

CHAPTER 16

ALTERNATE WATER SOURCES FOR NONPOTABLE APPLICATIONS

Intent

The provisions of this chapter are intended to:

1. Conserve water by facilitating greater reuse of laundry, shower, lavatory and similar sources of discharge for irrigation and/or indoor use.
2. Reduce the number of non-compliant gray water systems by making legal compliance easily achievable.
3. Provide guidance for avoiding potentially unhealthful conditions.
4. Provide an alternative way to relieve stress on a private sewage disposal system by diverting the graywater.

1601.0 General.

1601.1 Applicability. [HCD 1] Except as otherwise provided for in this chapter, the provisions of this code shall be applicable to alternate water source system installation. [BSC & HCD 1] The provisions of this chapter shall apply to the construction, alteration, discharge, use and repair of alternate water source systems for nonpotable applications.

1601.1.1 Allowable Use of Alternate Water. Where approved or required by the Authority Having Jurisdiction, alternate water sources [reclaimed (recycled) water, rainwater, gray water and on-site treated nonpotable gray water] shall be permitted to be used in lieu of potable water for the applications identified in this chapter.

1601.2 System Design. Alternate water source systems complying with this chapter shall be designed by a person who demonstrates competency to design the alternate water source system as required by the Enforcing Agency. The Enforcing Agency may also require plans and specifications to be prepared by a licensed design professional for Complex Systems. Components, piping, and fittings used in any alternate water source system shall be listed.

1601.3 Permit. It shall be unlawful for a person to construct, install, alter, or cause to be constructed, installed, or altered an alternate water source system in a building or on a premise without first obtaining a permit to do such work. Prior to commencing the issuance of permits for indoor gray water systems pursuant to state requirements relating to gray water, a city, county, city and county or other local agency shall seek consultation with the local public health department to ensure that local public health concerns are addressed in local standards or ordinances, or in issuing permits. See California Water Code Section 14877.3.

Exception: [HCD 1] A construction permit shall not be required for a clothes washer system meeting the requirements of Section 1602.1.1.

1601.4 Component Identification. System components shall be properly identified as to the manufacturer.

1601.5 Maintenance and Inspection. Alternate water source systems and components shall be inspected and maintained in accordance with the manufacturer's recommendations and/or as required by the Enforcing Agency. [BSC] Where no manufacturers recommendations exist, additional recommendations are listed in Table 1601.5.

1601.5.1 Maintenance Responsibility. The required maintenance and inspection of alternate water source systems shall be the responsibility of the property owner, unless otherwise required by the Authority Having Jurisdiction.

1601.6 Operation and Maintenance Manual. An operation and maintenance manual for gray water, rainwater, and on-site treated water systems required to have a permit in accordance with Section 1601.3 shall be supplied to the building owner by the system designer or installer. The operating and maintenance manual shall include the following:

- (1) Diagram(s) of the entire system and the location of system components.
- (2) Instructions on operating and maintaining the system.
- (3) Instructions on maintaining the required water quality for on-site treated nonpotable water systems.
- (4) Details on startup, shutdown, and deactivating the system for maintenance, repair, or other purposes.
- (5) Applicable testing, inspection, and maintenance frequencies in accordance with Section 1601.5.
- (6) A method of contacting the installer and/or manufacturer(s).
- (7) Directions to the owner or occupant that the manual shall remain with the building throughout the life cycle of the structure.

1601.7 Minimum Water Quality Requirements.

1601.7.1 [BSC] The minimum water quality for alternate water source systems shall meet the applicable water quality requirements for the intended application as determined by the Authority Having Jurisdiction. In the absence of water quality requirements for on-site nonpotable treated gray water systems, the requirements of NSF 350 shall apply.

Exception: Water treatment is not required for gray water used for subsurface/subsoil irrigation or a disposal field.

1601.7.2 [HCD 1] The minimum water quality for alternate water source systems shall meet the applicable water quality requirements for the intended application as determined by the public health Authority Having Jurisdiction. In the absence of water quality requirements for on-site treated nonpotable gray water systems, the following water quality requirements shall apply:

ALTERNATE WATER SOURCES FOR NONPOTABLE APPLICATIONS

TABLE 1601.5 [BSC]
RECOMMENDED MINIMUM ALTERNATE WATER SOURCE TESTING, INSPECTION, AND MAINTENANCE FREQUENCY

DESCRIPTION	MINIMUM FREQUENCY
Inspect and clean filters and screens, and replace (where necessary).	<i>In accordance with manufacturer's instructions, and/or the Authority Having Jurisdiction, or every 3 months.</i>
Inspect and verify that disinfection, filters and water quality treatment devices and systems are operational and maintaining minimum water quality requirements as determined by the Authority Having Jurisdiction.	<i>In accordance with manufacturer's instructions, and the Authority Having Jurisdiction.</i>
Inspect pumps and verify operation.	<i>In accordance with manufacturer's instructions, and/or the Authority Having Jurisdiction, or after installation and every 12 months thereafter.</i>
Inspect valves and verify operation.	<i>In accordance with manufacturer's instructions, and/or Authority Having Jurisdiction, or after installation and every 12 months thereafter.</i>
Inspect pressure tanks and verify operation.	<i>In accordance with manufacturer's instructions, and/or the Authority Having Jurisdiction, or after installation and every 12 months thereafter.</i>
Clear debris from and inspect storage tanks, locking devices, and verify operation.	<i>In accordance with manufacturer's instructions, and/or the Authority Having Jurisdiction, or after installation and every 12 months thereafter.</i>
Inspect caution labels and marking.	<i>In accordance with manufacturer's instructions, and/or the Authority Having Jurisdiction, or after installation and every 12 months thereafter.</i>
Inspect and maintain mulch basins for gray water irrigation systems.	<i>As needed to maintain mulch depth and prevent ponding and runoff.</i>
Cross-connection inspection and test*	<i>In accordance with this chapter, and/or the Authority Having Jurisdiction, or after installation and every 12 months thereafter.</i>

* The cross-connection test shall be performed in the presence of the Authority Having Jurisdiction in accordance with the requirements of this chapter, unless site conditions do not require it. Alternate testing requirements shall be permitted by the Authority Having Jurisdiction.

