
COMPONENT AND EQUIPMENT SPECIFICATIONS

- 5.1 Septic Tanks
 - 5.2 Dosing Septic Tank Assemblies
 - 5.3 Distribution Boxes
 - 5.4 Drop Boxes
 - 5.5 Filter Fabric
 - 5.6 Diversion Valves
 - 5.7 Effluent Pumps, Controls and Alarms
 - 5.8 Dosing Siphons
 - 5.9 Pipe Materials and Construction
 - 5.10 Flexible Membrane Liners
 - 5.11 Portable Toilets
-

Specifications for the major components of onsite wastewater disposal systems are included in this chapter. The goal of this chapter is to provide material and construction requirements which will enable the construction of effective and reliable onsite wastewater disposal systems in the Town of Paradise Onsite Wastewater Management Zone.

5.1 SEPTIC TANKS

A. General

The following requirements shall apply to all septic tanks manufactured for use in the Town of Paradise Wastewater Management Zone unless specifically exempted by other portions of these rules:

- Tanks shall be manufactured to comply with specifications within this manual, and requirements mandated by the Uniform Plumbing Code, California Plumbing Code Edition. Tanks shall be installed in strict conformance with the manufacturer's recommendations.
- Compartments: Septic tanks shall have multiple compartments for standard systems. Dosing tanks equipped with a screened vault may be single compartment. Multiple compartment tanks shall comply with the following:
 - a. The first compartment shall have a minimum liquid capacity of at least two-thirds of the total required liquid capacity, as measured from the invert of the outlet fitting.

- b. The second and succeeding compartments shall each have a minimum liquid capacity equal to or greater than one-half of the first compartment.
 - c. Each compartment shall have access provided by a manhole having not less than eighteen inches across its shortest dimension unless otherwise approved by the Town.
 - d. No compartment shall have an inside horizontal dimension of less than twenty-four inches.
- Liquid depth: The liquid depth of any compartment shall be at least thirty inches.
 - Septic tanks shall be watertight. Tanks shall be capable of successfully withstanding an above-ground static hydraulic test.
 - Septic tanks shall be capable of supporting a vertical load of at least 300 pounds per square foot when the maximum coverage does not exceed three feet. Tanks installed with more than three feet of cover shall be reinforced to support the additional load. Tanks shall be designed for lateral loads of at least 62.4 pounds per cubic foot.
 - The inlet and outlet fittings shall be of Schedule 40 PVC plastic, Schedule 40 ABS plastic, or other materials approved by the Town, with a minimum diameter of four inches:
 - a. The distance between the inlet and outlet fittings shall be equal to, or greater than the liquid depth of the tank.
 - b. The inlet and outlet fitting shall be located at opposite ends of the tank. They shall be attached in a watertight manner approved by the Town.
 - c. The inlet fitting shall be a "sanitary tee" extending at least six inches above and below the liquid level.
 - d. The outlet fitting shall be a "tee" extending below liquid level a distance equal to at least thirty-five percent but not greater than fifty percent of the liquid depth, and at least six inches above the liquid depth in order to provide scum storage. When the tank is used as a holding tank, the outlet fitting shall be provided with a watertight plug.
 - e. Ventilation shall be provided through the fittings by means of a two-inch minimum space between the underside of the top of the tank and the tip of the "tee" fitting.
 - f. The invert of the inlet fitting shall be not less than one inch but preferably three inches above the invert of the outlet fitting.

- g. The septic tank manufacturer shall provide, with each fitting, a rubber or neoprene rubber gasket meeting ASTM Specification C564, or an appropriate coupler which the Town determines will provide a watertight connection between the fittings and the building and effluent sewer pipes.
- h. An access cover of not less than 6 in. across shall be provided above each fitting.
- At least ten percent of the inside volume of the tank shall be above liquid level to provide scum storage.
- In tanks with more than one compartment, a four-inch diameter (minimum) "tee" fitting shall be placed in each common compartment wall, using the same specifications as required for the outlet fitting. The invert of this "tee" fitting shall be at the same elevation as the outlet "tee".
- All prefabricated septic tanks shall be marked on the uppermost tank surface with the liquid capacity of the tank and the manufacturers identification.

