

## CHAPTER 15

### ALTERNATE WATER SOURCES FOR NONPOTABLE APPLICATIONS

#### »» 1501.0 General.

»» 1501.1 **Applicability.** The provisions of this chapter shall apply to the construction, alteration, and repair of alternate water source systems for nonpotable applications.

»» 1501.1.1 **Allowable Use of Alternate Water.** Where approved or required by the Authority Having Jurisdiction, alternate water sources [reclaimed (recycled) water, gray water, and on-site treated nonpotable water] shall be permitted to be used in lieu of potable water for the applications identified in this chapter.

»» 1501.2 **System Design.** Alternate water source systems shall be designed in accordance with this chapter by a registered design professional or who demonstrates competency to design the alternate water source system as required by the Authority Having Jurisdiction. Components, piping, and fittings used in an alternate water source system shall be listed.

#### → Exceptions:

- (1) A registered design professional is not required to design gray water systems having a maximum discharge capacity of 250 gallons per day (gal/d) (0.011 L/s) for single family and multi-family dwellings.
- (2) A registered design professional is not required to design an on-site treated nonpotable water system for single family dwellings having a maximum discharge capacity of 250 gal/d (0.011 L/s).

»» 1501.3 **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 from the Authority Having Jurisdiction.

»» 1501.4 **Component Identification.** System components shall be properly identified as to the manufacturer.

»» 1501.5 **Maintenance and Inspection.** Alternate water source systems and components shall be inspected and maintained in accordance with Section 1501.5.1 through Section 1501.5.3.

»» 1501.5.1 **Frequency.** Alternate water source systems and components shall be inspected and maintained in accordance with Table 1501.5 unless more frequent inspection and maintenance is required by the manufacturer.

»» 1501.5.2 **Maintenance Log.** A maintenance log for gray water and on-site treated nonpotable water systems is required to have a permit in accordance with Section 1501.3 and shall be maintained by the property owner and be available for inspection. The property owner or designated appointee shall ensure that a record of testing, inspection and maintenance in accordance with Table 1501.5 is maintained in the log. The log will indicate the frequency of inspection and maintenance for each system.

1501.5.3 **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.

1501.6 **Operation and Maintenance Manual.** An operation and maintenance manual for gray water and on-site treated water systems required to have a permit in accordance with Section 1501.3 shall be supplied to the building owner by the system designer. The operating and maintenance manual shall include the following:

- (1) Detailed diagram of the entire system and the location of system components.
- (2) Instructions on operating and maintaining the system.
- (3) Details on maintaining the required water quality as determined by the Authority Having Jurisdiction.
- (4) Details on deactivating the system for maintenance, repair, or other purposes.
- (5) Applicable testing, inspection, and maintenance frequencies in accordance with Table 1501.5.
- (6) A method of contacting the manufacturer(s).

1501.7 **Minimum Water Quality Requirements.** 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, the EPA/625/R-04/108 contains recommended water reuse guidelines to assist regulatory agencies develop, revise, or expand alternate water source water quality standards.

**Exception:** Water treatment is not required for gray water used for subsurface irrigation.

1501.8 **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.

1501.9 **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.

1501.10 **Commercial, Industrial, and Institutional Restroom Signs.** A sign shall be installed in restrooms in commercial, industrial, and institutional occupancies using reclaimed (recycled) water and on-site treated water, for water closets, urinals, or both. Each sign shall contain ½ of an inch (12.7 mm) letters of a highly visible color on a contrasting background. The location of the sign(s) shall be such that the sign(s) are visible to users. The location of the sign(s) shall be approved by the Authority Having Jurisdiction and shall contain the following text:

TO CONSERVE WATER, THIS BUILDING USES  
\* \_\_\_\_\_ \* TO FLUSH TOILETS AND URINALS.

Reprinted with the permission of the International Association of Plumbing and Mechanical Officials. This copyright material and all points or statements in using this material have not been reviewed by IAPMO. The opinions expressed herein are not representations of fact from IAPMO.