- 1) *For owner occupied single family dwellings NSF/ANSI 350.*
- 2) *For R-1 and R-2 occupancies, the California Department of Public Health statewide uniform criteria for disinfected tertiary recycled water as provided in California Code of Regulations, Title 22, Section 60301.230.*

Exception: Water treatment is not required for gray water used in a disposal field or for subsurface or subsoil irrigation.

1601.8 Material Compatibility. Alternate water source systems shall be constructed of materials that are compatible with the type of pipe and fitting materials, water treatment, and water conditions in the system.

1601.9 System Controls. Controls for pumps, valves, and other devices that contain mercury that come in contact with alternate water source water supply shall not be permitted.

1602.0 Gray Water Systems.

1602.1 General. The provisions of this section shall apply to the construction, alteration, and repair of gray water systems. *A city, county, or city and county or other local government may adopt, after a public hearing and enactment of an ordinance or resolution, building standards that are more restrictive than the gray water building standards adopted in this code. For additional information, see Health and Safety Code Section 18941.7.*

(A) *All gray water systems shall be designed with a diverter valve to allow the user to direct the flow to the building sewer and either the irrigation field or disposal field,*

whichever is used. The means of changing the direction flow of the gray water shall be clearly labeled and readily accessible to the user.

- (B) *Water used to wash diapers or similarly soiled or infectious garments or other prohibited contents shall be diverted by the user to the building sewer.*
- (C) *Gray water shall not be used in spray irrigation, allowed to pond or runoff and shall not be discharged directly into or reach any storm sewer system or any surface body of water.*
- (D) *Human contact with gray water or the soil irrigated by gray water shall be minimized and avoided, except as required to maintain the gray water system. The discharge point of any gray water subsoil irrigation or subsurface irrigation field shall be covered by at least (2) inches (51 mm) of mulch, rock, or soil, or a solid shield to minimize the possibility of human contact.*
- (E) *Gray water may be released above the ground surface provided at least two (2) inches (51 mm) of mulch, rock, or soil, or a solid shield covers the release point. Other methods which provide equivalent separation are also acceptable.*
- (F) *Gray water shall not contain hazardous chemicals derived from activities such as cleaning car parts, washing greasy or oily rags, or disposing of waste solutions.*
 - (1) **[HCD 1]** *The prohibition in Subsection (F) includes, but is not limited to, home photo labs or other similar hobbyist or home occupational activities.*
 - (2) **[BSC]** *photo labs or similar activities.*

- (G) Exemption from construction permit requirements of this code shall not be deemed to grant authorization for any gray water system to be installed in a manner that violates other provisions of this code or any other laws or ordinances of the Enforcing Agency.
- (H) An operation and maintenance manual shall be provided to the owner. Directions shall indicate that the manual is to remain with the building throughout the life of the system and upon change of ownership or occupancy.
- (I) A gray water system shall not be connected to any potable water system without an air gap, reduced-pressure principle backflow preventer, or other physical device which prevents backflow and shall not cause ponding or runoff of gray water.

1602.1.1 [HCD 1] Clothes Washer System. A clothes washer system in compliance with all of the following is exempt from the construction permit specified in Section 1.8.4.1 and may be installed or altered without a construction permit:

- (1) If required, notification has been provided to the enforcing agency regarding the proposed location and installation of a gray water irrigation or disposal system.
- (2) The design shall allow the user to direct the flow to the irrigation or disposal field or the building sewer. The direction control of the gray water shall be clearly labeled and readily accessible to the user.
- (3) The installation, change, alteration, or repair of the system does not include a potable water connection or a pump and does not affect other building, plumbing, electrical, or mechanical components including structural features, egress, fire-life safety, sanitation, potable water supply piping, or accessibility.
Note: The pump in a clothes washer shall not be considered part of the gray water system.
- (4) The gray water shall be contained on the site where it is generated.
- (5) Gray water shall be directed to and contained within an irrigation or disposal field.
- (6) Ponding or runoff is prohibited and shall be considered a nuisance.
- (7) Gray water may be released above the ground surface provided at least two (2) inches (51 mm) of mulch, rock, or soil, or a solid shield covers the release point. Other methods which provide equivalent separation are also acceptable.
- (8) Gray water systems shall be designed to minimize contact with humans and domestic pets.
- (9) Water used to wash diapers or similarly soiled or infectious garments shall not be used and shall be diverted to the building sewer.
- (10) Gray water shall not contain hazardous chemicals derived from activities such as cleaning car parts, washing greasy or oily rags, or disposing of waste

solutions from home photo labs or similar hobbyist or home occupational activities.

- (11) Exemption from construction permit requirements of this code shall not be deemed to grant authorization for any gray water system to be installed in a manner that violates other provisions of this code or any other laws or ordinances of the enforcing agency.
- (12) An operation and maintenance manual shall be provided to the owner. Directions shall indicate that the manual is to remain with the building throughout the life of the system and upon change of ownership or occupancy.

1602.1.2 Simple System. Simple systems exceed a clothes washer system and shall comply with the following:

- (1) The discharge capacity of a gray water system shall be determined by Section 1602.8. Simple systems have a discharge capacity of 250 gallons (947 L) per day or less.
- (2) Simple systems shall require a construction permit, unless exempted from a construction permit by the Enforcing Agency. The Enforcing Agency shall consult with the water purveyor for any public water system (as defined in Health and Safety Code Section 116275) providing drinking water to the dwelling or non-residential structure before allowing an exemption from a construction permit.
- (3) The design of simple systems shall meet generally accepted gray water system design criteria.

