

Exhibit E
Recommended Amendments to the
2012 International Plumbing Code
North Central Texas Council of Governments region

The following sections, paragraphs, and sentences of the *2012 International Plumbing Code* are hereby amended as follows:

****Table of Contents, Chapter 7, Section 714; change to read as follows:**

714 Engineered Drainage Design.67

****Section 102.8; change to read as follows:**

102.8 Referenced codes and standards. The codes and standards referenced in this code shall be those that are listed in Chapter 14 and such codes, when specifically adopted, and standards shall be considered as part of the requirements of this code to the prescribed extent of each such reference. Where the differences occur between provisions of this code and the referenced standards, the provisions of this code shall be the minimum requirements. Whenever amendments have been adopted to the referenced codes and standards, each reference to said code and standard shall be considered to reference the amendments as well. Any reference to NFPA 70 or the ICC *Electrical Code* shall mean the Electrical Code as adopted.

****Sections 106.6.2 and 106.6.3; change to read as follows:**

106.6.2 Fee schedule. The fees for all plumbing work shall be as adopted by resolution of the governing body of the jurisdiction.

106.6.3 Fee Refunds. The code official shall establish a policy for authorizing the refunding of fees. *{Delete balance of section}*

****Section 109; Delete entire section and insert the following:**

SECTION 109
MEANS OF APPEAL

109.1 Application for appeal. Any person shall have the right to appeal a decision of the code official to the board of appeals established by ordinance. The board shall be governed by the enabling ordinance.

****Section 305.4.1; change to read as follows:**

305.4.1 Sewer depth. Building sewers shall be a minimum of 12 inches (304.80 mm) below grade.

****Section 305.7; change to read as follows:**

305.7 Protection of components of plumbing system. Components of a plumbing system installed within 3 feet along alleyways, driveways, parking garages or other locations in a manner in which they would be exposed to damage shall be recessed into the wall or otherwise protected in an *approved* manner or any other method as approved by the Building Official.

*****Section 314.2.1; change to read as follows:**

314.2.1 Condensate disposal. Condensate from all cooling coils and evaporators shall be conveyed from the drain pan outlet to an *approved* place of disposal...{text unchanged}...Condensate shall not discharge into a street, alley, sidewalk, rooftop, or other areas so as to cause a nuisance.

*****Section 314.2.2; change to read as follows:**

314.2.2 Drain pipe materials and sizes. Components of the condensate disposal system shall be cast iron, galvanized steel, copper, cross-linked polyethylene, polyethylene, ABS, CPVC, or schedule 80 PVC pipe or tubing when exposed to ultra violet light. All components shall be selected for the pressure, temperature and exposure rating of the installation. Joints and connections shall be made in accordance with the applicable provisions of Chapter 7 relative to the material type. Condensate waste and drain line size shall not be less than ¾-inch (19 mm) internal diameter and shall not decrease in size from the drain pan connection to the place of condensate disposal. Where the drain pipes from more than one unit are manifolded together for condensate drainage, the pipe or tubing shall be sized in accordance with Table 314.2.2. All horizontal sections of drain piping shall be installed in uniform alignment at a uniform slope.

*****Section 401.1; add a sentence to read as follows:**

401.1 Scope. This chapter shall govern the materials, design and installation of plumbing fixtures, faucets and fixture fittings in accordance with the type of *occupancy*, and shall provide for the minimum number of fixtures for various types of occupancies. The provisions of this Chapter coordinate with the provisions of the *Building Code*. Should any conflicts arise between the two chapters, the *Code Official* shall determine which provision applies.

****Section 403.1; change to read as follows:**

403.1 Minimum number of fixtures. Plumbing fixtures shall be provided for the type of *occupancy* and in the minimum number as follows:

1. Assembly Occupancies: At least one drinking fountain shall be provided at each floor level in an *approved* location.
2. Groups A, B, F, H, I, M and S Occupancies: Buildings or portions thereof where persons are employed shall be provided with at least one water closet for each sex except as provided for in Section 403.2.
3. Group E Occupancies: Shall be provided with fixtures as shown in Table 403.1.
4. Group R Occupancies: Shall be provided with fixtures as shown in Table 403.1.

It is recommended, but not required, that the minimum number of fixtures provided also comply with the number shown in Table 403.1. Types of occupancies not shown in Table 403.1 shall be considered individually by the Code Official. The number of occupants shall be determined by the *International Building Code*. Occupancy classification shall be determined in accordance with the *International Building Code*.

****Section 405.6; delete.**

****Section 409.2; change to read as follows:**

409.2 Water connection. The water supply to a commercial dishwashing machine shall be protected against backflow by an air gap or backflow preventer in accordance with Section 608.

****Section 412.4; change to read as follows:**

412.4 Required location. Floor drains shall be installed in the following areas.

1. In public coin-operated laundries and in the central washing facilities of multiple family dwellings, the rooms containing automatic clothes washers shall be provided with floor drains located to readily drain the entire floor area. Such drains shall have a minimum outlet of not less than 3 inches (76.20 mm) in diameter.

In lieu of floor drains in commercial kitchens, the Code Official may accept floor sinks.

3. Public restrooms.

****Section 419.3; change to read as follows:**

419.3 Surrounding material. Wall and floor space to a point 2 feet (609.60 mm) in front of a urinal lip and 4 feet (1219.20 mm) above the floor and at least 2 feet (609.60 mm) to each side of the urinal shall be waterproofed with a smooth, readily cleanable, hard, nonabsorbent material.

****Section 502.6; Add Section 502.6 to read as follows:**

502.6 Water heaters above ground or floor. When the attic, roof, mezzanine or platform in which a water heater is installed is more than 8 feet (2438.40 mm) above the ground or floor level, it shall be made accessible by a stairway or permanent ladder fastened to the building.

Exception: A max 10 gallon water heater (or larger with approval) is capable of being accessed through a lay-in ceiling and a water heater is installed is not more than 10 feet (3048 mm) above the ground or floor level and may be reached with a portable ladder.

502.6.1 Illumination and convenience outlet. Whenever the mezzanine or platform is not adequately lighted or access to a receptacle outlet is not obtainable from the main level, lighting and a receptacle outlet shall be provided in accordance with Section 502.1.

****Section 504.6; change to read as follows:**

504.6 Requirements for discharge piping. The discharge piping serving a pressure relief valve, temperature relief valve or combination thereof shall:

1. Not be directly connected to the drainage system.
2. Discharge through an air gap.
3. Not be smaller than the diameter of the outlet of the valve served and shall discharge full size to the air gap.
4. Serve a single relief device and shall not connect to piping serving any other relief device or equipment.

Exception: Multiple relief devices may be installed to a single T & P discharge piping system when *approved* by the administrative authority and permitted by the manufactures installation instructions and installed with those instructions.

5. Discharge to an indirect waste receptor or to the outdoors. Where discharging to the outdoors in areas subject to freezing, discharge piping shall be first piped to an indirect waste receptor through an air gap located in a conditioned area.
6. Discharge in a manner that does not cause personal injury or structural damage.
7. Discharge to a termination point that is readily observable by the building occupants.
8. Not be trapped.
9. Be installed so as to flow by gravity.

10. Not terminate less than 6 inches (152.40 mm) or more than 24 inches (609.60 mm) above grade nor more than 6 inches (152.40 mm) above the waste receptor.
11. Not have a threaded connection at the end of such piping.
12. Not have valves or tee fittings.
13. Be constructed of those materials listed in Section 605.4 or materials tested, rated and approved for such use in accordance with ASME A112.4.1.

Local Amendments:

1. Use of flexible copper on discharge piping serving a pressure relief valve, temperature relief valve or combination valve is prohibited.
2. When a water heater is located in the interior of a building/residence with no method to drain the pan according to this code, a water alarm or shut-off device shall be installed.
3. If the discharge piping serving a pressure relief valve, temperature relief valve or combination relief valve is unable to be discharged to the outside according to this code, alternate discharge means or methods may be approved by the Building Official on a case by case basis.

****Section 604.4; add Section 604.4.1 to read as follows:**

604.4.1 State maximum flow rate. Where the State mandated maximum flow rate is more restrictive than those of this section, the State flow rate shall take precedence.

*****Section 604.8; add Section 604.8.3 to read as follows:**

604.8.3 Thermal expansion control. An expansion tank or approved device shall be installed for the water heater with the addition of a pressure reducing valve or regulator creating a closed system.

****Section 606.1; delete items #4 and #5.**

****Section 606.2; change to read as follows:**

606.2 Location of shutoff valves. Shutoff valves shall be installed in the following locations:

1. On the fixture supply to each plumbing fixture other than bathtubs and showers in one- and two-family residential occupancies, and other than in individual sleeping units that are provided with unit shutoff valves in hotels, motels, boarding houses and similar occupancies.
2. On the water supply pipe to each appliance or mechanical equipment.

****Section 608.1; change to read as follows:**

608.1 General. A potable water supply system shall be designed, installed and maintained in such a manner so as to prevent contamination from non-potable liquids, solids or gases being introduced into the potable water supply through cross-connections or any other piping connections to the system. Backflow preventer applications shall conform to applicable local regulations, Table 608.1, and as specifically stated in Sections 608.2 through 608.16.10.

****Section 608.16.5; change to read as follows:**

608.16.5 Connections to lawn irrigation systems. The potable water supply to lawn irrigation systems shall be protected against backflow by an atmospheric-type vacuum breaker, a pressure-type vacuum breaker, a double-check assembly or a reduced pressure principle backflow preventer. A valve shall not be installed downstream from an atmospheric vacuum breaker. Where chemicals are introduced into the system, the potable water supply shall be protected against backflow by a reduced pressure principle backflow preventer.

Local Amendments:

Refer to the Benbrook Water Authority's "Landscape Irrigation Rules" for local requirements.

*****Section 608.17; change to read as follows:**

608.17 Protection of individual water supplies. An individual water supply shall be located and constructed so as to be safeguarded against contamination in accordance with applicable local regulations. Installation shall be in accordance with Sections 608.17.1 through 608.17.8.

****Section 610.1; add exception to read as follows:**

610.1 General. New or repaired potable water systems shall be purged of deleterious matter and disinfected prior to utilization. The method to be followed shall be that prescribed by the health authority or water purveyor having jurisdiction or, in the absence of a prescribed method, the procedure described in either AWWA C651 or AWWA C652, or as described in this section. This requirement shall apply to "on-site" or "in-plant" fabrication of a system or to a modular portion of a system.

1. The pipe system shall be flushed with clean, potable water until dirty water does not appear at the points of outlet.
2. The system or part thereof shall be filled with a water/chlorine solution containing at least 50 parts per million (50 mg/L) of chlorine, and the system or part thereof shall be valved off and allowed to stand for 24 hours; or the system or part thereof shall be filled with a water/chlorine solution containing at least 200 parts per million (200 mg/L) of chlorine and allowed to stand for 3 hours.
3. Following the required standing time, the system shall be flushed with clean potable water until the chlorine is purged from the system.
4. The procedure shall be repeated where shown by a bacteriological examination that contamination remains present in the system.

Exception: With prior approval the Code Official may waive this requirement when deemed unnecessary.