TABLE 1501.5

MINIMUM ALTERNATE WATER SOURCE TESTING, INSPECTION, AND MAINTENANCE FREQUENCY

| DESCRIPTION  | MINIMUM FREQUENCY  |
|--|--|
| Inspect and clean filters and screens, and replace (where necessary).  | Every 3 months   |
| 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. | In accordance with manufacturer's instructions, and the Authority Having Jurisdiction. |
| Inspect pumps and verify operation.  | After initial installation and every 12 months thereafter                              |
| Inspect valves and verify operation.   | After initial installation and every 12 months thereafter                              |
| Inspect pressure tanks and verify operation.   | After initial installation and every 12 months thereafter                              |
| Clear debris from and inspect storage tanks, locking devices, and verify operation.  | After initial installation and every 12 months thereafter                              |
| Inspect caution labels and marking.  | After initial installation and every 12 months thereafter                              |
| Inspect and maintain mulch basins for gray water irrigation systems.   | As needed to maintain mulch depth and prevent ponding and runoff.                      |
| Cross-connection inspection and test*  | After initial installation and every 12 months thereafter                              |

\* The cross-connection test shall be performed in the presence of the Authority Having Jurisdiction in accordance with the requirements of this chapter.

**1501.10.1 Equipment Room Signs.** Each room containing reclaimed (recycled) water and on-site treated water equipment shall have a sign posted in a location that is visible to anyone working on or near nonpotable water equipment with the following wording in 1 inch (25.4 mm) letters:

CAUTION: NONPOTABLE \* \_\_\_\_\_ \*, DO NOT DRINK. DO NOT CONNECT TO DRINKING WATER SYSTEM. NOTICE: CONTACT BUILDING MANAGEMENT BEFORE PERFORMING ANY WORK ON THIS WATER SYSTEM.

\* \_\_\_\_\_ \*Shall indicate RECLAIMED (RECYCLED) WATER or ON-SITE TREATED WATER, accordingly.

**1501.11 Inspection and Testing.** Alternate water source systems shall be inspected and tested in accordance with Section 1501.11.1 and Section 1501.11.2.

**1501.11.1 Supply System Inspection and Test.** Alternate water source systems shall be inspected and tested in accordance with this code for testing of potable water piping.

**1501.11.2 Annual Cross-Connection Inspection and Testing.** An initial and subsequent annual inspection and test shall be performed on both the potable and alternate water source systems. The potable and alternate water source system shall be isolated from each other and independently inspected and tested to ensure there is no cross-connection in accordance with Section 1501.11.2.1 through Section 1501.11.2.4.

**1501.11.2.1 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) Meter locations of the alternate water source and potable water lines shall be checked to verify that no modifications were made, and that no cross-connections are visible.
- (2) Pumps and equipment, equipment room signs, and exposed piping in equipment room shall be checked.
- (3) Valves shall be checked to ensure that the valve lock seals are still in place and intact. Valve control door signs shall be checked to verify that no signs have been removed.

**1501.11.2.2 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 alternate water source system shall be shut down, depressurized, and drained.
- (2) The potable water system shall remain pressurized for a minimum period of time specified by the Authority Having Jurisdiction while the alternate water source system is empty. The minimum period the alternate water source 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 the alternate water source distribution systems, but in no case shall that period be less than 1 hour.

- (3) The drain on the alternate water source system shall be checked for flow during the test and fixtures, potable and alternate water source, shall be tested and inspected for flow. Flow from an alternate water source system outlet indicates a cross-connection. No flow from a potable water outlet shall indicate that it is connected to the alternate water source system.
- (4) The potable water system shall then be depressurized and drained.
- (5) The alternate water source system shall then be activated and pressurized.
- (6) The alternate water source 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.
- (7) Fixtures, potable and alternate water source, shall be tested and inspected for flow. Flow from a potable water system outlet indicates a cross-connection. No flow from an alternate water source outlet will indicate that it is connected to the potable water system.
- (8) The drain on the potable water system shall be checked for flow during the test and at the end of the test.
- (9) Where there is no flow detected in the fixtures which would indicate a cross-connection, the potable water system shall be repressurized.

**1501.11.2.3 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) The alternate water source piping to the building shall be shut down at the meter, and the alternate water source 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 Section 1501.11.2.1 and Section 1501.11.2.2.
- (5) The potable water system shall be chlorinated with 50 parts-per-million (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.