1602.1.3 Complex System. Any gray water system that is not a clothes washer system or simple system shall comply with the following:

- (1) The discharge capacity of a gray water system shall be determined by Section 1602.8. Complex systems have a discharge capacity over 250 gallons (947 L) per day.
- (2) Complex systems shall require a construction permit, unless exempted from a construction permit by the Enforcing Agency. The Enforcing Agency shall consult with the water purveyor for any public water system (as defined in Health and Safety Code, Section 116275) providing drinking water to the dwelling or non-residential structure before allowing an exemption from a construction permit.

1602.2 System Requirements.

1602.2.1 Discharge. Gray water shall be permitted to be diverted away from a sewer or private sewage disposal system, and discharge to a subsurface irrigation or subsoil irrigation system, or disposal field. The gray water shall be permitted to discharge to a mulch basin for residential occupancies. Gray water shall not be used to irrigate root crops or food crops intended for human consumption that come in contact with soil.

1602.2.2 Surge Capacity. Gray water systems shall be designed to have the capacity to accommodate peak

flow rates and distribute the total amount of estimated gray water on a daily basis to a subsurface irrigation field, subsoil irrigation field, disposal field, or mulch basin without surfacing, ponding, or runoff. A surge tank is required for systems that are unable to accommodate peak flow rates and distribute the total amount of gray water by gravity drainage. The water discharge for gray water systems shall be determined in accordance with Section 1602.8.1 or Section 1602.8.2.

Exception: *It is not the intent of this section to require that all gray water must be handled by an irrigation field or disposal field. It is acceptable for excess gray water to be diverted to the building sewer through a diverter valve or overflow drain as permitted in this chapter.*

1602.2.3 Diversion. The point of diversion of gray water to the sanitary drainage system shall occur downstream of fixture traps and vent connections through an approved diverter valve. The diverter valve shall be installed in a readily accessible location and clearly indicate the direction of flow.

1602.2.4 Backwater Valves. Gray water drains subject to backflow shall be provided with a backwater valve at the point of connection to the building sewer system, so located as to be accessible for inspection and maintenance.

1602.3 Connections to Potable and Reclaimed (Recycled) Water Systems. Gray water systems shall have no unprotected connection to a potable water supply, on-site treated nonpotable water supply, or reclaimed (recycled) water systems. Potable, on-site treated nonpotable, reclaimed (recycled) water, or rainwater is permitted to be used as makeup water for a non-pressurized storage tank provided the connection is protected by an air gap, reduced-pressure principle backflow preventer, or other physical device which prevents backflow in accordance with this code.

1602.4 Location. No gray water system or part thereof shall be located on a lot other than the lot that is the site of the building or structure that discharges the gray water, nor shall a gray water system or part thereof be located at a point having less than the minimum distances indicated in Table 1602.4.

Exception: *When there exists a lawfully recorded perpetual and exclusive covenant to an easement appurtenant and right-of-way between adjoining land-owners of two or more contiguous lots to discharge gray water from one lot to an adjoining lot.*

1602.5 Plot Plan Submission. No permit for a gray water system shall be issued until a plot plan with data satisfactory to the Authority Having Jurisdiction has been submitted and approved.

TABLE 1602.4
LOCATION OF GRAY WATER SYSTEM

MINIMUM HORIZONTAL DISTANCE IN CLEAR REQUIRED FROM	SURGE TANK (feet)	SUBSURFACE AND SUBSOIL IRRIGATION FIELD AND MULCH BASIN (feet)	DISPOSAL FIELD
Building structures ¹	5 ^{2, 3, 9}	2 ^{3, 8}	5
Property line adjoining private property	5	5 ⁸	5
Water supply wells ⁴	50	100	100
Streams and lakes ⁴	50	100 ^{5, 10}	100 ⁵
Sewage pits or cesspools	5	5	5
Sewage disposal field ¹⁰	5	4 ⁶	4 ⁶
Septic tank	0	5	5
On-site domestic water service line	5	0	0
Pressurized public water main ⁷	10	10	10 ⁷

For SI units: 1 foot = 304.8 mm

Notes:

- ¹ Building structures do not include porches and steps, whether covered or uncovered, breezeways, roofed carports, roofed porte cocheres, roofed patios, carports, covered walks, covered driveways, and similar structures or appurtenances.
- ² The distance shall be permitted to be reduced to 0 feet for aboveground tanks where first approved by the Authority Having Jurisdiction.
- ³ Underground tanks shall not be located within a 45 degree angle from the bottom of the foundation, or they shall be designed to address the surcharge imposed by the structure. The distance may be reduced to six (6) inches (153 mm) for aboveground tanks when first approved by the Enforcing Agency.
- ⁴ Where special hazards are involved, the distance required shall be increased as directed by the Authority Having Jurisdiction.
- ⁵ These minimum clear horizontal distances shall apply between the irrigation or disposal field and the ocean mean higher high tide line.
- ⁶ Add 2 feet (610 mm) for each additional foot of depth in excess of 1 foot (305 mm) below the bottom of the drain line.
- ⁷ For parallel construction or for crossings, approval by the Authority Having Jurisdiction shall be required.
- ⁸ The distance shall be permitted to be reduced to 1½ feet (457 mm) for drip and mulch basin irrigation systems.
- ⁹ The distance shall be permitted to be reduced to 0 feet for surge tanks of 75 gallons (284 L) or less.
- ¹⁰ The minimum horizontal distance may be reduced to 50 feet (15 240 mm) for irrigation or disposal fields utilizing gray water which has been filtered prior to entering the distribution piping.