*****Section 712; change to read as follows:**

712.3.3.1 Materials. Pipe and fitting materials shall be constructed of brass, copper, CPVC, ductile iron, stainless steel, galvanized iron, PE, or PVC.

****Section 712.5; add Section 712.5 to read as follows:**

712.5 Dual pump system. All sumps shall be automatically discharged and, when in any "public use" occupancy where the sump serves more than 10 fixture units, shall be provided with dual pumps or ejectors arranged to function independently in case of overload or mechanical failure. For storm drainage sumps and pumping systems, see Section 1113.

****Section 714, 714.1; change to read as follows:**

**SECTION 714
ENGINEERED DRAINAGE DESIGN**

714.1 Design of drainage system. The sizing, design and layout of the drainage system shall be permitted to be designed by *approved* design methods.

****Section 802.4; add a sentence to the end of the paragraph to read as follows:**

802.4 Standpipes. Standpipes shall be...*{text unchanged}*...drains for rodding. No standpipe shall be installed below the ground.

****Section 903.1; change to read as follows:**

903.1 Roof extension. All open vent pipes that extend through a roof shall be terminated at least 6 inches (152.40 mm) above the roof, except that where a roof is to be used for any purpose other than weather protection, the vent extensions shall be run at least 7 feet (2133.60 mm) above the roof.

*****Section 917 Single stack vent system. Delete entire section.**

****Section 1002.10; delete.**

****Section 1003; see note below:**

Local Amendments:

Refer to the Benbrook Water Authority for interceptors and separators information and requirements.

*****Section 1101.8; change to read as follows:**

1101.8 Cleanouts required. Cleanouts or manholes shall be installed in the storm drainage system and shall comply with the provisions of this code for sanitary drainage pipe cleanouts.

****Section 1106.1; change to read as follows:**

The size of the vertical conductors and leaders, building storm drains, building storm sewers, and any horizontal branches of such drains or sewers shall be based on 6 inches per hour rainfall rate.

*****Section 1107.3; change to read as follows:**

Secondary (emergency) roof drain systems shall be sized in accordance with Section 1106. Scuppers shall be sized to prevent the depth of ponding water from exceeding that for which the roof was designed as determined by Section 1101.7. Scuppers shall not have an opening dimension of less than 4 inches (102 mm). The flow through the primary system shall not be considered when sizing the secondary roof drain system.

*****Section 1202.1; delete Exception 2.**

***Chapter 13; delete in its entirety and replace with:

Chapter 13; Water Recovery

1300 – General. This chapter is designed to provide safe usage of water that is acquired through a Re-use source and/or through Rainwater Harvesting methods. For the purpose of this chapter, Water Recovery shall mean water that is acquired through a source other than the local potable municipal water supply, is saved from loss and made available for use. Since water acquired from sources other than a potable municipal water supply has inherent limitations of quality and usability, installation requirements are necessary to protect the end user and prevent the possible contamination of potable water sources that are also present on the property. As such, the requirements as specified in this Chapter shall be applicable as follows:

- a. Rainwater Harvesting Systems, Division II;
- b. Reclaimed Water Systems, Division III;
- c. Gray Water Systems, Division IV;
- d. Industrial Reclaimed Water Systems, Division V.

There may be other methods of water recovery, or water sources available or newly created, that are not specifically addressed in this chapter. Any system not specifically covered in this chapter shall be subject to approval of the Building Official.

1301.1 Scope. This chapter shall apply to the installation, construction, alteration, repair and maintenance of any Water Recovery System. The provisions listed in this appendix are only authorized for the use of non-potable water. However, all systems shall comply with the plumbing requirements of Chapter 6 of this code. The provisions of this code for "Plumbing" and "Plumbing Systems" shall be applicable to those systems described in this chapter, except as amended by this chapter. Although some provisions of this chapter are applicable to potable systems, when any use is intended to be for potable water, the design and purification system must be separately approved by the Building Official.

Exception: This chapter shall not apply to water whose source is from a well. The other plumbing provisions of this code will still apply to a well system. If such well water is combined with a Water Recovery System, then the system after the combination shall comply with this chapter.

1301.2 Authority having Jurisdiction. The provisions of this chapter shall be under the authority of the Building Official except where the Director of the Water Department is specifically listed as the authority or as shared authority.

1301.3 State Law. Various provisions of this chapter are also referenced under State Law along with other sources of recommended installation methods. Compliance with State Law is the responsibility of the producer, provider and user of such installations. It is recommended that the following reference material be reviewed for guidance:

Harvesting, Storing, and Treating Rainwater for Domestic Indoor Use

http://www.tceq.state.tx.us/files/gi-366.pdf_4231966.pdf

The Texas Manual on Rainwater Harvesting

http://www.twdb.state.tx.us/publications/reports/RainwaterHarvestingManual_3rdedition.pdf

Texas Rainwater Harvesting Evaluation Committee Final Report

<http://www.twdb.state.tx.us/iwt/rainwater/docs/RainwaterCommitteeFinalReport.pdf>

Rainwater Harvesting—Frequently Asked Questions

<http://www.twdb.state.tx.us/iwt/rainwater/faq.html>

Water Reuse - Frequently Asked Questions

<http://www.twdb.state.tx.us/iwt/reuse/faq.html>

State of Texas Administrative Code—Title 30, Environmental Quality

Chapter 210—Use of Reclaimed Water

[http://info.sos.state.tx.us/pls/pub/readtac\\$ext.ViewTAC?tac_view=4&ti=30&pt=1&ch=210](http://info.sos.state.tx.us/pls/pub/readtac$ext.ViewTAC?tac_view=4&ti=30&pt=1&ch=210)

State of Texas Administrative Code—Title 30, Environmental Quality

Chapter 210 - Use of Graywater Systems

[http://info.sos.state.tx.us/pls/pub/readtac\\$ext.ViewTAC?tac_view=5&ti=30&pt=1&ch=210&sch=F&rl=Y](http://info.sos.state.tx.us/pls/pub/readtac$ext.ViewTAC?tac_view=5&ti=30&pt=1&ch=210&sch=F&rl=Y)

State of Texas Administrative Code—Title 30, Environmental Quality

Chapter 210 - Rules and Regulations for Public Water Systems

[http://info.sos.state.tx.us/pls/pub/readtac\\$ext.ViewTAC?tac_view=4&ti=30&pt=1&ch=290](http://info.sos.state.tx.us/pls/pub/readtac$ext.ViewTAC?tac_view=4&ti=30&pt=1&ch=290)

No provision of this chapter shall be construed as granting authority to violate nor assuring compliance with State Law. The provisions of this chapter and this code may be more stringent than those covered under state law.

1301.4 Color Coding. Color coding requirements are specified in various sections of this chapter to identify piping used for water recovery systems when entering a building. Such color coding is prohibited from use on any other plumbing system.

Exception: When required by the water purveyor, such color coding may also be required for exterior piping, such as irrigation systems that use water from systems covered in this chapter.

1302 - Rainwater Harvesting

1302.1 Scope. The provisions of this Section shall apply to the installation, construction, alteration, repair and maintenance of Rainwater Harvesting Systems. Provisions listed herein that are identified as "Recommended Practice" or "Informational" in italic text shall not be mandatory. If collected rain water is combined with another water recovery source or domestic water, the most restrictive provisions shall apply.

Exception: Any piping, joints and equipment used for irrigation systems that occur after the pump shall be subject to any applicable provisions in the municipality's Irrigation regulations. An irrigation and/or backflow permit may be required by the water purveyor.

1302.2 Definitions. All definitions listed in this section are intended to be in agreement with the State of Texas laws. Any definition not listed shall be as defined in this code, other city codes or State Law.

CATCHMENT SURFACE is the collection surface from which rainfall runs off; e.g. roof top, wall, surface paving, etc.

DEBRIS is used to describe any visible contaminant including leaves and twigs, dust and dirt, bird and animal droppings, insects, and other visible material.

Informational: Although debris obviously reduces the aesthetic quality of the water, it can also pose unseen chemical and biological health threats. For example, leaves and dust can contain unseen chemical contaminants such as herbicides and pesticides. Similarly, bird and animal dropping can contain microscopic parasites, bacteria, and viruses.

Other contaminants can include:

Volatile Organic Chemicals (VOC) can be introduced when rainwater comes into contact with materials containing refined organic products including plastics, glues, and solvents, as well as gasoline, greases, and oils.

Synthetic Organic Chemicals (SOCs) are chemicals that are typically found in pesticides, herbicides, and similar man-made products.

Minerals are inorganic materials found naturally in the environment including inorganic salts (such as calcium carbonate, sodium bicarbonate, magnesium sulfate, and sodium chloride).

Metals include lead, arsenic, copper, iron, and manganese.

NONPOTABLE WATER is water that may have received some treatment but not enough to make it safe for potable use. Non-potable water can be used for watering lawns and gardens, washing clothes, or flushing toilets, but should not be used for any purpose that might result in the ingestion of the water or its contact with the skin.

POTABLE WATER is water that is used for preparing food or beverages for human consumption, for washing dishes and utensils that are used to prepare or consume food or beverages, for bathing, or for any other purpose that might result in the ingestion of water or its contact with the skin.

RAINWATER HARVESTING is the capture and storage of rainwater for purposes such as landscape irrigation, potable and non-potable indoor uses, and storm water abatement.

Informational: Rainwater harvesting can be classified into two broad categories: land-based and roof-based. Land-based rainwater harvesting occurs when rainwater runoff from the land is collected in ponds and small impoundments before it reaches a river or stream. Roof-based harvesting involves collecting the rainwater that falls on a roof before the water reaches the ground. Both systems are subject to contamination and must be properly treated before it can be used.

1302.3 Permits required. No special permit(s) is required by this department for a rainwater system beyond the permits already required by this code and other city codes. Examples, but not an all-inclusive list, of possible permits are as follows:

- a. Rainwater collection system that conveys water to an above ground tank, such as a rain barrel, for gravity flow (hose flow) irrigation distribution:
 1. no permits are required.

However, the following provisions are mandatory:

1. mosquito protection
 - ii. the tank (the barrel) must be in compliance with the tank provisions listed herein to prevent algae growth, provide overflow protection, etc.
- b. Rainwater collection system that conveys water to an above or below ground tank for pressurized distribution, such as through a pump:

Permits are required for:

1. the pump and its electrical service;
 2. all piping, joints and equipment after the pump when the system enters a building or structure. The entire system starting from the catchment surface is subject to compliance and inspection;
 3. other than the pump, as listed above, no permits are required by this department when the system is for irrigation only and does not enter a building or structure. However, an irrigation and/or backflow permit may be required by the Water Department. The following provisions are mandatory:
 - i. mosquito protection
 - ii. the tank must be in compliance with the tank provisions listed herein to prevent algae growth, provide overflow protection, etc.
- c. Rainwater collection system in which the rainwater is combined with another water recovery source or domestic water:

1. the most restrictive permit requirements shall be applicable, and the entire system starting from the catchment surface is subject to compliance and inspection.
- d. Any piping, joints and equipment used for irrigation systems that occur after the pump shall be subject to any applicable provisions in the Water Department Irrigation regulations. When a permit is required through this department, even if just for the pump, plans and diagrams must be submitted showing compliance with the provisions of this appendix.