**1501.11.2.4 Annual Inspection.** An annual inspection of the alternate water source system, following the procedures listed in Section 1501.11.2.1 shall be required. Annual cross-connection testing, following the procedures listed in Section 1501.11.2.2 shall be required by the Authority Having Jurisdiction, unless site conditions do not require it. In no event shall the test occur less than once in 4 years. Alternate testing requirements shall be permitted by the Authority Having Jurisdiction.

**1501.12 Separation Requirements.** Underground alternate water source service piping other than gray water shall be separated from the building sewer in accordance with this code. Treated nonpotable 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 horizontal piping materials do not comply with 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 treated nonpotable water piping.

**1501.13 Abandonment.** Alternate water source systems that are no longer in use or fail to be maintained in accordance with Section 1501.5 shall be abandoned. Abandonment shall comply with Section 1501.13.1 and Section 1501.13.2.

**1501.13.1 General.** An abandoned system or part thereof covered under the scope of this chapter shall be disconnected from remaining systems, drained, plugged, and capped in an approved manner.

**1501.13.2 Underground Tank.** An underground water storage tank that has been abandoned or otherwise discontinued from use in a system covered under the scope of this chapter shall be completely drained and filled with earth, sand, gravel, concrete, or other approved material or removed in a manner satisfactory to the Authority Having Jurisdiction.

**1501.14 Sizing.** Unless otherwise provided for in this chapter, alternate water source piping shall be sized in accordance with Chapter 6 for sizing potable water piping.

## **1502.0 Gray Water Systems.**

**1502.1 General.** The provisions of this section shall apply to the construction, alteration, and repair of gray water systems.

**1502.2 System Requirements.** 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. The gray water shall be permitted to discharge to a mulch basin for single family and multi-family dwellings. Gray water shall not be used to irrigate root crops or food crops intended for human consumption that come in contact with soil.

**1502.2.1 Surge Capacity.** Gray water systems shall be designed to have the capacity to accommodate peak

Reprinted with the permission of the International Association of Plumbing and Mechanical Officials. This copyright material and all points or statements in using this material have not been reviewed by IAPMO. The opinions expressed herein are not representations of fact from IAPMO.

flow rates and distribute the total amount of estimated gray water on a daily basis to a subsurface irrigation field, subsoil irrigation 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 1502.8.1 or Section 1502.8.2.

» **1502.2.2 Diversion.** The gray water system shall connect to the sanitary drainage system downstream of fixture traps and vent connections through an approved gray water diverter valve. The gray water diverter valve shall be installed in an accessible location and clearly indicate the direction of flow.

» **1502.2.3 Backwater Valves.** Gray water drains subject to backflow shall be provided with a backwater valve so located as to be accessible for inspection and maintenance.

» **1502.3 Connections to Potable and Reclaimed (Recycled) Water Systems.** Gray water systems shall have no direct connection to a potable water supply, on-site treated nonpotable water supply, or reclaimed (recycled) water systems. Potable, on-site treated nonpotable, or reclaimed (recycled) water is permitted to be used as makeup water for a non-pressurized storage tank provided

the connection is protected by an air gap in accordance with this code.

» **1502.4 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 1502.4.

» **1502.5 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.

» **1502.6 Prohibited Location.** Where there is insufficient lot area or inappropriate soil conditions for adequate absorption to prevent the ponding, surfacing, or runoff of the gray water, as determined by the Authority Having Jurisdiction, no gray water system shall be permitted. A gray water system is not permitted on a property in a geologically sensitive area as determined by the Authority Having Jurisdiction.