Exception: [HCD 1] A construction permit shall not be required for a clothes washer system in compliance with Section 1602.1.1.

1602.6 Prohibited Location. Where there is insufficient lot area or inappropriate soil conditions for adequate absorption, no gray water system shall be permitted.

1602.7 Drawings and Specifications. The Authority Having Jurisdiction may require the following information to be included with or in the plot plan before a permit is issued for a gray water system, or at a time during the construction thereof:

- (1) Plot plan drawn to scale and completely dimensioned, showing lot lines and structures, direction and approximate slope of surface, location of present or proposed retaining walls, drainage channels, water supply lines, wells, paved areas and structures on the plot, number of bedrooms and plumbing fixtures in each structure, location of private sewage disposal system and expansion area or building sewer connecting to the public sewer, and location of the proposed gray water system.
- (2) Details of construction necessary to ensure compliance with the requirements of this chapter, together with a full description of the complete installation, including installation methods, construction, and materials.
- (3) Details for holding tanks shall include dimensions, structural calculations, bracings, and such other pertinent data as required.
- (4) A log of soil formations and groundwater level as determined by test holes dug in proximity to proposed irrigation and/or disposal area, together with a statement of water absorption characteristics of the soil at the proposed site as determined by approved percolation tests.

Exceptions:

- (1) The Authority Having Jurisdiction shall permit the use of Table 1602.10 in lieu of percolation tests.
- (2) The Enforcing Agency may waive the requirement for identification of groundwater level and/or soil absorption qualities based on knowledge of local conditions.
- (3) The absence of groundwater in a test hole three (3) vertical feet (915 mm) below the deepest irrigation or disposal point shall be sufficient to satisfy this section unless seasonal high groundwater levels have been documented to rise to within this area.
- (5) Distance between the plot and surface waters such as lakes, ponds, rivers or streams, and the slope between the plot and the surface water, where in close proximity.

1602.8 Procedure for Estimating Gray Water Discharge. Gray water systems shall be designed to distribute the total amount of estimated gray water on a daily basis. The water discharge for gray water systems shall be determined in accordance with Section 1602.8.1 or Section 1602.8.2.

Exception: It is not the intent of this section to require that all gray water must be handled by an irrigation field or disposal field. It is acceptable for excess gray water to be

diverted to the building sewer through a diverter valve or overflow drain as permitted in this chapter.

1602.8.1 Residential Occupancies. The gray water discharge for residential occupancies shall be calculated by water use records, calculations of local daily per person interior water use, or the following procedure:

- (1) The number of occupants of each dwelling unit shall be calculated as follows:

First Bedroom	2 occupants
Each additional bedroom	1 occupant
- (2) The estimated gray water flows of each occupant shall be calculated as follows:

Showers, bathtubs, and lavatories	25 gallons (95 L) per day/occupant
Laundry	15 gallons (57 L) per day/occupant
- (3) The total number of occupants shall be multiplied by the applicable estimated gray water discharge as provided above and the type of fixtures connected to the gray water system.

1602.8.2 Commercial, Industrial, and Institutional Occupancies. The Authority Having Jurisdiction may utilize the graywater discharge procedures listed below, water use records, or other documentation to estimate graywater discharge.

1602.8.2.1 Lavatories. Daily discharge from lavatories may be determined by the following equation:
(Equation 16-1)

$$\text{Occupants} \times \text{lavatory flow rate} \times 3$$

Where:

The number of occupants = square footage of the building divided by the occupant load factor from the California Plumbing Code Chapter 4, Table A.
Lavatory fixture flow rate, new construction = That from the California Green Building Standards (CALGreen) Code Table 5.303.2.3

Lavatory fixture flow rate, existing fixtures = Actual flow rate for existing fixtures

3 = Average number of uses per person per day

1602.8.2.2 Showers. Daily gray water discharge from showers may be determined by the following equation:

(Equation 16-2)

$$\text{Number of daily uses} \times \text{shower flow rate} \times 5 \text{ minutes}$$

1602.8.2.3 Commercial Clothes Washers. Daily gray water discharge from commercial clothes washers may be determined by the following equation:

(Equation 16-3)

$$\text{Cubic feet of capacity} \times \text{Water Factor} \times 6$$

Where:

Water Factor = Gallons per cubic foot

6 = Average number of uses per day

Note: Cubic feet of capacity and Water Factor are contained in product specifications or are available from the washer manufacturer.

1602.8.3 Daily Discharge. *Gray water systems using tanks shall be designed to minimize the amount of time gray water is held in the tank and shall be sized to distribute the total amount of estimated gray water on a daily basis.*

Exception: *Approved on-site treated nonpotable gray water systems.*

1602.9 Gray Water System Components. Gray water system components shall comply with Section 1602.9.1 through 1602.9.4.

[HCD 1] Gray water system components shall comply with this chapter.