B. Precast concrete tanks

The following requirements apply to precast concrete septic tanks.

- Tanks shall be designed by a registered civil engineer.
- Walls, bottom and top reinforced-concrete tanks shall be designed across the shortest dimension using one-way slab analysis. Stresses in each face of monolithically-constructed tanks may be determined by analyzing the tank cross-section as a continuous fixed frame.
- The walls and bottom slab shall be poured monolithically.
- Reinforcing steel, when used, shall be ASTM A-615 Grade 60, $f_y=60,000$ psi. Details and placement shall be in accordance with ACI 315 and ACI 318.
- Concrete shall be ready-mix with cement conforming to ASTM C150, Type II. It shall have a cement content of not less than six (6) sacks per cubic yard and maximum aggregate size of three-fourths inch. Water/cement ratio shall be kept low ($0.35 \pm$), and concrete shall achieve a minimum compressive strength of 5,000 psi in twenty-eight days.
- Tanks shall be protected by applying a heavy cement-base waterproof coating (Thoroseal or equal), on both inside and outside surfaces, in compliance with Council of American Building Officials (CABO) report No. NRB-168; 6181.
- Form release used on tank molds shall be Nox-Crete or equal. Diesel or other petroleum products are not acceptable.

- Tanks shall not be moved from the manufacturing site to the job site until the tank has cured for seven (7) days or has reached two-thirds of the design strength.
- In order to demonstrate watertightness, tanks shall be tested twice prior to acceptance. Each tank shall be tested at the factory, prior to shipping, by filling with water to the soffit and letting stand. After 24 hours, the tank shall be refilled to the soffit and the exfiltration rate shall be determined by measuring the water loss during the next two hours. The two-hour loss shall not exceed one gallon. After installation is completed, each tank shall be filled with water and retested as previously described. If the tank is filled with water to the top of the riser, backfill of a depth equal to the height of the riser must be in place over the tank to prevent damage due to hydrostatic uplift.

C. Cast-in-place concrete tanks

Cast-in-place concrete tanks shall be designed by a registered civil engineer.

D. Fiberglass tanks

The following requirements apply to fiberglass tanks.

- The tank shall be constructed with a glass fiber and resin content specified by the manufacturer and with no exposed glass fibers. The manufacturer shall supply satisfactory evidence of testing by an approved laboratory showing compliance with IAPMO IGC 3-74, excepting as herein modified. Any metal part shall be 300 series stainless steel.
- The tank wall thickness shall average at least one-fourth inch.
- Holes specified for the tank shall be provided by the manufacturer. Resin shall be properly applied to all cut or ground edges so that no glass fibers are exposed and all voids are filled.
- Water testing shall be performed on each tank. Every tank shall be assembled by the manufacturer and filled with water to the brim of the access opening. The tank shall show no leakage from section seams, pinholes or other imperfections. Any leakage is cause for rejection. The manufacturer shall be responsible for making all corrective measures in production or assembly necessary to ensure a completely watertight tank.
- After installation is completed, each tank shall be filled with water to the top of the riser and the water loss measured after a two-hour period shall not exceed 1 gallon. Backfill of a depth equal to the height of the riser must be in place over the tank to prevent damage due to hydrostatic uplift.

5.2 DOSING SEPTIC TANK ASSEMBLIES

A dosing septic tank combines the functions of a septic tank and dosing tank into one unitized assembly by withdrawing septic tank effluent with a pump or dosing siphon from the clear zone (the area between scum and sludge) at the outlet end of the tank.