Exception: Plans need not be provided to this department for any portion of the irrigation piping that occurs after the pump.

1302.4 System Limitations/Restrictions.

1302.4.1 Allowable Uses. The provisions of this division are designed only for the non-potable use of rain water. Although some provisions listed herein are applicable to potable systems, when any use is intended to be for potable water, the design and purification system must be separately approved by the Building Official. Non-potable uses include irrigation, water closets (toilets), urinals, washing clothes, and industrial uses. Informational: In planning a rainwater collection and storage system:

- a. The catchment and storage facilities must be designed so that they reduce potential sources of contamination.
- b. The catchment surface and storage tanks should be large enough to capture and store enough rainwater to last until the next time it rains. Otherwise, you will need to identify a supplemental source of water.

North Central Texas has an average of 35 inches (889 mm) of rainfall per year. A 2,000 square foot roof can provide about 35,000 gallons of water annually. There is an average of 55 days between rainfall periods. If storage capacity is not large enough to capture the maximum water at each rainfall event, the overflow will be lost and realization of the full 35,000 gallon potential will not be achieved.

1302.4.2 Connection to Potable Water Systems. The rainwater system shall have no connection to any potable water system, except as approved by the water purveyor. When the rainwater system tank is supplemented with a potable water source, such connection shall be made with an air gap. Exposed piping shall be resistant to damage from UV rays and must have adequate freeze protection. Public water system customers that also have rainwater harvesting systems must install a reduced pressure zone (RPZ) backflow preventer at the service meter.

Exception: A reduced pressure zone backflow preventer is not required for the gravity fed (rain barrel) irrigation system where no cross-connection to the potable supply exists.

1302.4.3 Components. Regardless of the complexity of the system, the rainwater harvesting system comprises six basic components:

- a. Catchment surface: the collection surface from which rainfall runs off.
- b. Gutters and downspouts: channel water from the roof to the tank.
- c. Leaf screens, first-flush diverters, and roof washers: components which remove debris and dust from the captured rainwater before it goes to the tank.
- d. One or more storage tanks, also called cisterns.
- e. Delivery system: gravity-fed or pumped to the end use.
- f. Treatment/purification: filters and other methods to prevent particles from clogging, contaminating or damaging equipment.

1302.4.3.1 Catchment surface. *(This subsection is Informational only)*

- a. Roofs with copper flashings can cause discoloration of porcelain fixtures.

- b. Clay and concrete tiles may contribute to as much as a 10 percent loss of water due to texture, inefficient flow, or evaporation.
- c. Due to leaching of toxins, composite shingles are not appropriate for potable systems, but can be used to collect water for irrigation. Composite roofs have an approximated 10 percent loss due to inefficient flow or evaporation.
- d. Water harvested using wood shingle, tar and gravel roofing materials is suitable only for irrigation due to leaching of compounds.
- e. Slate's smoothness makes it ideal for a catchment surface for potable use, assuming no toxic sealant is used.

1302.4.3.2 Gutters and downspouts. (This subsection is Informational only)

- a. For potable water systems, lead cannot be used as gutter solder.
- b. Copper can cause discoloration of porcelain fixtures.

1302.4.3.3 Leaf Screens. Leaf screens are required to prevent larger debris from entering the system. Debris can fill holding tanks, block piping and clog or damage pumps, irrigation emitters and plumbing equipment. Leaf screens come in many forms including:

- a. Leaf guards, usually ¼ inch mesh screens in wire frames that fit along the length of the gutter.
- b. Funnel-type downspout filter, made of PVC or galvanized steel fitted with a stainless steel or brass screen.
- c. Strainer baskets, spherical cage-like strainers that slip into the drop outlet of the downspout.
- d. A cylinder of rolled screen inserted into the drop outlet.
- e. Filter sock of nylon mesh can be installed on the PVC pipe at the tank inflow.

1302.4.3.4 First-Flush Diverters. First-flush diverters are required. A roof can be a natural collection surface for dust, leaves, blooms, twigs, insect bodies, animal feces, pesticides, and other airborne residues. The first-flush diverter routes the first flow of water from the catchment surface away from the storage tank. The first-flush diverter gives the system a chance to rid itself of the smaller contaminants that are not stopped by the leaf screens, such as dust, pollen, and bird and rodent feces.

Informational: The first-flush diverters should be capable of diverting at least 10 gallons per one thousand (1,000) square feet of collection (roof) area. Diverters need to be emptied after each rain event.

1302.4.3.5 Roof Washers. The roof washer is required for systems to be used as potable water. For irrigation systems using drip irrigation, installation is recommended to prevent clogging of the emitters.

1302.4.3.6 Storage Tanks. A gallon of water weighs 8.34 pounds. 50 gallons weighs 417 pounds. Storage tanks, their foundation and their installation method must be capable of holding the imposed weight. Also, the water and its clarity may be affected by exposure to sunlight and the tank material, lining, or any paint that might be used. Tank water is subject to algae growth and mosquito breeding. Algae can affect the clarity and odor of the water. Mosquito breeding is a health hazard. The following provisions are required.

- a. Storage tanks must be opaque, either upon purchase or painted later, to inhibit algae growth.
- b. For potable systems, storage tanks must never have been used to store toxic materials.
- c. Tanks must be covered and vents screened to discourage mosquito breeding.
- d. Tanks used for potable systems must be accessible for cleaning.
- e. Tanks should be protected for direct sunlight if possible.

- f. Tanks are required to have an overflow design, and the overflow discharge should not enter septic system drain fields and should be routed so that it does not affect the foundation of the tanks or any other structures.
- g. Tanks should be placed on a stable, level pad.
- h. Wood tanks for potable water use must be lined with a food-grade liner.
- i. Underground tanks within 5 feet (1524 mm) of the foundation of a building or structure require an engineered design to insure the stability of that building or structure.
- j. If supplied with supplemental water from a potable water source, the connection must be made through an air gap and must be inspected as part of the permit for the extension of the potable water line.

1302.4.3.6.1 Tank size. When used to supply plumbing fixtures, the tank shall be a minimum of twice the volume of water required to meet the daily requirements of the fixtures supplied, but not less than 50 gallons (189 L).

Informational: When a plumbing fixture is operated, such as flushing a water closet or operating a washing machine, it is important to have the necessary quantity of water in the tank to meet the demand. Otherwise, the tank may empty faster than the supplemental line can refill.

1302.4.3.6.2 Makeup water. When rainwater is used to supply plumbing fixtures, potable water or approved well water from a dependable supply, shall be provided as a source of makeup water to the tank. Such connection to the tank shall be made with an air gap. Further, an adequate internal cross-connection control program is required to be demonstrated to the Water Department.

1302.4.3.7 Treatment. Filter systems installed after the pump may be necessary to reduce the number and size of particles that are distributed in the system.

Recommended Practice:

For non-potable systems used for hose irrigation, leaf screens on gutters and a roof washer is usually sufficient. If drip irrigation is planned, extra sediment filtration beyond the leaf screens, first-flush diverter and roof washer may be necessary to prevent clogging of emitters. Disinfecting non-potable rainwater for indoor use is desirable to control microbial growth which could cause fouling and affect the operation of plumbing fixtures. A 5 micron filter may be sufficient. Disinfection can be accomplished by passing the water through ultraviolet light or by treating it with chlorine.

Informational: For non-potable rainwater for indoor use, household bleach (6 percent sodium hypochlorite) may be applied to the cistern at the rate of 2 fluid ounces per 1,000 gallons of water to achieve disinfection.

For potable water systems, treatment beyond the leaf screen, first-flush diverter and roof washer is necessary to remove sediment and disease-causing pathogens.

Recommended Practice:

If using non-potable water inside a building, e.g. toilets, urinals, clothes washing, filtering to remove small particles that might clog valves and equipment should be considered. Treatment generally consists of filtration and disinfection processes in series before distribution. Treatment options include:

- a. Cartridge Filters and Ultraviolet (UV) Light. Two in-line sediment filters - The 5 micron fiber cartridge filter followed by the three-micron activated charcoal cartridge filter -followed by ultraviolet light.
- b. Ozone. Chemically, ozone is O₃: essentially a more reactive form of molecular oxygen made up of 3 atoms of oxygen. An ozone generator forces ozone into storage tanks through rings

- or a diffuser stone. Ozone is unstable and reacts quickly to revert to O₂ and dissipates through the atmosphere.
- c. Membrane Filtration (Reverse Osmosis and Nanofiltration). Membrane filtration, such as reverse osmosis and nanofiltration work by forcing water under high pressure through a semipermeable membrane to filter dissolved solids and salts, both of which are in very low concentrations in rainwater.
 - d. Chlorination. A chlorine pump injects chlorine in to the water as it enters the building. A practical chlorine contact time, which is critical to kill bacteria, is usually from 2 minutes to 5 minutes with a free chlorine residual of 2 parts per million (ppm).

1302.5 Special Design Criteria

1302.5.1 Material. Unless it can be shown by the designer that the acidic property of rainwater is to be reduced, the use of copper pipe or tubing shall be limited as follows:

- a. No prohibitions apply for a gravity flow (rain barrel) irrigation system.
- b. No prohibitions apply to the irrigation system after the pump. Copper shall not be used from the tank to the pump.
- c. When any part of the system enters a building or structure, copper shall not be used from the tank to any discharge point, except that those lines dedicated for irrigation only may use copper.

Informational: Rainwater is very soft and somewhat acidic, so it tends to be more corrosive than most other sources of drinking water. Due to the corrosive tendencies of rainwater, you should NOT use copper pipe or tubing, even if it is ANSI/NSF certified, because of its potential to develop pinhole leaks.

1302.5.2 Material identification. If rainwater is used in a building or structure, the pipe from the tank to the discharge point shall be labeled for non-potable uses. The pipe should be labeled in black lettering "**RAINWATER - DO NOT DRINK**" on a bright orange background. The label should be marked at two-foot intervals throughout the length of the pipe. Every toilet, urinal, hose bib, or other fixture that uses rainwater should be permanently identified at the point of connection as non-potable rainwater by the above labeling. Identification may be by any method noted in Division III of this appendix. For private residences, identification of fixtures may be accomplished with the installation of a permanent tag attached to the fixture cut-off valve. If collected rain water is combined with another source of recovered water, the most restrictive provisions for use and identification shall apply.

1302.6 Protection of the roof. In order to prevent water back up and accumulation on the roof, no screen, diverter, washer, filter or any other method subject to blockage shall be installed as listed below:

- a. No system shall block a roof scupper.
- b. No item shall be installed in the system that could back up water to the roof unless some form of overflow relief is installed such that the water is discharged before accumulation on the roof.

Informational: Roof drainage must occur. Any system that prevents the water from leaving the roof can create maintenance issues, such as leakage, or can overload the roof leading to collapse.

H1302.7 Inspection and testing. Rainwater water piping shall be tested as outlined in this code for testing of potable water piping. Associated back-flow devices, as required by this code and the Water Department, shall be tested as required for potable water systems.