1602.9.1 Surge Tanks. Where installed, surge tanks shall be in accordance with the following:

- (1) Surge tanks shall be constructed of solid, durable materials not subject to excessive corrosion or decay and shall be watertight. *Aboveground surge tanks shall be protected from direct sunlight or shall be constructed of UV resistant materials including but not limited to heavily tinted or opaque plastic, fiberglass, lined metal, concrete and wood.* Surge tanks constructed of steel shall be approved by the Authority Having Jurisdiction, provided such tanks are in accordance with approved applicable standards.
- (2) Each surge tank shall be vented in accordance with this code. The vent size shall be determined based on the total gray water fixture units as outlined in this code.
- (3) Each surge tank shall have an access opening with lockable gasketed covers or approved equivalent to allow for inspection and cleaning.
- (4) Each surge tank shall have its rated capacity permanently marked on the unit. In addition, a sign stating *GRAY WATER SYSTEM, CAUTION – UNSAFE WATER* shall be permanently marked on the holding tank.
- (5) Each surge tank shall have an overflow drain. The overflow drains shall have permanent connections to the building drain or building sewer, upstream of septic tanks. The overflow drain shall not be equipped with a shutoff valve.
- (6) The overflow drain pipes shall not be less in size than the inlet pipe. Unions or equally effective fittings shall be provided for piping connected to the surge tank.
- (7) Surge tank shall be structurally designed to withstand anticipated earth or other loads. Surge tank covers shall be capable of supporting an earth load of not less than 300 pounds per square foot (lb/ft²) (1465 kg/m²) where the tank is designed for underground installation.
- (8) Where a surge tank is installed underground, the system shall be designed so that the tank overflow

will gravity drain to the existing sewer line or septic tank. The tank shall be protected against sewer line backflow by a backwater valve installed in accordance with this code.

- (9) Surge tanks shall be installed on dry, level, well-compacted soil where underground or on a level 3 inch (76 mm) thick concrete slab *or other approved method* where aboveground.
- (10) Surge tanks shall be anchored to prevent against overturning where installed aboveground. Underground tanks shall be ballasted, anchored, or otherwise secured, to prevent the tank from floating out of the ground where empty. The combined weight of the tank and hold down system shall meet or exceed the buoyancy forces of the tank.
- (11) **[HCD 1]** *An overflow drain and backwater valve is not required on a clothes washer system.*

1602.9.2 Gray Water Pipe and Fitting Materials. Aboveground and underground building drainage and vent pipe and fittings for gray water systems shall comply with the requirements for aboveground and underground sanitary building drainage and vent pipe and fittings in this code. These materials shall extend not less than 2 feet (610 mm) outside the building.

1602.9.3 Animals and Insects. *Gray water tank openings shall be protected to prevent the entrance of insects, birds, or rodents into the tank and piping systems. Screens installed on vent pipes, inlets, and overflow pipes shall have an aperture of not greater than 1/16 of an inch (1.6mm) and shall be close fitting.*

1602.9.4 Freeze Protection. *Tanks and piping installed in locations subject to freezing shall be provided with an approved means of freeze protection.*

1602.10 Subsurface Irrigation System Zones. Irrigation or disposal fields shall be permitted to have one or more valved zones. Each zone shall be of a size to receive the gray water anticipated in that zone.

**TABLE 1602.10
DESIGN OF SIX TYPICAL SOILS**

TYPE OF SOIL	MINIMUM SQUARE FEET OF IRRIGATION/LEACHING AREA PER 100 GALLONS OF ESTIMATED GRAY WATER DISCHARGE PER DAY	MAXIMUM ABSORPTION CAPACITY IN GALLONS PER SQUARE FOOT OF IRRIGATION/LEACHING AREA FOR A 24-HOUR PERIOD
Coarse sand or gravel	20	5.0
Fine sand	25	4.0
Sandy loam	40	2.5
Sandy clay	60	1.7
Clay with considerable sand or gravel	90	1.1
Clay with small amounts of sand or gravel	120	0.8

For SI units: 1 square foot = 0.0929 m², 1 gallon per day = 0.000043 L/s

1602.10.1 Required Area of Subsurface Irrigation Fields, Subsoil Irrigation Fields and Mulch Basins.

The minimum effective irrigation area of subsurface irrigation fields, subsoil irrigation fields, and mulch basins shall be determined by Table 1602.10 for the type of soil found in the excavation, based upon a calculation of estimated gray water discharge pursuant to Section 1602.8. For a subsoil irrigation field, the area shall be equal to the aggregate length of the perforated pipe sections within the valved zone multiplied by the width of the proposed subsoil irrigation field.

1602.10.2 Determination of Maximum Absorption Capacity. The irrigation field and mulch basin size shall be based on the maximum absorption capacity of the soil and determined using Table 1602.10. For soils not listed in Table 1602.10, the maximum absorption capacity for the proposed site shall be determined by percolation tests or other method acceptable to the Authority Having Jurisdiction. A gray water system shall not be permitted, where the percolation test shows the absorption capacity of the soil is unable to accommodate the maximum discharge of the proposed gray water irrigation system.

Exception: The Enforcing Agency may waive the requirement for identification of groundwater level and/or soil absorption qualities based on knowledge of local conditions.

1602.10.3 Groundwater Level. No excavation for an irrigation field, disposal field, or mulch basin shall extend within 3 feet (914 mm) vertical of the highest known seasonal groundwater level, nor to a depth where gray water contaminates the groundwater or surface water. The applicant shall supply evidence of groundwater depth to the satisfaction of the Authority Having Jurisdiction.

Note: The absence of groundwater in a test hole three (3) vertical feet (915 mm) below the deepest irrigation or disposal point shall be sufficient to satisfy this section unless seasonal high groundwater levels have been documented to rise to within this area.

1602.11 Irrigation, Disposal Field and Mulch Basin Construction. Irrigation fields, disposal fields and mulch basins used in gray water systems shall comply with this section. Gray water systems may contain either an irrigation field or a disposal field or a combination of both. This section is not intended to prevent the use of other methods of gray water irrigation or disposal approved by the Enforcing Agency.

1602.11.1 Mulch Basin. A mulch basin may be used as an irrigation or disposal field. Mulch basins shall be sized in accordance with Table 1602.10 and of sufficient depth, length and width to prevent ponding or runoff during the gray water surge of a clothes washer, bathtub or shower. Mulch must be replenished as required due to decomposition of organic matter. Mulch basins will require periodic maintenance, reshaping or removal of dirt to maintain surge capacity and to accommodate plant growth and prevent ponding or runoff.