A. Design

- A single compartment tank may be used if an effluent screen and vault is provided.
- Design and equipment shall emphasize ease of maintenance and longevity and reliability of components and shall be proven suitable by operational experience, test, or analysis suitable to the Onsite Sanitary Official.
- An easy means of electrical and plumbing disconnection shall be provided, preventing the need for a repairman.
- Component materials shall be durable and corrosion resistance such as Type 316 stainless steel, suitable plastics, or 85-5-5-5 bronze.
- Each dosing tank shall be constructed and reinforced to withstand the loads imposed upon the top, walls and bottom.
- The minimum total volume of the tank shall be 1,500 gallons.
- The minimum submerged volume at the lowest operating liquid level shall be 900 gallons.
- Unless otherwise authorized by the Town, liquid levels shall be controlled so that a maximum of twenty percent of the projected daily wastewater flow is discharged each cycle.
- The invert of the inlet tee shall be not less than one inch above the high operating liquid level.
- Ports, or holes provided in a vault or outlet device shall be located to withdraw effluent horizontally at an elevation that represents the zone of best effluent quality.
- A convenient means of monitoring sludge and scum accumulation shall be provided with access extending to ground level. Dosing septic tanks shall be fitted with watertight access risers that extend to finished grade.

B. Construction requirements

Dosing septic tanks shall comply with applicable Town standards for septic tanks. Each tank shall be water tested by filling to the top of the tank for a period of one hour. During the test there shall

be no measurable drop in water level, and no visible leakage. Each tank shall be certified watertight.

Tanks may be constructed of concrete, fiberglass, or other noncorrosive materials approved by the Town.

Dosing tanks with siphons shall be designed and sized for each specific project and shall allow sufficient clearance above the siphon dome to allow removal of the dome.

5.3 DISTRIBUTION BOXES

- Distribution boxes shall be constructed of concrete, fiberglass, or other materials acceptable to the Town.
- Distribution boxes shall be watertight, and designed to accommodate the necessary distribution laterals. The top, walls, and bottom of concrete distribution boxes shall be at least one and one-half inches thick.
- The invert elevation of all outlets shall be the same, and shall be at least two inches below the inlet invert.
- Each distribution box shall be provided with a sump extending at least two inches below the invert of the outlets.
- The minimum inside horizontal dimension measured at the bottom shall be eight inches, with a minimum bottom inside surface area of 160 square inches. The bottom outside surface area shall be equal to or greater than the top outside surface area.
- Distribution box covers shall be marked with the manufacturer's identification.

5.4 DROP BOXES

- Drop boxes shall be constructed of concrete, fiberglass, or other materials acceptable to the Onsite Sanitary Official.
- Drop boxes shall be watertight, and designed to accommodate the necessary piping. The top, walls, and bottom of concrete drop boxes shall be at least one and one-half inches thick.
- The inverts of the inlet and overflow port shall be at the same elevation. The invert of the header pipe port(s) leading to the absorption trench(es) shall be six inches below the inlet invert.
- Drop box covers shall be marked with the manufacturer's identification.

5.5 FILTER FABRIC

Except as otherwise allowed by the Onsite Sanitary Official on a case-by-case basis, filter fabric used within onsite systems in the zone shall meet the following specifications:

- Material: synthetic fabric, either spun bonded or woven
- Burst strength: not less than twenty-five pounds per square inch.
- Air permeability: not less than 500 cubic feet per square foot-minute.
- Water flow rate: not less than 500 gallon per square foot-minute at three inches of head.
- Surface reaction to water: hydrophilic
- Equivalent opening size: No. 70 to No. 100 sieve
- Chemical properties:
 - a. Non-biodegradable
 - b. Resistant to acids and alkalis within a pH range of four to ten
 - c. Resistant to common solvents

5.6 DIVERSION VALVES

- Diversion valves shall be constructed of durable material and be of a design approved by the Onsite Sanitary Official. They shall be corrosion-resistant, watertight, and designed to accommodate the inlet and outlet pipes.
- The manufacturer's name shall be marked on the cover.

5.7 EFFLUENT PUMPS, CONTROLS AND ALARMS

Electrical components used in onsite sewage disposal systems shall comply with National Electrical Code, and the following provisions:

- Motors shall be continuous-duty, with overload protection.
- Pumps shall have durable impellers of bronze, cast iron, or other materials approved by the Onsite Sanitary Official.