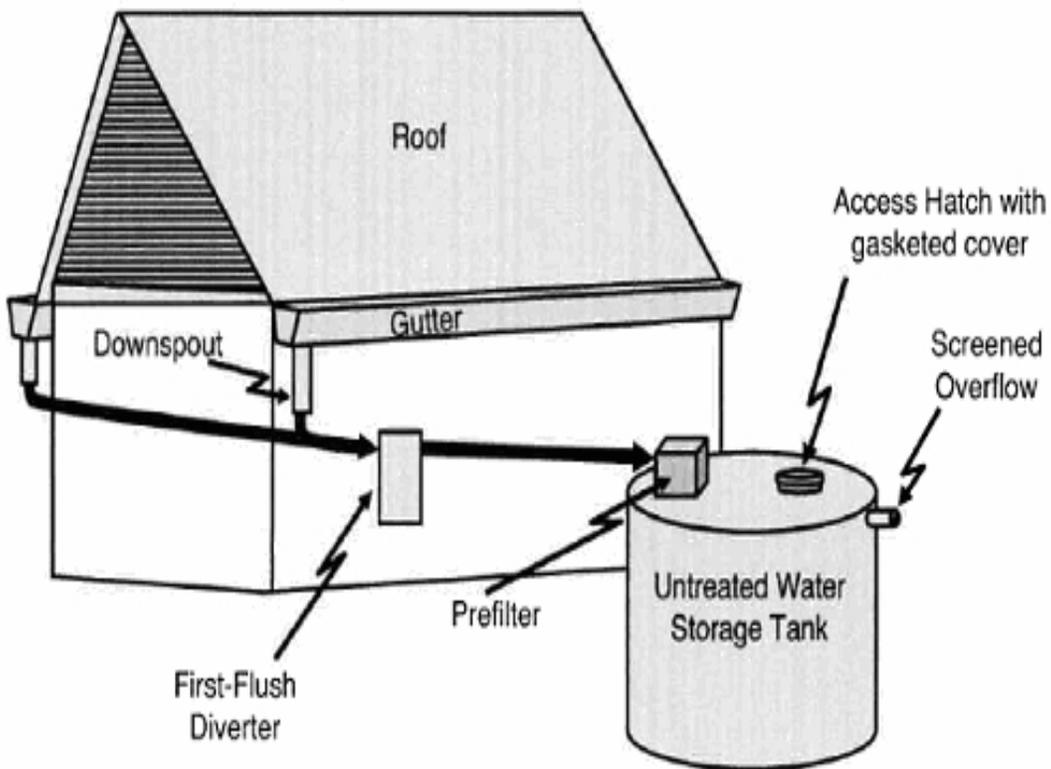
1302.8 Maintenance. The system must be maintained or appropriately abandoned in an approved manner as provided for in Section H209.

Informational: The system owner should take into consideration the maintenance required to keep the system functioning as designed. Any failure to maintain the system can lead to damage to the tank, pump, piping, irrigation and plumbing equipment. Such damage should be expected to generate associated costs of repair.

1302.9 Abandonment. When a rainwater system is to be abandoned, all re-piping necessary to supply the irrigation and/or plumbing system with another water source will require applicable permits along with a set of plans to be approved by the Building Official.

Supplemental Information

Rainwater Collection and Untreated Water Storage



First-Flush Diverters

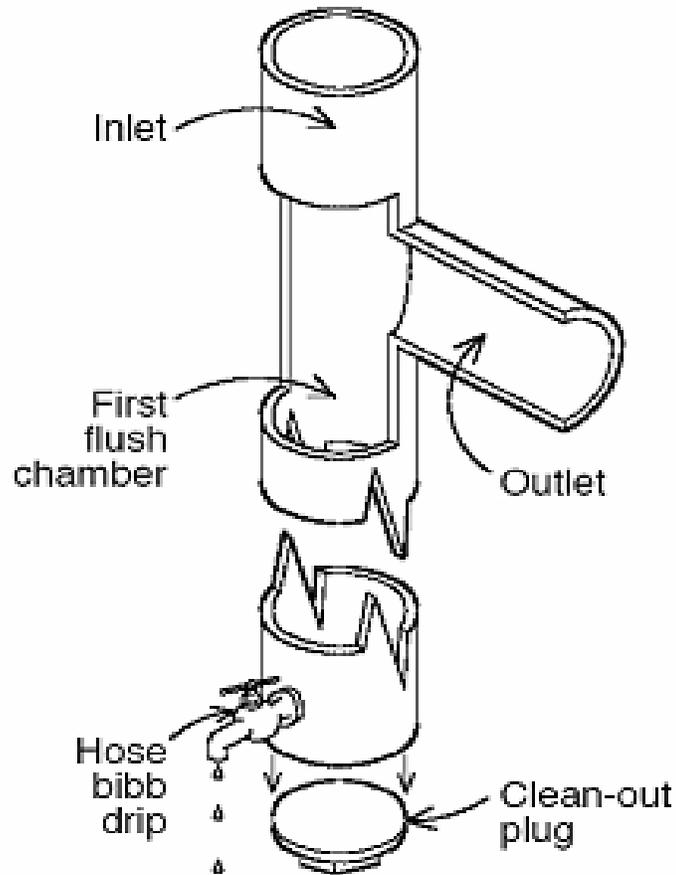


Figure 2-2. Standpipe first-flush diverter

The simplest first-flush diverter is a 6 or 8 inch (152.40 mm or 203.20 mm) PVC standpipe (Figure 2-2). The diverter fills with water first, backs up, and then allows water to flow into the main collection piping. These standpipes usually have a cleanout fitting at the bottom, and must be emptied and cleaned out after each rainfall event. The water from the standpipe may be routed to a planted area. A pinhole drilled at the bottom of the pipe or a hose bibb fixture left slightly open (shown) allows water to gradually leak out. If you are using three-inch diameter PVC or similar pipe, allow 33 inch length of pipe per gallon; 4 inch diameter pipe needs only 18 inch of length per gallon; and a little over 8 inches (203.20 mm) of 6 inch (152.40 mm) diameter pipe is needed to catch a gallon of water.

The standpipe with ball valve is a variation of the standpipe filter. The cutaway drawing (Figure 2-3) shows the ball valve. As the chamber fills, the ball floats up and seals on the seat, trapping first-flush water and routing the balance of the water to the tank.

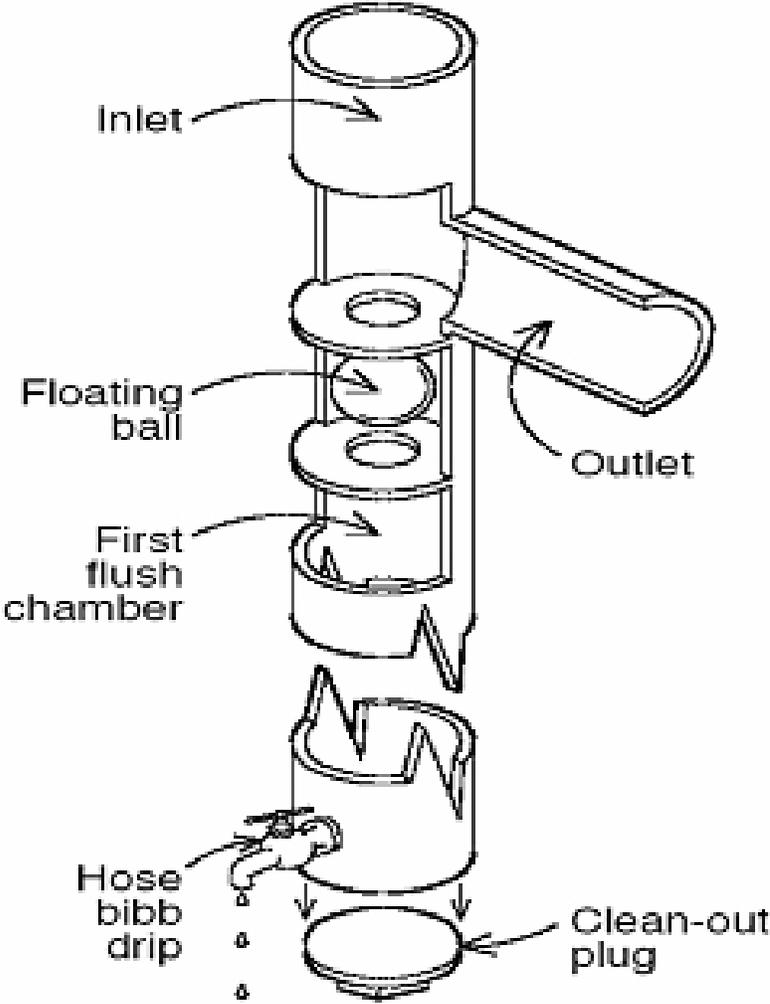
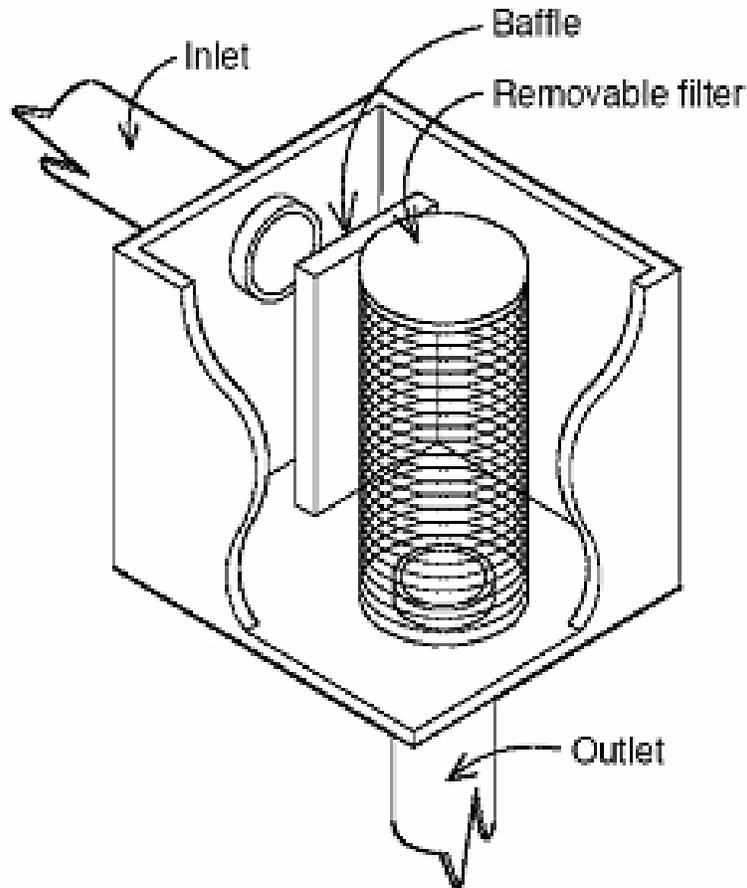


Figure 2-3. Standpipe with ball valve

The roof washer, placed just ahead of the storage tank, filters small debris for potable systems and also for systems using drip irrigation. Roof washers consist of a tank, usually between 30 and 50 gallon capacity, with leaf strainers and a filter (Figure 2-4). One commercially available roof washer has a 30 micron filter. (A micron, also called a micrometer, is one-millionth of a meter. A 30 micron filter has pores about 1/3 the diameter of a human hair.) All roof washers must be cleaned. Without proper maintenance they not only become clogged and restrict the flow of rainwater, but may themselves become breeding grounds for pathogens.