**TABLE 1602.11
SUBSURFACE IRRIGATION DESIGN
CRITERIA FOR SIX TYPICAL SOILS**

TYPE OF SOIL	MAXIMUM EMITTER DISCHARGE (gallons per day)	MINIMUM NUMBER OF EMITTERS PER GALLON OF ESTIMATED GRAY WATER DISCHARGE PER DAY* (gallons per day)
Sand	1.8	0.6
Sandy loam	1.4	0.7
Loam	1.2	0.9
Clay loam	0.9	1.1
Silty clay	0.6	1.6
Clay	0.5	2.0

For SI units: 1 gallon per day = 0.000043 L/s

* The estimated gray water discharge per day shall be determined in accordance with Section 1602.8 of this code.

1602.11.2 Irrigation Field. The provisions of this section are not intended to prevent the use of any appropriate material, appliance, installation, device, design or method of construction. If an alternate design is not available, the following provisions may be used as guidance in the design of a gray water irrigation field:

- (1) Filters used in gray water irrigation systems shall be as specified by the manufacturer's installation instructions for the design flow rate and intended use. The filter backwash and flush discharge shall be contained and disposed of into the building sewer system, septic tank or, with approval of the Enforcing Agency, a separate mini-leachfield sized to accept all the backwash and flush discharge water. Filter backwash water and flush water shall not be used for any purpose. Sanitary procedures shall be followed when handling filter backwash and flush discharge or gray water.
- (2) Emitters shall be designed to resist root intrusion and shall be of a design recommended by the manufacturer for the intended gray water flow and use. For emitter ratings, refer to Irrigation Equipment Performance Report, Drip Emitters and Micro-Sprinklers, Center for Irrigation Technology, California State University, 5730 N. Chestnut Avenue, Fresno, California 93740-0018.
- (3) Each irrigation zone shall be designed to include no less than the number of emitters specified in Table 1602.11, or through a procedure designated by the Enforcing Agency. Minimum spacing between emitters in any direction shall be sufficient to prevent surfacing or runoff.
- (4) The system design shall provide user controls, such as valves, switches, timers and other controllers, as appropriate, to rotate the distribution of gray water between irrigation zones.
- (5) All drip irrigation supply lines shall be polyethylene tubing or PVC Class 200 pipe or better and Schedule 40 fittings. All joints shall be pressure tested at 40 psi (276 kPa), and shown to be drip tight for five minutes, before burial. All supply

piping shall be covered to a minimum depth of two (2) inches (51 mm) of mulch or soil. Drip feeder lines can be poly or flexible PVC tubing and shall be covered to a minimum depth of two (2) inches (51 mm) of mulch or soil.

- (6) Where pressure at the discharge side of the pump exceeds 20 psi (138 kPa), a pressure-reducing valve able to maintain downstream pressure no greater than the maximum operating pressure of the installed tubing, emitters, or other components shall be installed downstream from the pump and before any emission device.
- (7) When an irrigation system utilizes a pump, and discharges water at a point higher than the pump, a backwater valve shall be installed downstream of the pump to prevent back siphonage of water and soil.

1602.11.3 Disposal Field. The provisions of this section are not intended to prevent the use of any appropriate material, appliance, installation, device, design or method of construction. If an alternate design is not available the following provisions may be used as guidance in the design of a gray water disposal field:

- (A) Disposal systems shall be not less than three (3) inches (80 mm) in cross sectional dimension and shall be constructed of perforated high-density polyethylene pipe, perforated ABS pipe, perforated PVC pipe, leaching chambers or other approved materials, provided that sufficient openings are available for distribution of the gray water into the trench area. Material, construction, and perforation shall be in compliance with the appropriate absorption fields drainage standards and shall be approved by the Enforcing Agency.
- (B) Filter material, clean stone, gravel, slag, or similar filter material acceptable to the Enforcing Agency, varying in size from three-quarter (¾) inch (19.1 mm) to two and one-half (2½) inches (64 mm) shall be placed in the trench to the depth and grade required by this section. The perforated section shall be laid on the filter material in an approved manner. The perforated section shall then be covered with filter material to the minimum depth required by this section. The filter material shall then be covered with untreated building paper, straw, or similar porous material to prevent closure of voids with earth backfill. No earth backfill shall be placed over the filter material cover until after inspection and acceptance.

Exception: Manufactured leaching chambers shall be installed in compliance with the manufacturer's installation instructions.

- (C) Disposal fields shall be constructed in accordance with Table 1602.11.3.
- (D) When necessary on sloping ground to prevent excessive line slopes, disposal lines shall be

stepped or installed on the contour lines of the slope. The lines between each horizontal leaching section shall be made with approved water-tight joints and installed on natural or unfilled ground.

**TABLE 1602.11.3
SUBSOIL IRRIGATION FIELD CONSTRUCTION**

DESCRIPTION	MINIMUM	MAXIMUM
Number of drain lines per valved zone ¹	1	-
Length of each perforated line ¹	-	100 feet
Bottom width of trench ¹	12 inches	24 inches
Spacing of lines, center to center ¹	4 feet	-
Depth of earth cover of lines	10 inches	-
Depth of filter material cover of lines	2 inches	-
Depth of filter material beneath lines ¹	3 inches	-
Grade of perforated lines level	level	3 inches per 100 feet

For SI units: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 inch per foot = 83.3 mm/m

¹ Manufactured leaching chambers shall be installed in compliance with the manufacturer's installation instructions.

1602.12 Gray Water System Color and Marking Information. Pressurized gray water distribution systems shall be identified as containing nonpotable water in accordance with Section 601.2 of this code. Marking shall be at intervals not to exceed 5 feet (1524 mm). Gray water distribution piping upstream of any connection to an irrigation or disposal field or a distribution valve shall be identified with the words "CAUTION: NONPOTABLE GRAY WATER, DO NOT DRINK".