» **1502.7 Drawings and Specifications.** The Authority Having Jurisdiction shall 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:

TABLE 1502.4  
LOCATION OF GRAY WATER SYSTEM<sup>7</sup>

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

For SI units: 1 foot = 304.8 mm

**Notes:**

- <sup>1</sup> Including porches and steps, whether covered or uncovered, breezeways, roofed carports, roofed patios, carports, covered walks, covered driveways, and similar structures or appurtenances.
- <sup>2</sup> The distance shall be permitted to be reduced to 0 feet for aboveground tanks where first approved by the Authority Having Jurisdiction.
- <sup>3</sup> Reference to a 45 degree (0.79 rad) angle from foundation.
- <sup>4</sup> Where special hazards are involved, the distance required shall be increased as directed by the Authority Having Jurisdiction.
- <sup>5</sup> These minimum clear horizontal distances shall apply between the irrigation or disposal field and the ocean mean higher high tide line.
- <sup>6</sup> 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.
- <sup>7</sup> For parallel construction or for crossings, approval by the Authority Having Jurisdiction shall be required.
- <sup>8</sup> The distance shall be permitted to be reduced to 1 1/2 feet (457 mm) for drip and mulch basin irrigation systems.
- <sup>9</sup> The distance shall be permitted to be reduced to 0 feet for surge tanks of 75 gallons (284 L) or less.
- <sup>10</sup> Where irrigation or disposal fields are installed in sloping ground, the minimum horizontal distance between a part of the distribution system and the ground surface shall be 15 feet (4572 mm).

Reprinted with the permission of the International Association of Plumbing and Mechanical Officials. This copyright material and all points or statements in using this material have not been reviewed by IAPMO. The opinions expressed herein are not representations of fact from IAPMO.

- (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 in accordance with the Authority Having Jurisdiction.
- (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 area, together with a statement of water absorption characteristics of the soil at the proposed site as determined by approved percolation tests.

**Exception:** The Authority Having Jurisdiction shall permit the use of Table 1502.10 in lieu of percolation tests.

- (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.

» **1502.8 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 1502.8.1 or Section 1502.8.2.

» **1502.8.1 Single Family Dwellings and Multi-Family Dwellings.** The gray water discharge for single family and multi-family dwellings 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.

**1502.8.2 Commercial, Industrial, and Institutional Occupancies.** The gray water discharge for commercial, industrial, and institutional occupancies shall be calculated by utilizing the procedure in Section 1502.8.1, water use records, or other documentation to estimate gray water discharge.

**1502.9 Gray Water System Components.** Gray water system components shall comply with Section 1502.9.1 through Section 1502.9.7.

**1502.9.1 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. 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, DANGER — 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/ft<sup>2</sup>) (1465 kg/m<sup>2</sup>) 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 where above-ground.
- (10) Surge tanks shall be anchored to prevent against overturning where installed aboveground. Underground tanks shall be ballasted, anchored, or

Reprinted with the permission of the International Association of Plumbing and Mechanical Officials. This copyright material and all points or statements in using this material have not been reviewed by IAPMO. The opinions expressed herein are not representations of fact from IAPMO.

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.

» **1502.9.2 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.

» **1502.9.3 Subsoil Irrigation Field Materials.**

Subsoil irrigation field piping shall be constructed of perforated high-density polyethylene pipe, perforated ABS pipe, perforated PVC pipe, or other approved materials, provided that sufficient openings are available for distribution of the gray water into the trench area. Material, construction, and perforation of the pipe shall be in accordance with the appropriate absorption field drainage piping standards and shall be approved by the Authority Having Jurisdiction.

» **1502.9.4 Subsurface Irrigation Field and Mulch Basin Supply Line Materials.**

Materials for gray water piping outside the building shall be polyethylene or PVC. Drip feeder lines shall be PVC or polyethylene tubing.

» **1502.9.5 Valves.** Valves shall be accessible.

» **1502.9.6 Trap.** Gray water piping discharging into the surge tank or having a direct connection to the sanitary drain or sewer piping shall be downstream of an approved water seal type trap(s). Where no such trap(s) exists, an approved vented running trap shall be installed upstream of the connection to protect the building from possible waste or sewer gases.

» **1502.9.7 Backwater Valve.** A backwater valve shall be installed on gray water drain connections to the sanitary drain or sewer.

» **1502.10 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.

» **1502.10.1 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 1502.10 for the type of soil found in the excavation, based upon a calculation of estimated gray water discharge pursuant to Section 1502.8. 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.

» **1502.10.2 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

1502.10. For soils not listed in Table 1502.10, 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.

» **1502.10.3 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.