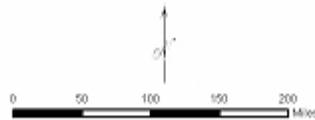
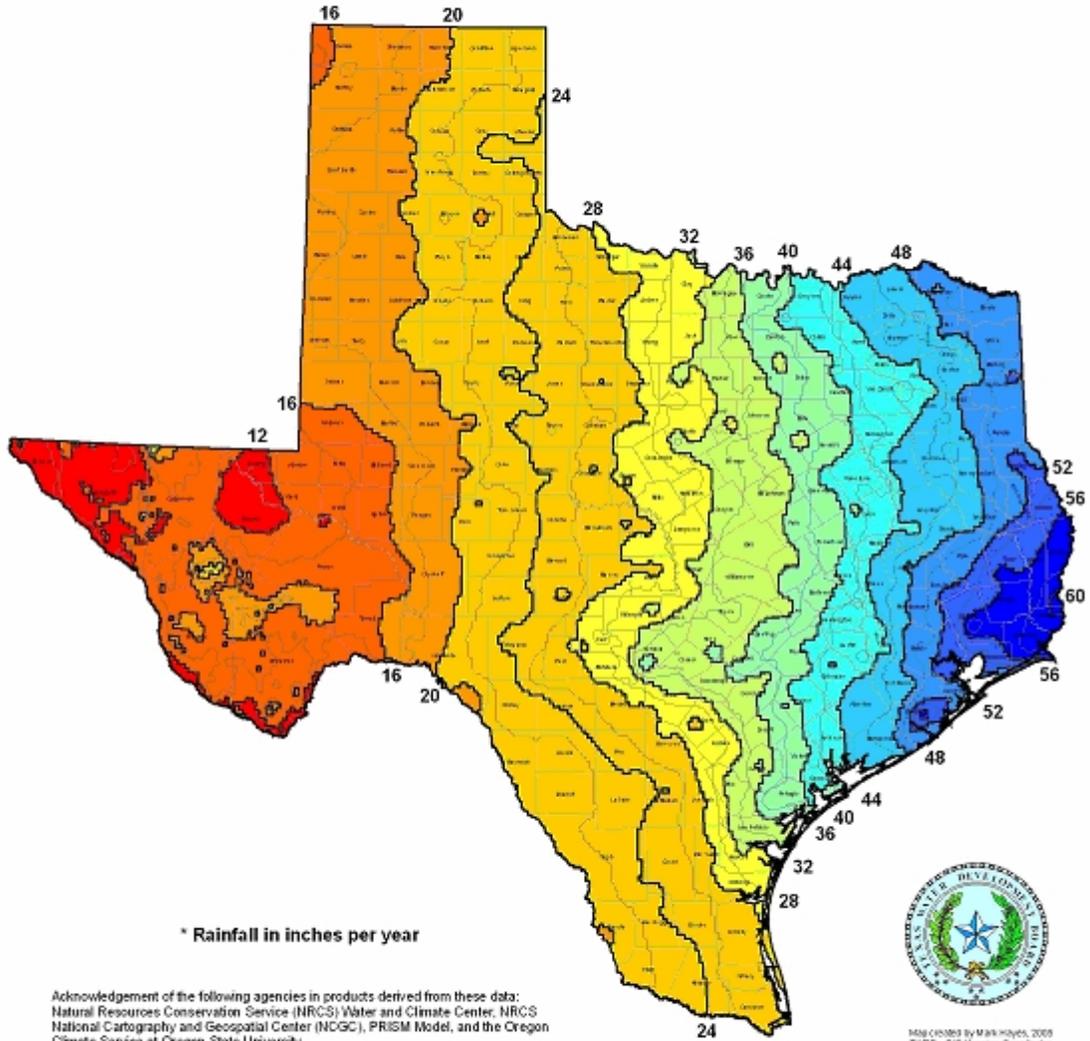
The box roof washer (Figure 2-4) is a commercially available component consisting of a fiberglass box with one or two 30 micron canister filters (handling rainwater from 1,500 and 3,500 square-foot catchments, respectively). The box is placed atop a ladder-like stand beside the tank, from which the system owner accesses the box for cleaning via the ladder. In locations with limited drop, a filter with the canisters oriented horizontally is indicated, with the inlet and outlet of the filter being nearly parallel.

Cistern Types

MATERIAL	FEATURES	CAUTION
Plastics		
Trash cans (20 - 50 gallon)	commercially available; inexpensive	use only new cans
Fiberglass	commercially available; alterable and moveable	must be sited on smooth, solid, level footing
Polyethylene/polypropylene	commercially available; alterable and moveable	UV-degradable, must be painted or tinted
Metals		
Steel drums (55 gallon)	commercially available; alterable and moveable	verify prior to use for toxics; prone to corrosion an rust;
Galvanized steel tanks	commercially available; alterable and moveable	possibly corrosion and rust; must be lined for potable use
Concrete and Masonry		
Ferrocement	durable and immoveable	potential to crack and fail
Stone, concrete block	durable and immoveable	difficult to maintain
Monolithic/Poured-in-place	durable and immoveable	potential to crack
Wood		
Redwood, fir, cypress	attractive, durable, can be disassembled and moved	expensive

Adapted from *Texas Guide to Rainwater Harvesting, Second Edition*, Texas Water Development Board, 1997.

Average Annual Rainfall in the State of Texas For the Climatological Period 1971 - 2000.



Maximum Number of Consecutive Days Without Rainfall in Texas

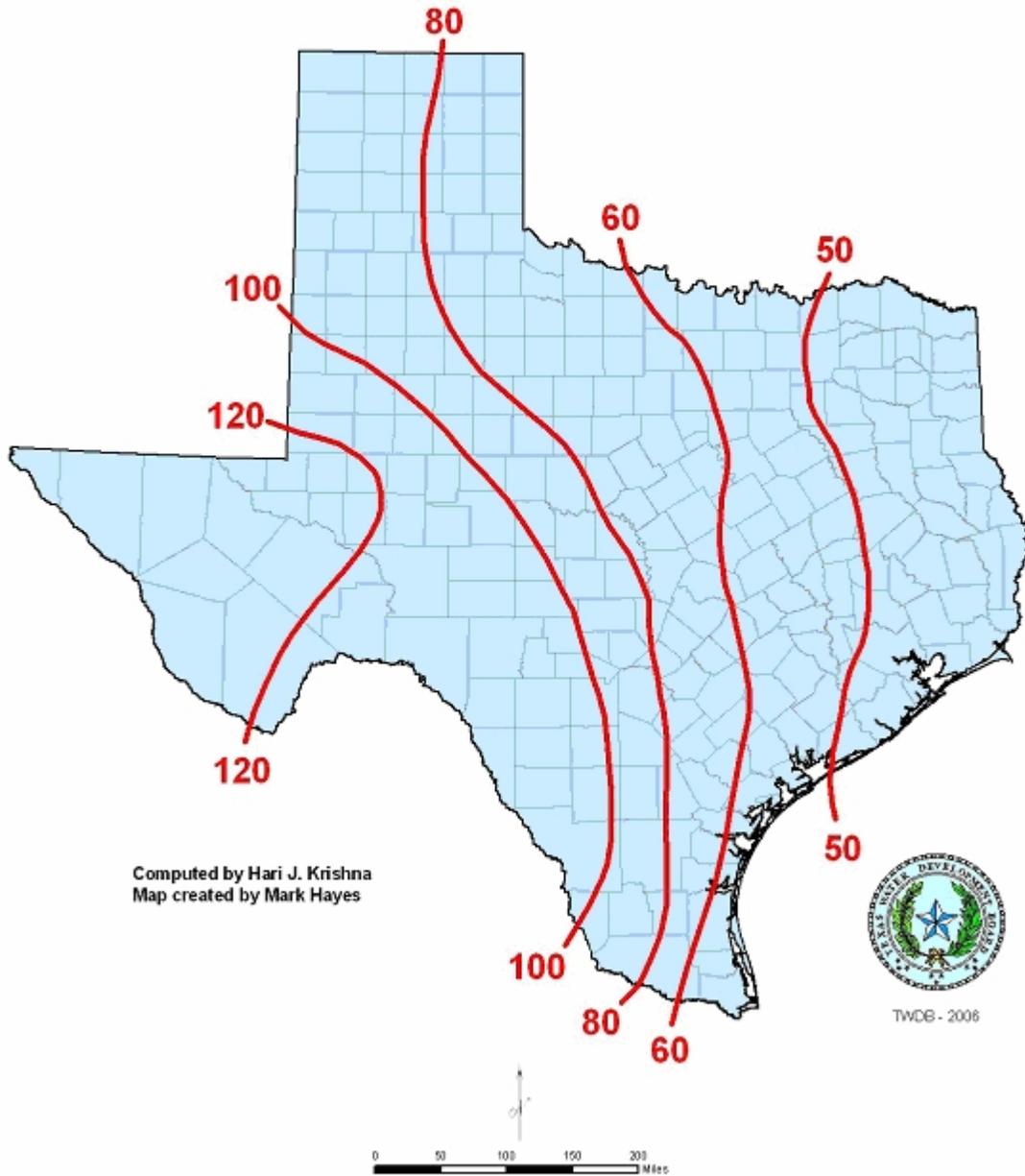


Figure 2. A map of Texas with isolines showing the maximum number of consecutive days without rainfall (Krishna, 2003; TWDB, 2005).