- Submersible pumps shall be provided with an easy, readily accessible means of electrical and plumbing disconnect, and a noncorrosive lifting device as a means of removal for servicing.
- Pump can be placed within a corrosion-resistant screen that extends above the maximum effluent level within the pump chamber. The screen shall have at least twelve square feet of surface area, with one-eighth inch openings. The use of a screen is not required if the pump does not discharge into a pressurized distribution system, and the pump has a nonclog impeller capable of passing a three-fourths inch diameter solid sphere.
- Pumps shall be controlled automatically by UL, CSA, or ETL approved sealed mercury float switches with mercury tube ratings of 4-20 amps at 115 volts A.C. (depending on function) or by an approved equivalently reliable switching mechanism. The switches shall be installed so that the design dose is discharged each cycle.
- An audible and visual high water level alarm with manual silence switch shall be located in or near the building served by the pump. The audible alarm can be the type that can be turned off by the owner. The switching mechanism controlling the high water level alarm shall be located so that at time of activation the dosing tank has a reserve capacity remaining for effluent storage.
- When a system has more than one pump, the Onsite Sanitary Official may require they be wired into the electrical control panel to function alternately after each pumping cycle. If either pump should fail the other pump will continue to function, while an audible and visual alarm indicating pump malfunction will activate. A cycle counter and hour run meter shall be installed in the electrical control panel for each pump.

5.8 DOSING SIPHONS

Dosing siphons used in onsite wastewater disposal systems shall comply with all of the minimum requirements:

- Shall be constructed of corrosion-resistant materials.
- Shall be installed in accordance with the manufacturer's recommendations.

5.9 PIPE MATERIALS AND CONSTRUCTION

- Effluent sewer: The building effluent sewer shall be constructed with materials in conformance to building sewer standards, as identified in the Uniform Plumbing Code, California Plumbing Code Edition. The effluent sewer pipe shall have a minimum diameter of four inches.
- Distribution and Header Pipe and Fittings - Plastic pipe and fittings:

- a. Styrene-rubber plastic distribution and header pipe and fitting shall meet the most current ASTM Specification D2852 and Sections 5.5 and 7.8 of Commercial Standard 228, published by the U.S. Department of Commerce. Pipe and fittings shall also pass a deflection test withstanding 350 pounds per foot without cracking by using the method found in ASTM 2412.
- b. Polyethylene distribution pipe in 10 ft lengths and header pipe in lengths of ten feet or greater of which pipe and fitting shall meet the current ASTM Specification F405. Pipe and fittings shall also pass a deflection test withstanding 350 pounds per foot without cracking or collapsing by using the method found in ASTM 2412.
- c. Polyvinyl chloride (PVC) distribution and header pipe and fittings shall meet the most current ASTM Specification D2729. Pipe and fittings shall pass a deflection test withstanding 350 pounds per foot without cracking or collapsing by using the method found in ASTM 2412. Markings shall meet requirements established in ASTM Specification D2729, subsections 9.1.1, 9.1.2 and 9.1.4.
- d. Polyethylene smooth wall distribution and header pipe ten foot lengths and fittings shall meet the most current ASTM specification F810. Pipe and fittings shall also pass a deflection test of 350 lb/ft without cracking or collapsing by using the method found in ASTM 2412. Markings shall meet the requirements established in ASTM specification F810, Section 9.
- e. The four types of plastic pipe described above shall have two rows of holes spaced 120 degrees apart and 60 degrees on either side of a center line. For distribution pipe, a line of contrasting color shall be provided on the outside of the pipe along the line furthest away and parallel to the two rows of perforations. Markings, consisting of durable ink, shall cover at least fifty percent of the pipe. Markings may consist of a solid line, letters, or a combination of the two. Intervals between markings shall not exceed twelve inches. The holes of each row shall be not more than five inches on center and shall have a minimum diameter of one-half inch.
 - Polyvinyl chloride (PVC) pressure transport pipe, pressure manifolds, and pressure lateral pipe and fittings shall meet the current requirements for Class 200 PVC 1120 pressure pipe as identified in ASTM Specification D2241. The pipe and fittings shall marked be as required by ASTM Specifications D2241.