1602.13 Special Provisions.

1602.13.1 Other Collection and Distribution Systems. Other collection and distribution systems shall be approved as allowed by Section 301.2 of this code.

1602.13.2 Future Connections. Gray water stub-out plumbing may be allowed for future connection prior to the installation of irrigation lines and landscaping. Stub-out shall be permanently marked "CAUTION: NONPOTABLE GRAY WATER, DO NOT DRINK."

1602.14 Testing. Building drains and vents for gray water systems shall be tested in accordance with this code. Surge tanks shall be filled with water to the overflow line prior to and during inspection. Seams and joints shall be left exposed, and the tank shall remain watertight. A flow test shall be performed through the system to the point of gray water discharge. Lines and components shall be watertight up to the point of the irrigation perforated and drip lines.

1602.15 Maintenance. Gray water systems and components shall be maintained in accordance with Section 1601.5.

|| 1603.0 Reserved.

|| **1604.0 On-Site Treated Nonpotable Gray Water Systems.**

|| **1604.1 General.** The provisions of this section shall apply to the installation, construction, alteration, and repair of on-site treated nonpotable *gray* water systems intended to supply uses such as water closets, urinals, trap primers for floor drains and floor sinks, above and belowground irrigation, and other uses approved by the Authority Having Jurisdiction.

|| *Other approved nonpotable water sources including swimming pool backwash operations, air conditioner condensate, rainwater, cooling tower blow-down water, foundation drainage, steam system condensate, fluid cooler discharge water, food steamer discharge water, combination oven discharge water, industrial process water, and fire pump test water may be permitted to be collected for re-use by gray water systems, as approved for the intended application.*

|| **1604.2 Plumbing Plan Submission.** No permit for an on-site treated nonpotable *gray* water system shall be issued until complete plumbing plans, with data satisfactory to the Authority Having Jurisdiction, have been submitted and approved.

|| **1604.3 System Changes.** No changes or connections shall be made to either the on-site treated nonpotable *gray* water system or the potable water system within a site containing an on-site treated nonpotable *gray* water system without approval by the Authority Having Jurisdiction.

|| **1604.4 Connections to Potable or Reclaimed (Recycled) Water Systems.** On-site treated nonpotable *gray* water systems shall have no *unprotected* connection to a potable water supply or reclaimed (recycled) water source system. Potable or reclaimed (recycled) water is permitted to be used as makeup water for a non-pressurized storage tank provided the makeup water supply is protected by an air gap, *reduced-pressure principle backflow preventer* or *other physical device which prevents backflow* in accordance with this code.

|| **1604.5 Initial Cross-Connection Test.** A cross-connection test is required in accordance with Section 1604.12.2. Before the building is occupied or the system is activated, the installer shall perform the initial cross-connection test in the presence of the Authority Having Jurisdiction and other authorities having jurisdiction. The test shall be ruled successful by the Authority Having Jurisdiction before final approval is granted.

|| **1604.6 On-Site Treated Nonpotable Gray Water System Materials.** On-site treated nonpotable *gray* water supply and distribution system materials shall comply with the requirements of this code for potable water supply and distribution systems, unless otherwise provided for in this section.

|| **1604.7 On-Site Treated Nonpotable Gray Water Devices and Systems.** Devices or equipment used to treat on-site

treated nonpotable *gray* water in order to maintain the minimum water quality requirements determined by the Authority Having Jurisdiction shall be listed or labeled (third-party certified) by a listing agency (accredited conformity assessment body) and approved for the intended application.

|| **1604.8 On-Site Treated Nonpotable Gray Water System Color and Marking Information.** On-site treated *nonpotable gray* water systems shall have a colored background and marking information in accordance with Section 601.2 of this code.

|| **1604.9 Valves.** Valves, except fixture supply control valves, shall be equipped with a locking feature.

|| **1604.10 Design and Installation.** The design and installation of on-site treated nonpotable *gray* water systems shall be in accordance with Section 1604.10.1 through Section 1604.10.6.

|| **1604.10.1 Listing Terms and Installation Instructions.** On-site treated nonpotable *gray* water systems shall be installed in accordance with the terms of its listing and the manufacturer's installation instructions.

|| **1604.10.2 Minimum Water Quality.** On-site treated nonpotable *gray* water supplied to toilets or urinals or for other uses in which it is sprayed or exposed shall be disinfected. Acceptable disinfection methods shall include chlorination, ultraviolet sterilization, ozone, or other methods as approved by the Authority Having Jurisdiction. The minimum water quality for on-site treated nonpotable *gray* water systems shall meet the applicable water quality requirements for the intended applications as determined by the public health Authority Having Jurisdiction. *In the absence of local water quality requirements for on-site treated nonpotable gray water, Section 1601.7 shall apply.*

|| **1604.10.3 Deactivation and Drainage.** The on-site treated nonpotable *gray* water system and the potable water system within the building shall be provided with the required appurtenances (e.g., valves, air/vacuum relief valves, etc.) to allow for deactivation or drainage as required for a cross-connection test in accordance with Section 1604.12.2.

|| **1604.10.4 Near Underground Potable Water Pipe.** On-site treated nonpotable *gray* water pipes shall be permitted to be run or laid in the same trench as potable water pipes with a 12 inch (305 mm) minimum vertical and horizontal separation where both pipe materials are approved for use within a building. Where piping materials do not meet this requirement the minimum separation shall be increased to 60 inches (1524 mm). The potable water piping shall be installed at an elevation above the on-site treated nonpotable *gray* water piping.

|| **1604.10.5 Required Filters.** A filter permitting the passage of particulates no larger than 100 microns (100 µm) shall be provided for on-site treated nonpotable *gray* water supplied to water closets, urinals, trap primers, and drip irrigation system.