TABLE 1502.10  
DESIGN OF SIX TYPICAL SOILS

| TYPE OF SOIL                              | MINIMUM SQUARE FEET OF IRRIGATION 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 m<sup>2</sup>, 1 gallon per day = 0.000043 L/s

» **1502.11 Subsurface and Subsoil Irrigation Field, and Mulch Basin Design and Construction.**

Subsurface and subsoil irrigation field, and mulch basin design and construction shall be in accordance with Section 1502.11.1 through Section 1502.11.3. Where a gray water irrigation system design is predicated on soil tests, the subsurface or subsoil irrigation field or mulch basin shall be installed at the same location and depth as the tested area.

» **1502.11.1 Subsurface Irrigation Field.** A subsurface irrigation field shall comply with Section 1502.11.1.1 through Section 1502.11.1.6.

» **1502.11.1.1 Minimum Depth.** Supply piping, including drip feeders, shall be not less than 2 inches (51 mm) below finished grade and covered with mulch or soil.

» **1502.11.1.2 Filter.** Not less than 140 mesh (105 micron) filter with a capacity of 25 gallons per

Reprinted with the permission of the International Association of Plumbing and Mechanical Officials. This copyright material and all points or statements in using this material have not been reviewed by IAPMO. The opinions expressed herein are not representations of fact from IAPMO.

minute (gpm) (1.58 L/s), or equivalent shall be installed. Where a filter backwash is installed, the backwash and flush discharge shall discharge into the building sewer or private sewage disposal system. Filter backwash and flush water shall not be used.

» **1502.11.1.3 Emitter Size.** Emitters shall be installed in accordance with the manufacturer's installation instructions. Emitters shall have a flow path of not less than 1200 microns ( $\mu$ ) (1200  $\mu$ m) and shall not have a coefficient of manufacturing variation (Cv) exceeding 7 percent. Irrigation system design shall be such that emitter flow variation shall not exceed 10 percent.

» **1502.11.1.4 Number of Emitters.** The minimum number of emitters and the maximum discharge of each emitter in an irrigation field shall be in accordance with Table 1502.11.

» **1502.11.1.5 Controls.** The system design shall provide user controls, such as valves, switches, timers, and other controllers, to rotate the distribution of gray water between irrigation zones.

» **1502.11.1.6 Maximum Pressure.** Where pressure at the discharge side of the pump exceeds 20 pounds-force per square inch (psi) (138 kPa), a pressure-reducing valve able to maintain downstream pressure not exceeding 20 psi (138 kPa) shall be installed downstream from the pump and before an emission device.

» **TABLE 1502.11  
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 1502.8 of this code.

» **1502.11.2 Mulch Basin.** A mulch basin shall comply with Section 1502.11.2.1 through Section 1502.11.2.4.

» **1502.11.2.1 Single Family and Multi-Family Dwellings.** The gray water discharge to a mulch basin is limited to single family and multi-family dwellings.

» **1502.11.2.2 Size.** Mulch basins shall be of sufficient size to accommodate peak flow rates and

distribute the total amount of estimated gray water on a daily basis without surfacing, ponding or runoff. Mulch basins shall have a depth of not less than 10 inches (254 mm) below finished grade. The mulch basin size shall be based on the maximum absorption capacity of the soil and determined using Table 1502.10.

**1502.11.2.3 Minimum Depth.** Gray water supply piping, including drip feeders, shall be not less than 2 inches (51 mm) below finished grade and covered with mulch.

**1502.11.2.4 Maintenance.** The mulch basin shall be maintained periodically to retain the required depth and area, and to replenish the required mulch cover.

**1502.11.3 Subsoil Irrigation Field.** Subsoil irrigation fields shall comply with Section 1502.11.3.1 through Section 1502.11.3.3.

**TABLE 1502.11.3  
SUBSOIL IRRIGATION FIELD CONSTRUCTION**

| DESCRIPTION                             | MINIMUM   | MAXIMUM               |
|---|-----------|-----------------------|
| Number of drain lines per valved zone   | 1         | -                     |
| Length of each perforated line          | -         | 100 feet              |
| Bottom width of trench                  | 12 inches | 18 inches             |
| Spacing of lines, center to center      | 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  | 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

**1502.11.3.1 Minimum Pipe Size.** Subsoil irrigation field distribution piping shall be not less than 3 inches (80 mm) diameter.

