall be introduced into the drainage piping, or public or private sewer.

7. No water- jacketed grease trap or grease interceptor shall be approved or installed.

8. Each grease trap shall have an approved water seal of not less than two (2) inches in depth or the diameter of its outlet; whichever is greater.

TABLE 12-2 Grease Traps

Total Number Of Fixtures connected	Required Rate Of flow per Minute, Gallons	Grease Retention Capacity, Pounds
1	20	40
2	25	50
3	35	70
4	50	100

APPENDIX H

Recommended Procedures for Sizing Grease Interceptors for Commercial Kitchens

H1- Waste Discharge Requirements

(a) Waste discharge for fixtures and equipment in establishments that may contain grease, including but not limited to, scullery sinks, pot and pan sinks, dishwashing machines, soup kettles and floor drains located in areas where grease-containing materials exist, may be drained into the sanitary waste through the interceptor when approved by the District.

(b) Toilets, urinals and other similar fixtures shall not waste through the interceptor.

(c) All waste shall enter through the interceptor through the inlet pipe only.

H2- Design

(a) Interceptors shall be constructed in accordance with the design approved by the District and shall have a minimum of two compartments with fittings designed for grease retention.

(b) There shall be an adequate number of manholes to provide access for cleaning all areas of an interceptor, minimum of one (1) per ten (10) feet of interceptor length. Manhole covers shall be gas tight in construction having a minimum opening dimension of twenty (20) inches.

(c) In areas where traffic may exist the interceptor shall be designed to have adequate reinforcement and cover.

H3- Location

(a) Each grease interceptor shall be so installed and connected that it shall be at all times easily accessible for inspection, cleaning and removal of the intercepted grease. A grease interceptor may not be installed in any part of a building where food is handled. Location of the grease interceptor shall meet the approval of the District.

(b) Interceptors shall be placed as close as practical to the fixtures it serves.

(c) Each business establishment for which a grease interceptor is required shall have an interceptor that shall serve only that establishment.

H4- Sizing Criteria

(a) Parameters- The parameters for sizing a grease interceptor are Hydraulic loading and grease storage capacity, for one or more fixtures.

(b) Sizing Formula- The size of the interceptor shall be determined by the following formula:

Nos. of meals		Waste Flow		Retention		Storage		Interceptor
▼	X	▼	X	▼	X	▼	X	▼
Per Peak Hour*		Rate**		Time***		Factor****		Size (liquid capacity)

(c) * Meals served at Peak Hour

** Waste Flow Rate

a. With dishwashing machine	6-gallon flow
b. Without dishwashing machine	5-gallon flow
c. Single service kitchen	2-gallon flow
d. Food waste disposer	1-gallon flow

*** Retention Times

Commercial kitchen waste	
Dishwasher	2.4 hours
Single service kitchen	
Single serving	1.5 hours

**** Storage Factors

Fully equipped commercial kitchen	8 hours operation:1 16 hours operation:2 24 hours operation:3
Single service kitchen	1.5

H5- Effluent Sampling

An effluent sampling box on grease interceptors shall be required by the District.

H6- Abandoned Grease Interceptors

Abandoned grease interceptors shall be pumped and filled as required for abandoned sewers and sewage disposal facilities.

SANITARY SEWER NOTES

1. Sewer System Specifications and Standard construction drawings of the Camrosa Water District shall govern the materials and installation of the project and variation there from shall be approved by the Engineering Services Manager of Camrosa Water District.

2. All gravity sewer pipes shall be PVC SDR-35.

3. The owner or his authorized representative shall furnish the District with grade sheets and stationing for all house laterals and Y branches and shall provide stakes for them at their proper locations with stationing plainly marked. Any changes in location shall be requested in writing by the owner or his representative.

4. All sewer stationing shall be along the centerline of the sewer.

5. The Engineer shall furnish the house lateral depth from the sidewalk or top of the curb elevation at the property line for each house lateral on the grade sheet.

6. House service laterals shall be constructed with invert elevations at the property line4 feet minimum below sidewalk elevation.

7. Minimum clearance between sewer and water lines shall be 3 feet vertical and 10 feet horizontal otherwise special construction detail shall be submitted for approval.

8. Manhole shall be pre-cast concrete per **District Standard S-7**.

9. Use standard manhole frames and covers per **District Standard S-12** except as noted.

10. Manhole tops in unimproved right of way are to be 6 inches above finish grade.

11. No construction will be permitted in filled areas unless acceptable certification is submitted to the District that relative compaction is greater than 80% of maximum if compaction is less than 90% of maximum neither cradling nor special manhole bases will be required.

12. The contractor shall keep a strict record of location of all wyes, tees and laterals so their final location may be shown on the “As-Built” plans. Where yard cleanout is located under pavement, **District Standard S-22** applies.

13. All yard sewer clean-outs shall be brought to grade, capped or plugged and protected by a sewer box with “sewer” stamped on the lid. Box shall be placed minimum 1” higher than the finish grade, per **District Standard S-25**.

14. No connections for the disposal of industrial wastes shall be made to sewers shown on those plans without written permission from the District.

15. All sewer testing shall be in accordance with the Camrosa Water District specifications.

16. All pipe bedding shall be import material unless Developer furnishes soil survey satisfactory to the District that the native soils are suitable for pipe bedding.

17. Contractor shall mark the location of all sewer services on the face of the curb by chiseling the letter “S”, 2” high and 1/8” deep on the concrete or stamped while the concrete is still wet. Contractor shall be liable for damages caused by mis-marked sewer service.

18. After pressure testing and cleaning, but prior to occupancy and final acceptance all sewer lines 8” diameter and larger, shall have a videotape record of their interior performed. The Developer has the option of hiring a contractor to accomplish this requirement or can pay, through development fees, to the District to accomplish this.

19. All pipes for sewer force mains shall be C-900 CL 200 PVC.

20. A waterproof joint is required at each joint between the pre-cast manhole sections. Prior to stacking, a mastic and joint sealant shall be applied between sections.

21. Repairs to concrete, where required shall be accomplished using a mixture of epoxy cement and dry sand. Epoxy cement shall be “ceilcoat” no. 348 distributed by Shoellerman-Founts Corporation, Los Angeles, CA; “Lefkoweld” type 83, distributed by Laffingwell chemical Company, Whittier, CA, or approved equal.

22. The interior of all new manhole sections shall be lined with a polyurethane coating system. The polyurethane coating system shall result in a dry film thickness of 100 mils. The topcoat material shall be 100% solid, non-solvented, elastomeric polyurethane as manufactured by Zebron Corporation, P.O. Box 2874 Newport Beach, California 92659. Surface preparation, priming and application shall conform to the manufacturer’s recommendations. The plastic lining sheets, lining cast-in–place concrete, shall be protected and shall not be coated or over-sprayed with the polyurethane coating.

23. If water table is encountered during pipe laying, the exterior bottom 4 feet of all wastewater manholes shall be coated with 2 coats Sealant Products, Inc BG-50 or an approved equivalent in accordance with the manufacturer’s recommendations for application. Coating shall be cured as recommended by the manufacturer prior to placement of backfill against the coated surfaces.