Average Annual Runoff from 2,000 square feet of Roof Area

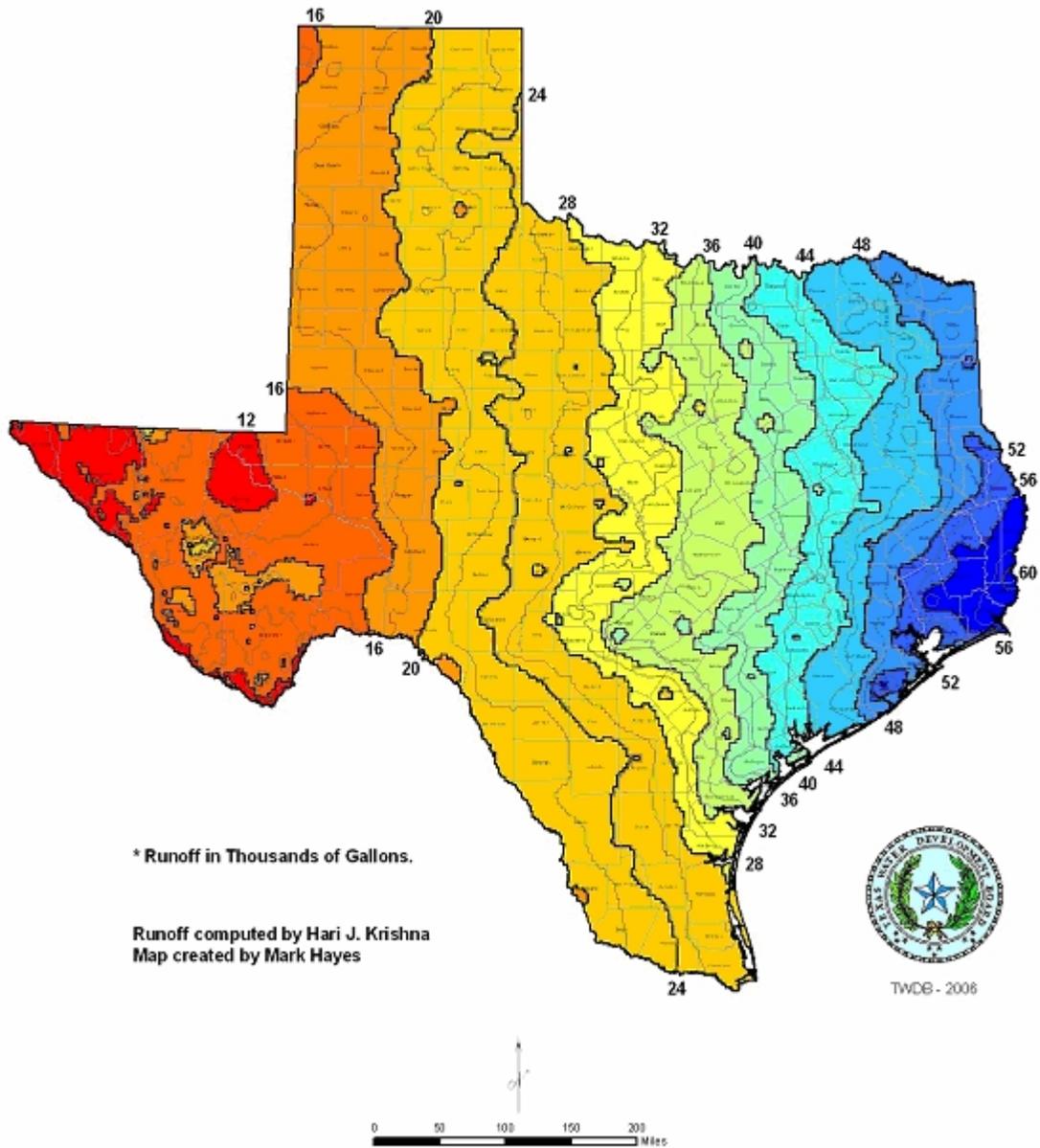


Figure 3. Map of Texas showing isolines of average annual runoff (in thousands of gallons) that can be expected from 2,000 square feet of roof area.

1303 - Domestic or Municipal Reclaimed Water Systems

1303.1 Scope. The provisions of this Division shall apply to the installation, construction, alteration, repair and maintenance of Domestic or Municipal Reclaimed Water Systems. Provisions listed herein that are identified as "Recommended Practice" or "Informational" in italic text shall not be mandatory. If Domestic or Municipal Reclaimed Water is combined with another water recovery source or domestic water, the most restrictive provisions shall apply.

This division shall apply to Domestic or Municipal Reclaimed Water Systems as follows:

1. After the point of delivery to private property from the local municipal water provider;
2. After the point of delivery to private property from another producer, licensed to do so in accordance with State Law.

Exceptions:

1. When the reclaimed water is being used at the site of the treatment plant (the producer), a point of delivery shall be determined at which point the public system becomes the private plumbing for use on the property. The then designated private plumbing shall comply with this division.
2. Any piping, joints and equipment used for irrigation systems that occur after the pump shall be subject to any applicable provisions in the Water Department Irrigation regulations. An irrigation and/or backflow permit may be required by the Water Department.

1303.1.1 Access to reclaimed water. Allowable access to the City of Fort Worth reclaimed water utility system shall only be with the approval of the Director of the Water Department.

1303.2 Definitions. All definitions listed in this section are intended to be in agreement with the Water Department regulations and the State of Texas laws. Any definition not listed shall be as defined in this code, other city codes or State Law.

BENEFICIAL USE - An economic use of wastewater in accordance with the purposes, applicable requirements, and quality criteria of this division and State Law, and which takes the place of potable and/or raw water that could otherwise be needed from another source. The use of reclaimed water in a quantity either less than or the economically optimal amount may be considered a beneficial use as long as it does not constitute a nuisance.

IRRIGATION USE means an approved use of reclaimed water for landscape, horticultural, or agricultural irrigation as defined by Title 30 Texas Administrative Code, Chapter 210.

MUNICIPAL WASTEWATER means waste or wastewater discharged into a publicly owned or a privately owned sewerage treatment works primarily consisting of domestic waste.

NUISANCE - Any distribution, storage, or use of reclaimed water, in such concentration and of such duration that is or may tend to be injurious to or which adversely affects human health or welfare, animal life, vegetation, or property, or which interferes with the normal use and enjoyment of animal life, vegetation, or property.

RECLAIMED WATER is domestic, municipal or industrial wastewater which has been treated to a quality suitable for beneficial use. Such water is either collected in a quality, or has been treated to a quality, that meets or exceeds Title 30 Texas Administrative Code, Chapter 210 requirements.

TYPE I RECLAIMED WATER USE means use of reclaimed water where contact between humans and the reclaimed water is likely.

TYPE II RECLAIMED WATER USE means use of reclaimed water where contact between humans and the reclaimed water is unlikely.

1303.3 Permits required. No special permit(s) is required by this department for a reclaimed water system beyond the permits already required by this code and other city codes. Examples, but not an all-inclusive list, of possible permits are as follows:

- a. Reclaim water system that conveys water to an above ground tank, such as a rain barrel, for gravity flow (hose flow) irrigation distribution:
 1. no permits are required. However, the following provisions are mandatory:
 - i. mosquito protection
 - ii. the tank (the barrel) must be in compliance with the tank provisions listed herein to prevent algae growth, provide overflow protection, etc.
- b. Reclaim water system that conveys water to an above or below ground tank for pressurized distribution, such as through a pump:

Permits are required for:

1. the pump and its electrical service;
2. all piping, joints and equipment after the pump when the system enters a building or structure. The entire system starting from the delivery point is subject to compliance and inspection;
3. other than the pump, as listed above, no permits are required by this department when the system is for irrigation only and does not enter a building or structure. However, an irrigation and/or backflow permit may be required by the Water Department. The following provisions are mandatory:
 - i. mosquito protection
 - ii. the tank must be in compliance with the tank provisions listed herein to prevent algae growth, provide overflow protection, etc.
- c. Reclaimed water systems in which the reclaimed water is combined with another water recovery source or domestic water:
 1. the most restrictive permit requirements shall be applicable, and the entire system starting from the delivery point is subject to compliance and inspection.
- d. Any piping, joints and equipment used for irrigation systems that occur after the pump shall be subject to any applicable provisions in the Water Department Irrigation regulations.

When a permit is required through this department, even if just for the pump, plans and diagrams must be submitted showing compliance with the provisions of this appendix.

Exception: Plans need not be provided to this department for any portion of the irrigation piping that occurs after the pump.

1303.4 System Limitations/Restrictions.

1303.4.1 Quality of reclaimed water. Reclaimed water obtained from a source approved by the State of Texas shall be assumed to meet the quality as specified in the State written approval. Reclaimed Water shall not leave the site at which it is obtained except when approved as a producer or provider through appropriate State approval process.

1303.4.2 Type I reclaimed water use. The provisions of this division are designed only for the non-potable use of Type I reclaimed water. Any system intended for use with Type II reclaimed water must be separately approved by the Building Official.

1303.4.3 Allowable Occupancies. Reclaimed Water Systems are not permitted in Residential Occupancies. In mixed-use occupancies, Reclaimed Water Systems may only be used in those areas that are non-residential (commercial and/or common area) in nature, when such areas are clearly separate and distinct from residential uses.

Exception: When permitted by the Director of the Water Department, Residential Occupancies may use Reclaimed Water for landscape irrigation.

1303.4.4 Connection to Potable Water Systems. The reclaimed water system shall have no connection to any potable water system, with or without mechanical backflow prevention devices. When the reclaimed water system tank is supplemented with a potable water source, such connection shall be made with an air gap. Exposed piping shall be resistant to damage from UV rays and must have adequate freeze protection.

Public water system customers that also have a reclaim water system must install a reduced pressure zone (RPZ) backflow preventer at the service meter.

1303.4.5 Permitted Fixtures. Reclaimed Water Systems may only be used as supply water to fixtures and/or appliances in which humans do not drink, consume, bath, wash food, dishes or wash their hands. Such allowable items include any of the following:

- a. turf and general landscape irrigation;
- b. non-food processing industrial processes;
- c. construction activities;
- d. vehicle washing;
- e. chillers, boilers, cooling towers;
- f. other non-human consumption uses authorized by the Director of the Water Department and approved by the Building Official.

Reclaimed water may not be used to fill swimming pools, hot tubs, wading pools, or other structures designed for contact recreation.

Informational: While irrigation systems are not covered by this division, the operator should be aware of the requirements under State Law. Some of the items listed in Texas Administrative Code (TAC), Title 30, Part 1, Chapter 210, Rule 210.24 and 210.56 are as follows:

General irrigation requirements.

- a. The irrigation application rates and application times shall be developed so as to minimize "wet grass" conditions in unrestricted landscaped areas during the periods the area could be in use.
- b. Irrigation systems shall be designed so that the irrigation spray does not reach any privately-owned premises outside the designated irrigation area or reach public drinking fountains.
- c. There shall be no application of effluent when the ground is water saturated or frozen.
- d. Distribution systems must be designed to prevent operation by unauthorized personnel.
- e. Irrigation operations shall be managed in a manner to minimize the inadvertent contact of reclaimed water with humans.
- f. Operations or tail water controls shall be provided to preclude discharge of reclaimed water from irrigation sites.
- g. When using industrial reclaimed water, the system shall be designed and managed to prevent contamination of groundwater or surface water and to prevent the occurrence of nuisance conditions. Tail water control facilities shall be provided, where necessary, to prevent the discharge of any industrial reclaimed water from irrigated lands into or adjacent to water in the state.

- h. No industrial reclaimed water may be land applied when the ground is frozen or saturated or during rainfall events.
- i. When applying industrial reclaimed water to land, a buffer area must be maintained around water wells to prevent the possibility of waste transport to groundwater via the well or well casing. Industrial reclaimed water shall not be applied within 250 feet of a private water well (used for domestic or irrigation use) or 500 feet of a public water supply well.

1303.4.6 Storage Tanks. Storage tanks, their foundation and their installation method must be capable of holding the imposed weight. Also, the water and its clarity may be affected by exposure to sunlight and the tank material, lining, or any paint that might be used. Tank water is subject to algae growth and mosquito breeding. Algae can affect the clarity and odor of the water. Mosquito breeding is a health hazard. Therefore, the following provisions are required.