**1502.11.3.2 Filter Material and Backfill.** Filter material, clean stone, gravel, slag, or similar material acceptable to the Authority Having Jurisdiction, varying in size from  $\frac{3}{4}$  of an inch (19.1 mm) to  $2\frac{1}{2}$  inches (64 mm) shall be placed in the trench to the depth and grade in accordance with Table 1502.11.3. The perforated section of subsoil irrigation field distribution piping 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 in accordance with Table 1502.11.3. The filter material shall then be covered with 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.

**1502.11.3.3 Subsoil Irrigation Field Construction.** Subsoil irrigation fields shall be

Reprinted with the permission of the International Association of Plumbing and Mechanical Officials. This copyright material and all points or statements in using this material have not been reviewed by IAPMO. The opinions expressed herein are not representations of fact from IAPMO.

constructed in accordance with Table 1502.11.3. Where necessary on sloping ground to prevent excessive line slopes, irrigation lines shall be stepped. The lines between each horizontal leaching section shall be made with approved watertight joints and installed on natural or unfilled ground.

- » **1502.12 Gray Water System Color and Marking Information.** Pressurized gray water distribution systems shall be identified as containing nonpotable water in accordance with Section 601.3 of this code.
- » **1502.13 Other Collection and Distribution Systems.** Other collection and distribution systems shall be approved by the local Authority Having Jurisdiction, as allowed by Section 301.3 of this code.
- » **1502.13.1 Higher Requirements.** Nothing contained in this chapter shall be construed to prevent the Authority Having Jurisdiction from requiring compliance with higher requirements than those contained herein, where such higher requirements are essential to maintain a safe and sanitary condition.
- » **1502.14 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.
- » **1502.15 Maintenance.** Gray water systems and components shall be maintained in accordance with Table 1501.5.
- » **1503.0 Reclaimed (Recycled) Water Systems.**
- » **1503.1 General.** The provisions of this section shall apply to the installation, construction, alteration, and repair of reclaimed (recycled) water systems intended to supply uses such as water closets, urinals, trap primers for floor drains and floor sinks, aboveground and subsurface irrigation, industrial or commercial cooling or air conditioning and other uses approved by the Authority Having Jurisdiction.
- » **1503.2 Permit.** It shall be unlawful for a person to construct, install, alter, or cause to be constructed, installed, or altered a reclaimed (recycled) water system within a building or on a premises without first obtaining a permit to do such work from the Authority Having Jurisdiction.
- » **1503.2.1 Plumbing Plan Submission.** No permit for a reclaimed (recycled) water system shall be issued until complete plumbing plans, with data satisfactory to the Authority Having Jurisdiction, have been submitted and approved.
- » **1503.3 System Changes.** No changes or connections shall be made to either the reclaimed (recycled) water system or the potable water system within a site containing a reclaimed (recycled) water system without approval by the Authority Having Jurisdiction.

**1503.4 Connections to Potable or Reclaimed (Recycled) Water Systems.** Reclaimed (recycled) water systems shall have no connection to a potable water supply or alternate water source system. Potable water is permitted to be used as makeup water for a reclaimed (recycled) water storage tank provided the water supply inlet is protected by an air gap or reduced-pressure principle backflow preventer in accordance with this code.

**1503.5 Initial Cross-Connection Test.** A cross-connection test is required in accordance with Section 1501.11.2. 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.

**1503.6 Reclaimed (Recycled) Water System Materials.** Reclaimed (recycled) 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.

**1503.7 Reclaimed (Recycled) Water System Color and Marking Information.** Reclaimed (recycled) water systems shall have a colored background and marking information in accordance with Section 601.3 of this code.

**1503.8 Valves.** Valves, except fixture supply control valves, shall be equipped with a locking feature.

**1503.9 Hose Bibbs.** Hose bibbs shall not be allowed on reclaimed (recycled) water piping systems located in areas accessible to the public. Access to reclaimed (recycled) water at points in the system accessible to the public shall be through a quick-disconnect device that differs from those installed on the potable water system. Hose bibbs supplying reclaimed (recycled) water shall be marked with the words: "CAUTION: NONPOTABLE RECLAIMED WATER, DO NOT DRINK," and the symbol in Figure 1503.9.