5.10 FLEXIBLE MEMBRANE LINERS

Unsupported polyvinyl chloride (PVC) shall have the properties listed in Table 5.1.

TABLE 5.1
PROPERTIES OF UNSUPPORTED PVC USED AS A
MEMBRANE LINER IN FILTERS

Property	Test Method
A. Thickness	ASTM D1593, 30 mil, min Para 8.1.3
B. Specific Gravity (minimum)	ASTM D792
C. Minimum tensile properties (each direction)	ASTM D882
1. Breaking factor (1 in. wide)	Method A or B 69
2. Elongation at break (percent)	Method A or B 300
3. Modulus (force at 100 percent elongation (lb/in. width))	Method A or B 27
D. Tear resistance (lb, minimum)	ASTM D1004 8 Die C
E. Low temperature	ASTM S1790 -20F
F. Dimensional stability (each direction, percent change maximum)	ASTM D1204 + or -5 212 F, 15 min.
G. Water extraction	ASTM D1239, 0.35 percent maximum
H. Volatile loss	ASTM D1203, 0.7 percent maximum
I. Resistance to soil burial (percent change maximum in original value)	ASTM D3083
1. Breaking factor -5	
2. Elongation at break -20	
3. Modulus at 100 percent elongation +10	
J. Bonded Seam Strength (factory seam, breaking factor, ppi width)	ASTM D3083 55.2
K. Hydrostatic resistance	ASTM D751 82 Method A

Installation standards:

- Patches, repairs, and seams shall have the same physical properties as the parent material.
- Site considerations and preparation:
 - a. The supporting surface slopes and foundation to accept the liner shall be stable and structurally sound including appropriate compaction. Particular attention shall be paid to the potential of sink hole development and differential settlement.
 - b. Soil stabilizers such as cementations or chemical binding agents must not adversely affect the membrane.
- Only fully buried membrane liner installation shall be considered to avoid weathering.
- Unreinforced liners have high elongation and can conform to irregular surfaces and follow settlements within limits. Unreasonable strain reduces effective thickness and may reduce life expectancy by lessening the chemical resistance of the thinner (stretched) material. Every effort shall be made to minimize the strain (for elongation) anywhere in the flexible membrane liner.
- Installation of liner:
 - a. Preparation of earth subgrade: The prepared subgrade shall be of soil types no larger than Unified Soil Classification System (USCS) sand (SP) to a minimum of four inches below the surface and free from loose earth, rock, fractured stone, debris, cobbles, rubbish and roots. The surface of the complete subgrade shall be properly compacted, smooth, uniform and free from sudden changes in grade. Importing suitable soil may be required.
 - b. Maintenance of subgrade: The earth subgrade shall be maintained in a smooth, uniform and compacted condition during installation of the lining.
 - c. Temperature: The desirable temperature range for membrane installation is 42°F to 78°F. Lower or higher temperatures may have an adverse effect on transportation, storage, field handling and placement, seaming and backfilling and attaching boots and patches may be difficult. Placing liner outside the desirable temperature range should be avoided.
 - d. Wind: Wind may have an adverse effect on liner installation such as interfering with liner placement. Mechanical damage may result. Cleanliness of areas for boot connection and patching may not be possible. Alignment of seams and cleanliness may not be possible. Placing the liner in high wind should be avoided.