- a. Storage tanks must be opaque, either upon purchase or painted later, to inhibit algae growth.
- b. Tanks must be covered and vents screened to discourage mosquito breeding.
- c. Tanks should be protected for direct sunlight if possible.
- d. Tanks are required to have an overflow design, and the overflow discharge shall be to an approved disposal method.
- e. Tanks should be placed on a stable, level pad.
- f. Underground tanks within 5 feet (1524 mm) of the foundation of a building or structure require an engineered design to insure the stability of that building or structure.
- g. If supplied with supplemental water from a potable water source, the connection must be made through an air gap and must be inspected as part of the permit for the extension of the potable water line.

1303.4.6.1 Tank size. When used to supply plumbing fixtures, the tank shall be a minimum of twice the volume of water required to meet the daily requirements of the fixtures supplied, but not less than fifty (50) gallons (189 L).

Informational: When a plumbing fixture is operated, such as flushing a water closet, it is important to have the necessary quantity of water in the tank to meet the demand. Otherwise, the tank may empty faster than the supplemental line can refill.

1303.4.6.2 Makeup water. When reclaimed water used to supply plumbing fixtures, potable water or approved well water from a dependable supply, shall be provided as a source of makeup water to the tank. Such connection to the tank shall be made with an air gap. Further, an adequate internal cross-connection control program is required to be demonstrated to the Water Department.

1303.4.6.3 Overflow. When the supply of reclaimed water has the potential of exceeding the storage capacity in an uncontrolled delivery system, an approved alternate means of disposal shall be provided.

Informational: When the delivery system of a source of water, such as chilling towers or cooling evaporators, can provide more water than is used during periods of low demand, an approved means of disposal of the excess water must be designed in the system. An approved means of disposal may mean into the municipal wastewater system, if such disposal would have been allowed before the installation of a reclaimed water system.

1303.4.7 Holding Ponds. Using holding ponds as water storage must be in accordance with State Law and requires separate approval by the Building Official.

1303.4.8 Treatment. Filter systems installed after the pump may be necessary to remove sediment and disease-causing pathogens and to reduce the number and size of particles that are distributed in the system.

Recommended Practice:

Disinfecting reclaimed water for indoor use is desirable to control microbial growth which could cause fouling and affect the operation of plumbing fixtures. A 5 micron filter may be sufficient. Disinfection can be accomplished by passing the water through ultraviolet light or by treating it with chlorine. If using non-potable water inside a building, e.g. toilets and urinals, filtering to remove small particles that might clog valves and equipment should be considered. If using reclaimed water for irrigation, filtering to remove small particles that might clog valves and equipment should be considered. Treatment generally consists of filtration and disinfection processes in series before distribution. Treatment options include:

- a. Cartridge Filters and Ultraviolet (UV) Light. Two in-line sediment filters—the 5 micron fiber cartridge filter followed by the 3 micron activated charcoal cartridge filter—followed by ultraviolet light.
- b. Ozone. Chemically, ozone is O₃; essentially a more reactive form of molecular oxygen made up of 3 atoms of oxygen. An ozone generator forces ozone into storage tanks through rings or a diffuser stone. Ozone is unstable and reacts quickly to revert to O₂ and dissipates through the atmosphere.
- c. Membrane filtration (reverse osmosis and nanofiltration). Membrane filtration, such as reverse osmosis and nanofiltration work by forcing water under high pressure through a semipermeable membrane to filter dissolved solids and salts.
- d. Chlorination. A chlorine pump injects chlorine in to the water as it enters the building. A practical chlorine contact time, which is critical to kill bacteria, is usually from 2 minutes to 5 minutes with a free chlorine residual of 2 parts per million (ppm).

1303.5 Special Design Criteria

1303.5.1 Material Identification. Reclaimed water piping and fittings shall be as required in this code for potable water piping and fittings. All reclaimed water pipe and fittings, hose bibs and faucets shall be purple in color as follows:

1. Piping and fittings shall be manufactured with purple color integral to the plastic, painted purple or wrapped with purple tape. Piping shall be marked on opposite sides to read "**CAUTION: RECLAIMED WATER, DO NOT DRINK**" in intervals not to exceed 3 feet (914.40 mm), or may be continuously wrapped with purple-colored Mylar tape. The wrapping tape shall have a minimum nominal thickness of 0.0005 inch (0.127 mm) and a minimum width of 2 inches (50.80 mm). Tape shall be fabricated of poly(vinyl chloride) with synthetic rubber adhesive and a clear polypropylene protective coating or approved equal. The tape shall be purple (Pantone color #512) and shall be imprinted in nominal ½ inch (12.7 mm) high, black uppercase letters, with the words "**CAUTION: RECLAIMED WATER, DO NOT DRINK.**" The lettering shall be imprinted in 2 parallel lines, such that after wrapping the pipe with a ½ width overlap, one full line of text shall be visible.
 2. All hose bibs and faucets shall be painted purple or manufactured with an integrated purple color and designed to prevent connection to a standard water hose. Such design may include a different size outlet such that standard water hoses cannot be attached.
 3. All valves except fixture supply control valves shall be painted purple or manufactured with an integrated purple color and be equipped with a locking feature.
 4. All mechanical equipment which is appurtenant to the reclaimed water system shall be painted purple or manufactured with an integrated purple color to match the Mylar wrapping tape.
 5. All purple paint shall be of an approved type designated for this type of use and installed in accordance with the manufacturer's installation instructions.
-

1303.5.2 Installation.

1. Hose bibs shall be located in locked, below grade vaults which shall be clearly labeled as being of non-potable quality. As an alternative to the use of locked, below grade vaults with standard hose bibs services, hose bibs may be placed in a non-lockable service box which can only be operated by a special tool so long as the hose bib is clearly labeled as non-potable water, in accordance with subsection H305.3.
2. Reclaimed water pipes shall not be run or laid in the same trench as potable water pipes. A 10 foot (3048 mm) horizontal separation shall be maintained between pressurized, buried reclaimed and potable water piping. Buried potable water pipes crossing pressurized reclaimed water pipes shall be laid a minimum of 12 inches (304.80 mm) above the reclaimed water pipes.
3. Reclaimed water pipes laid in the same trench or crossing building sewer or drainage piping shall be installed in compliance with Sections 603.2 of this code. Reclaimed water pipes shall be protected similar to potable water pipes.

1303.5.3 Signs.

1. **Restroom entrance signs.** All installations using reclaimed water for water closets and/or urinals shall be identified with signs. Each sign shall contain ½ 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) shall be visible to all users entering the restroom. The number and location of the signs shall be approved by the Authority Having Jurisdiction and shall contain the following text:

TO CONSERVE WATER, THIS BUILDING USES RECLAIMED WATER TO FLUSH TOILETS AND URINALS

1. **Equipment room signs.** Each equipment room containing reclaimed water equipment shall have a sign posted with the following wording in 1 inch (25.40 mm) letters on a purple background:

**CAUTION:
RECLAIMED 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 reclaimed water equipment.

3. **Valve access door signs.** Each reclaimed water valve within a wall shall have its access door into the wall equipped with a warning sign approximately 6 inches (152.40 mm) by 6 inches (152.40 mm x 152.40 mm) with wording in ½ inch (12.7 mm) letters on a purple background. The size, shape, and format of the sign shall be substantially the same as that specified in subsection 2 above. The signs shall be attached inside the access door frame and shall hang in the center of the access door frame. This sign requirement shall be applicable to any and all access doors, hatches, etc., leading to reclaimed water piping and appurtenances.
4. **Valve seals.** Each valve or appurtenance shall be sealed in a manner approved by the Authority Having Jurisdiction after the reclaimed system has been approved and placed into operation. These seals shall either be a crimped lead wire seal or a plastic breakaway seal which, if broken after system approval, shall be deemed conclusive evidence that the reclaimed water system has been accessed. The seals shall be purple with the words "**RECLAIMED WATER**" and shall be supplied by the reclaimed water purveyor or by other arrangements acceptable to the Authority Having Jurisdiction.

5. **Storage areas and hose bibs.** Signs having a minimum size of 8 inches by 8 inches (203.20 mm x 203.20 mm), as shown in Figure 1, shall be posted at all storage areas and on all hose bibs reading, in both English and Spanish, " **RECLAIMED WATER, DO NOT DRINK** " or similar wording. The area shall be secured to prevent access by the public.

FIGURE 1: 30 TAC §210.25(b)(1)



DO NOT DRINK THE WATER

NO TOMAR EL AGUA

1303.6 Inspection and testing. Reclaimed water piping shall be tested as outlined in this code for testing of potable water piping. Associated back-flow devices, as required by this code and the Water Department, shall be tested as required for potable water systems.

1303.7 Maintenance. The system must be maintained or appropriately abandoned in an approved manner as provided for in Section H308.

Informational: The system owner should take into consideration the maintenance required to keep the system functioning as designed. Any failure to maintain the system can lead to damage to the tank, pump, piping, irrigation and plumbing equipment. Such damage should be expected to generate associated costs of repair.

1303.8 Abandonment. When a reclaimed water system is to be abandoned, all re-piping necessary to supply the irrigation and/or plumbing system with another water source will require applicable permits along with a set of plans to be approved by the Building Official.

1304 - Gray Water

1304.1 Scope. The provisions of this Division shall apply to the installation, construction, alteration, repair and maintenance of Gray Water Systems. Provisions listed herein that are identified as "*Recommended Practice*" or "*Informational*" in italic text shall not be mandatory. If Gray Water is combined with another water recovery source or domestic water, the most restrictive provisions shall apply. This division shall apply to the entire Gray Water system.

Exception: Any piping, joints and equipment used for irrigation systems that occur after the pump shall be subject to any applicable provisions in the Water Department Irrigation regulations. An irrigation and/or backflow permit may be required by the Water Department.

1304.2 Definitions. All definitions listed in this section are intended to be in agreement with the State of Texas laws. Any definition not listed shall be as defined in this code, other city codes or State Law.

GRAY WATER - Wastewater from:

- a. showers;
- b. bathtubs;
- c. hand washing lavatories;
- d. sinks that are not used for disposal of hazardous or toxic ingredients;
- e. sinks not used for food preparation or disposal; and
- f. clothes-washing machines.

Gray water does not include wastewater from the washing of material, including diapers, soiled with human excreta or wastewater that has come into contact with toilet waste.

NUISANCE – Any distribution, storage, or use of gray water, in such concentration and of such duration that is or may tend to be injurious to or which adversely affects human health or welfare, animal life, vegetation, or property, or which interferes with the normal use and enjoyment of animal life, vegetation, or property.

1304.3 Permits required. No special permit(s) is required by this department for a gray water system beyond the permits already required by this code and other city codes. Any piping, joints and equipment used for irrigation systems that occur after the pump shall be subject to any applicable provisions in the Benbrook Water Department Irrigation regulations. An irrigation and/or backflow permit may be required by the Benbrook Water Department. When a permit is required through this department, even if just for the pump, plans and diagrams must be submitted showing compliance with the provisions of this appendix.

Exception: Plans need not be provided to this department for any portion of the irrigation piping that occurs after the pump.