FIGURE 1503.9

**1503.10 Required Appurtenances.** The reclaimed (recycled) 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 1501.11.2.

»» **1503.11 Same Trench as Potable Water Pipes.**

Reclaimed (recycled) water pipes shall be permitted to be run or laid in the same trench as potable water pipes with 12 inches (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 horizontal separation shall be increased to 60 inches (1524 mm). The potable water piping shall be installed at an elevation above the reclaimed (recycled) water piping. Reclaimed (recycled) water pipes laid in the same trench or crossing building sewer or drainage piping shall be installed in accordance with this code for potable water piping.

»| **1503.12 Signs.** Signs in rooms and water closet tanks in buildings using reclaimed (recycled) water shall be in accordance with Section 1501.10 and Section 1501.10.1.

»| **1503.13 Inspection and Testing.** Reclaimed (recycled) water systems shall be inspected and tested in accordance with Section 1501.11.

»» **1504.0 On-Site Treated Nonpotable Water Systems.**

»» **1504.1 General.** The provisions of this section shall apply to the installation, construction, alteration, and repair of on-site treated nonpotable 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.

»» **1504.2 Plumbing Plan Submission.** No permit for an on-site treated nonpotable water system shall be issued until complete plumbing plans, with data satisfactory to the Authority Having Jurisdiction, have been submitted and approved.

»» **1504.3 System Changes.** No changes or connections shall be made to either the on-site treated nonpotable water system or the potable water system within a site containing an on-site treated nonpotable water system without approval by the Authority Having Jurisdiction.

»» **1504.4 Connections to Potable or Reclaimed (Recycled) Water Systems.** On-site treated nonpotable water systems shall have no 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 in accordance with this code.

»» **1504.5 Initial Cross-Connection Test.** A cross-connection test is required in accordance with Section 1501.11.2. 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.

**1504.6 On-Site Treated Nonpotable Water System Materials.** On-site treated nonpotable 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.

**1504.7 On-Site Treated Nonpotable Water Devices and Systems.** Devices or equipment used to treat on-site treated nonpotable 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) or approved for the intended application. Devices or equipment used to treat on-site treated nonpotable water for use in water closet and urinal flushing, surface irrigation, and similar applications shall be listed or labeled to NSF 350 or approved by the Authority Having Jurisdiction.

**1504.8 On-Site Treated Nonpotable Water System Color and Marking Information.** On-site treated water systems shall have a colored background and marking information in accordance with Section 601.3 of this code.

**1504.9 Valves.** Valves, except fixture supply control valves, shall be equipped with a locking feature.

**1504.10 Design and Installation.** The design and installation of on-site treated nonpotable systems shall be in accordance with Section 1504.10.1 through Section 1504.10.5.

**1504.10.1 Listing Terms and Installation Instructions.** On-site treated nonpotable water systems shall be installed in accordance with the terms of its listing and the manufacturer's installation instructions.

**1504.10.2 Minimum Water Quality.** On-site treated nonpotable 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 water systems shall meet the applicable water quality requirements for the intended applications as determined by the public health Authority Having Jurisdiction.

**1504.10.3 Deactivation and Drainage.** The on-site treated nonpotable 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 1501.11.2.

**1504.10.4 Near Underground Potable Water Pipe.** On-site treated nonpotable 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

Reprinted with the permission of the International Association of Plumbing and Mechanical Officials. This copyright material and all points or statements in using this material have not been reviewed by IAPMO. The opinions expressed herein are not representations of fact from IAPMO

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 water piping.

- » **1504.10.5 Required Filters.** A filter permitting the passage of particulates no larger than 100 microns (100  $\mu$ m) shall be provided for on-site treated nonpotable water supplied to water closets, urinals, trap primers, and drip irrigation system.
- » **1504.11 Signs.** Signs in buildings using on-site treated nonpotable water shall comply with Section 1501.10 and Section 1501.10.1.
- » **1504.12 Inspection and Testing.** On-site treated nonpotable water systems shall be inspected and tested in accordance with Section 1501.11.