- e. Precipitation: When field seaming is adversely affected by moisture, portable protective structures and/or other methods shall be used to maintain a dry sealing surface. Proper surface preparation for bonding boots and patches may not be possible. Seaming, patching and attaching "boots" shall be done under dry conditions.
- f. Penetration of liner: Penetration of a flexible liner by any designed means shall be avoided. Where penetrations are necessary, such as horizontal and vertical pipes, it is essential to obtain a secure, liquid-tight seal between the pipes and the flexible liner. Liners shall be attached to pipes with a mechanical type seal supplied by the liner manufacturer, supplemented by a chemically compatible caulking or adhesives to effect a liquid-tight seal. The highest order of compaction shall be provided in the area adjacent to pipes to compensate for any settlement.
- g. Size. The final cut size of the liner shall be carefully determined and ordered to generously fit the container geometry without field seaming or excess straining of the liner material.
- h. Transportation, handling and storage: Transportation, handling and storage procedures shall be planned to prevent material damage. Material shall be stored in a secured area and protected from adverse weather.
- i. Site inspection: A site inspection shall be carried out by the Onsite Sanitary Official and the installer prior to liner installation to verify surface conditions, etc.
- j. Deployment: Panels shall be positioned to minimize handling. Seaming should not be necessary. Bridging or stressed conditions shall be avoided with proper slack allowances for shrinkage. The liner shall be secured to prevent movement and promptly backfilled.
- k. Anchoring trenches: The liner edges should be secured frequently in a backfilled trench.
- l. Field seaming: Field seaming, if absolutely necessary, shall only be attempted when weather conditions are favorable. The contact surfaces of the materials should be clean of dirt, dust, moisture, or other foreign materials. The contact surfaces shall be aligned with sufficient overlap and bonded in accordance with the suppliers recommended procedures. Wrinkles shall be smoothed out and seams should be inspected by nondestructive testing techniques to verify their integrity. As seaming occurs during installation, the field seams shall be inspected continuously and any faulty area repaired immediately.
- m. Field repairs: It is important that traffic on the lined area be minimized. Any necessary repairs to the liner shall be patched using the same lining material and following the recommended procedure of the supplier.

- n. Final inspection and acceptance: Completed liner installations shall be checked visually for punctures, rips, tears and seam discontinuities before placement of any backfill. At this time the installer shall also manually check all factory and field seams with an appropriate tool. In lieu of, or in addition to, manual checking of seams by the installer shall also manually check all factory and field seams with an appropriate tool. In lieu of or in addition to manual checking of seams by the installer, either of the following tests may be performed:
1. Wet test: The lined basin shall be flooded to the four foot level with water after inlets and outlets have been plugged. Workmanship shall be accepted if leakage rate in a twenty-four hour period is no greater than 0.25 inch.
 2. Air lance test: Inspect all seams (factory and field) for unbonded areas using an air nozzle to detect loose edges. Riffles indicate unbonded areas within the seam, or other undesirable seam construction. Check all bonded seams using a minimum 50 pounds per square inch (gage) air supply directed through a three-quarters inch (typical) nozzle, held not more than two inches from the seam edge and directed at the seam edge.

5.11 PORTABLE TOILETS

All portable toilet facilities shall comply with the following requirements:

- They shall have water-tight chambers constructed of reinforced concrete, plastic, fiberglass, metal, or of other material of acceptable durability and corrosion resistance, approved by the Onsite Sanitary Official, and designed to facilitate the removal of the wastes.
- Blackwater shall be stored in an appropriate chamber until removal for final disposal elsewhere. Wastes shall be removed from the chamber whenever necessary to prevent overflow.
- Chemicals containing heavy metals, including but not limited to copper, cadmium and zinc, shall not be used.
- All surfaces subject to soiling shall be impervious, easily cleanable, and readily accessible.
- Toilet bowls shall be constructed of stainless steel, plastic, fiberglass, ceramic or of other material approved by the Onsite Sanitary Official.
- Waste passages shall have smooth surfaces and be free of obstructions, recesses or cross braces which would restrict or interfere with flow of black wastes.

5. Components and Equipment Specifications

- Biocides and oxidants shall be added to waste detention chambers at rates and intervals recommended by the chemical manufacturer and approved by the Onsite Sanitary Official.
- Chambers and receptacles shall provide a minimum storage capacity of fifty gallons per seat.
- Portable shelters housing chemical toilets shall display the business name of the licensed sewage disposal service that is responsible for servicing them.