1604.10.6 Disinfection. *Where the intended use of on-site treated nonpotable gray water requires disinfection and/or other treatment, on-site treated nonpotable gray water shall be disinfected as needed to ensure the required water quality is obtained at the point of use. Where chlorine is used for disinfection or treatment, water shall be tested for residual chlorine in accordance with ASTM D 1253.*

1604.11 Signs. Signs in buildings using on-site treated nonpotable gray water shall comply with Section 1604.11.1, Section 1604.11.2, and applicable requirements of the California Building Code.

1604.11.1 Commercial, Industrial, Institutional, and Residential Restroom Signs. A sign shall be installed in restrooms in commercial, industrial, institutional occupancies, and shall also be installed in residential common use area restrooms using on-site treated nonpotable gray water for water closets, urinals, or both. Each sign shall contain the following text:

TO CONSERVE WATER, THIS BUILDING USES ON-SITE TREATED NONPOTABLE GRAY WATER TO FLUSH TOILETS AND URINALS.

1604.11.2 Equipment Room Signs. Each room containing on-site treated gray water equipment shall have a sign posted with the following wording in 1 inch (25.4 mm) letters:

CAUTION ON-SITE TREATED NONPOTABLE GRAY WATER, DO NOT DRINK. DO NOT CONNECT TO DRINKING WATER SYSTEM. NOTICE: CONTACT BUILDING MANAGEMENT BEFORE PERFORMING ANY WORK ON THIS WATER SYSTEM.

This sign shall be posted in a location that is visible to anyone working on or near on-site treated nonpotable gray water equipment.

1604.12 Inspection and Testing. On-site treated nonpotable gray water systems shall be inspected and tested in accordance with Section 1604.12.1, and Section 1604.12.2 and/or as required by the Authority Having Jurisdiction.

1604.12.1 Supply System Inspection and Test. On-site treated nonpotable gray water systems shall be inspected and tested in accordance with this code for testing of potable water piping.

1604.12.2 Cross-Connection Inspection and Testing. An initial inspection and test shall be performed on both the potable and on-site treated nonpotable gray water systems. The potable and on-site treated nonpotable gray water system shall be isolated from each other and independently inspected and tested to ensure there is no cross-connection in accordance with Section 1604.12.2.1 through Section 1604.12.2.3.

1604.12.2.1 Visual System Inspection. Prior to commencing the cross-connection testing, a dual system inspection shall be conducted by the Authority Having Jurisdiction and other Authorities Having Jurisdiction as follows:

- (1) Pumps and equipment, equipment room signs, and exposed piping in equipment room shall be checked.
- (2) Valves shall be checked to ensure that valve lock seals are still in place and intact. Valve control door signs shall be checked to verify that no signs have been removed.

1604.12.2.2 Cross-Connection Test. The procedure for determining cross-connection shall be followed by the applicant in the presence of the Authority Having Jurisdiction and other Authorities Having Jurisdiction to determine whether a cross-connection has occurred as follows:

- (1) The potable water system shall be activated and pressurized. The on-site treated nonpotable gray water system shall be shut down and completely drained.
- (2) The potable water system shall remain pressurized for a minimum period of time specified by the Authority Having Jurisdiction while the on-site treated nonpotable gray water system is empty. The minimum period the on-site treated nonpotable gray water system is to remain depressurized shall be determined on a case-by-case basis, taking into account the size and complexity of the potable and on-site treated gray water distribution systems, but in no case shall that period be less than 1 hour.
- (3) Fixtures, potable and on-site treated, shall be tested and inspected for flow. Flow from an on-site treated gray water system outlet indicates a cross-connection. No flow from a potable water outlet shall indicate that it is connected to the on-site treated gray water system.
- (4) The drain on the on-site treated nonpotable gray water system shall be checked for flow during the test and at the end of the test.
- (5) The potable water system shall then be completely drained.
- (6) The on-site treated nonpotable gray water system shall then be activated and pressurized.
- (7) The on-site treated gray nonpotable water system shall remain pressurized for a minimum period of time specified by the Authority Having Jurisdiction while the potable water system is empty. The minimum period the potable water system is to remain depressurized shall be determined on a case-by-case basis, but in no case shall that period be less than 1 hour.
- (8) Fixtures, potable and on-site treated nonpotable, shall be tested and inspected for flow. Flow from a potable water system outlet indicates a cross-connection. No flow from an

on-site treated *gray* water outlet will indicate that it is connected to the potable water system.

- (9) The drain on the potable water system shall be checked for flow during the test and at the end of the test.
- (10) Where there is no flow detected in the fixtures which would indicate a cross-connection, the potable water system shall be repressurized.

1604.12.2.3 Discovery of Cross-Connection. In the event that a cross-connection is discovered, the following procedure, in the presence of the Authority Having Jurisdiction, shall be activated immediately:

- (1) On-site treated nonpotable *gray* water piping to the building shall be shut down at the *source* and the on-site treated *gray* water riser shall be drained.
- (2) Potable water piping to the building shall be shut down at the meter.
- (3) The cross-connection shall be uncovered and disconnected.
- (4) The building shall be retested in accordance with procedures listed in Section 1604.12.2.1 and Section 1604.12.2.2.
- (5) The potable water system shall be chlorinated with 50 ppm chlorine for 24 hours.
- (6) The potable water system shall be flushed after 24 hours, and a standard bacteriological test shall be performed. Where test results are acceptable, the potable water system shall be permitted to be recharged.

1604.13 Sizing. On-site treated nonpotable *gray* water piping shall be sized in accordance with Section 610.0 of this code.