1304.4 System Limitations/Restrictions.

1304.4.1 Connection to Potable Water Systems. The gray water system shall have no connection to any potable water system, with or without mechanical backflow prevention devices. When the gray water system tank is supplemented with a potable water source, such connection shall be made with an air gap. Exposed piping shall be resistant to damage from UV rays and must have adequate freeze protection. Where possible, the intake pipe shall extend into the tank to avoid venting through the intake pipe. The internal termination point of this intake pipe shall be higher than the overflow drain. Public water system

customers that also have a gray water system must install a reduced pressure zone (RPZ) backflow preventer at the service meter.

1304.4.2 Permitted Fixtures. Gray Water Systems may only be used as supply water to fixtures and/or appliances in which humans do not drink, consume, bath, wash food, dishes or wash their hands. Such allowable items include any of the following:

- a. toilet and urinal flushing;
- b. turf and general landscape irrigation.

Gray water may not be used to fill swimming pools, hot tubs, wading pools, or other structures designed for contact recreation. Gray water shall not be used for hose bibs and faucets.

Informational: While irrigation systems are not covered by this division, the operator should be aware of the requirements under State Law listed in Texas Administrative Code (TAC), Title 30, Part 1, Chapter 210, Rule 210.83, 210.84 and 210.85 and the following recommended practices.

Recommended Practice:

- a. The irrigation application rates and application times shall be developed so as to minimize "wet grass" conditions in unrestricted landscaped areas during the periods the area could be in use.
- b. Irrigation systems shall be designed so that the irrigation spray does not reach any privately-owned premises outside the designated irrigation area or reach public drinking fountains.
- c. There shall be no application of effluent when the ground is water saturated or frozen.
- d. Irrigation operations shall be managed in a manner to minimize the inadvertent contact of gray water with humans.
- e. Operations or tail water controls shall be provided to preclude discharge of gray water from irrigation sites.
- f. When using gray water, the system shall be designed and managed to prevent contamination of groundwater or surface water and to prevent the occurrence of nuisance conditions. Tail water control facilities shall be provided, where necessary, to prevent the discharge of any gray water from irrigated lands into or adjacent to water in the state.
- g. Gray water systems should maintain the following separations:

Element	Minimum Horizontal Distance	
	Holding Tank (feet)	Irrigation Disposal Field (feet)
Buildings	5	2
Property line adjoining private property	5	5
Public water main	10	10
Seepage pits	5	5
Septic tanks	0	5
Streams and lakes	50	50
Water service	5	5
Water wells	50	100

1304.4.3 Storage tanks. Storage tanks, their foundation and their installation method must be capable of holding the imposed weight. Also, the water and its clarity may be affected by exposure to sunlight and the tank material, lining, or any paint that might be used. Tank water is subject to algae growth and mosquito breeding. Algae can affect the clarity and odor of the water. Mosquito breeding is a health hazard. Therefore, the following provisions are required.

- a. Storage tanks must be opaque, either upon purchase or painted later, to inhibit algae growth.
- b. Tanks must be covered and vents screened to discourage mosquito breeding.
- c. Tanks should be protected for direct sunlight if possible.
- d. Tanks are required to have an overflow design, and the overflow discharge shall be to an approved disposal method.
- e. Tanks should be placed on a stable, level pad.
- f. Underground tanks within 5 feet (1524 mm) of the foundation of a building or structure require an engineered design to insure the stability of that building or structure.
- g. If supplied with supplemental water from a potable water source, the connection must be made through an air gap and must be inspected as part of the permit for the extension of the potable water line.

Where possible, the intake pipe shall extend into the tank to avoid venting through the intake pipe. The internal termination point of this intake pipe shall be higher than the overflow drain.

1304.4.3.1 Tank size. When used to supply plumbing fixtures, the tank shall be a minimum of twice the volume of water required to meet the daily requirements of the fixtures supplied, but not less than 50 gallons (189 L).

Informational: When a plumbing fixture is operated, such as flushing a water closet, it is important to have the necessary quantity of water in the tank to meet the demand. Otherwise, the tank may empty faster than the supplemental line can refill. The tank should be sized to limit the retention time of gray water to a maximum of 72 hours. Longer storage time increases the potential of microbial growth and odors.

1304.4.3.2 Makeup water. When gray water is used to supply plumbing fixtures, potable water or approved well water from a dependable supply, shall be provided as a source of makeup water to the tank. Such connection to the tank shall be made with an air gap. Further, an adequate internal cross-connection control program is required to be demonstrated to the Water Department.

1304.4.3.3 Overflow. When the supply of gray water has the potential of exceeding the storage capacity in an uncontrolled delivery system, an approved alternate means of disposal shall be provided. For a system that receives gray water only, the tank shall be equipped with an overflow pipe having the same or larger diameter as the influent pipe for the gray water. The overflow pipe shall be indirectly connected to the sanitary drainage system. If the tank is supplied with water recovered from another source, the most restrictive overflow provision shall apply.

Informational: An approved means of disposal may mean into the municipal wastewater system, if such disposal would have been allowed before the installation of a gray water system.

1304.4.3.4 Drain. For a system that receives gray water only, a drain shall be located at the lowest point of the tank and shall be indirectly connected to the sanitary drainage system. The drain shall be the same diameter as the overflow pipe required in Section H404.3.3. If the tank is supplied with water recovered from another source, the most restrictive drain provision shall apply.

1304.4.3.5 Vent required. The reservoir shall be provided with a vent sized in accordance with the vent provisions of this code based on the diameter of the reservoir influent pipe.

1304.4.4 Treatment.

1304.4.4.1 Filtration entering the tank. Gray water entering the tank shall pass through an approved filter such as a media, sand or diatomaceous earth filter. A full-open valve shall be installed downstream of the last fixture connection to the gray water discharge pipe before entering the required filter.

1304.4.4.2 Disinfection. Gray water used for flushing water closets and urinals shall be disinfected by an approved method that employs one or more disinfectants such as chlorine, iodine or ozone as listed in Section H404.4.3.

1304.4.4.3 Filter systems installed after the pump may be necessary to remove sediment and disease-causing pathogens and to reduce the number and size of particles that are distributed in the system.

Recommended Practice:

Disinfecting gray water for indoor use is required to control microbial growth which could cause fouling and affect the operation of plumbing fixtures. A 5 micron filter may be sufficient. Disinfection can be accomplished by passing the water through ultraviolet light or by treating it with chlorine. If using gray water for irrigation, filtering to remove small particles that might clog valves and equipment should be considered. Treatment generally consists of filtration and disinfection processes in series before distribution. Treatment options include:

- a. Cartridge Filters and Ultraviolet (UV) Light. Two (2) in-line sediment filters—the 5 micron fiber cartridge filter followed by the three-micron activated charcoal cartridge filter—followed by ultraviolet light.
- b. Ozone. Chemically, ozone is O₃: essentially a more reactive form of molecular oxygen made up of 3 atoms of oxygen. An ozone generator forces ozone into storage tanks through rings or a diffuser stone. Ozone is unstable and reacts quickly to revert to O₂ and dissipates through the atmosphere.
- c. Membrane filtration (reverse osmosis and nanofiltration). Membrane filtration, such as reverse osmosis and nanofiltration work by forcing water under high pressure through a semipermeable membrane to filter dissolved solids and salts.
- d. Chlorination. A chlorine pump injects chlorine in to the water as it enters the building. A practical chlorine contact time, which is critical to kill bacteria, is usually from 2 minutes to 5 minutes with a free chlorine residual of 2 parts per million (ppm).

1304.4.4.4 Coloring. When used for flushing water closets and urinals, the gray water shall be dyed blue or green with a food grade vegetable dye before such water is supplied to the fixtures.

1304.5 Special Design Criteria

1304.5.1 Material identification. Gray water piping and fittings shall be as required in this code for potable water piping and fittings. All gray water pipe and fittings shall be purple in color as follows:

- a. Piping and fittings shall be manufactured with purple color integral to the plastic, painted purple or wrapped with purple tape. Piping shall be marked on opposite sides to read "**CAUTION: GRAY WATER, DO NOT DRINK**" in intervals not to exceed 3 feet (914.40 mm), or may be continuously wrapped with purple-colored Mylar tape. The wrapping tape shall have a minimum nominal thickness of 0.0005 inch (0.127 mm) and a minimum width of 2 inches (50.80 mm). Tape shall be fabricated of poly (vinyl chloride) with synthetic rubber adhesive and a clear polypropylene protective coating or approved equal. TheThe tape shall be purple (Pantone color #512) and shall be imprinted in nominal ½ inch (12.7 mm) high, black uppercase letters, with the words "**CAUTION: GRAY WATER, DO NOT DRINK.**" The

lettering shall be imprinted in two parallel lines, such that after wrapping the pipe with a ½ width overlap, one full line of text shall be visible.

- b. All valves except fixture supply control valves shall be painted purple and be equipped with a locking feature.
- c. All mechanical equipment which is appurtenant to the gray water system shall be painted purple to match the Mylar wrapping tape.
- d. All purple paint shall be of an approved type designated for this type of use and installed in accordance with the manufacturer's installation instructions.

1304.5.2 Installation.

- a. Gray water pipes shall not be run or laid in the same trench as potable water pipes. A 10 foot (3048 mm) horizontal separation shall be maintained between pressurized, buried reclaimed and potable water piping. Buried potable water pipes crossing pressurized reclaimed water pipes shall be laid a minimum of 12 inches (304.80 mm) above the reclaimed water pipes.
- b. Gray water pipes laid in the same trench or crossing building sewer or drainage piping shall be installed in compliance with Sections 603.2 of this code. Gray water pipes shall be protected similar to potable water pipes.

1304.5.3 Signs.

- 1. **Restroom entrance signs.** All installations using gray water for water closets and/or urinals shall be identified with signs. Each sign shall contain ½ 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) shall be visible to all users entering the restroom. The number and location of the signs shall be approved by the Authority Having Jurisdiction and shall contain the following text:

TO CONSERVE WATER, THIS BUILDING USES GRAY WATER TO FLUSH TOILETS AND URINALS
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Exception: For private residences, identification of fixtures may be accomplished with the installation of a permanent tag attached to the fixture cut-off valve.

- 2. **Valve seals.** Each valve or appurtenance shall be sealed in a manner approved by the Authority Having Jurisdiction after the gray system has been approved and placed into operation. These seals shall either be a crimped lead wire seal or a plastic breakaway seal which, if broken after system approval, shall be deemed conclusive evidence that the reclaimed water system has been accessed. The seals shall be purple with the words "**GRAY WATER**" and shall be supplied by installer or by other arrangements acceptable to the Building Official.

FIGURE 1: 30 TAC §210.25(b)(1)



DO NOT DRINK THE WATER
NO TOMAR EL AGUA

1304.6 Inspection and testing. Gray water piping shall be tested as outlined in this code for testing of potable water piping. Associated back-flow devices, as required by this code and the Benbrook Water Authority rules and regulations, shall be tested as required for potable water systems.

1304.7 Maintenance. The system must be maintained or appropriately abandoned in an approved manner as provided for in Section H408.

Informational: The system owner should take into consideration the maintenance required to keep the system functioning as designed. Any failure to maintain the system can lead to damage to the tank, pump, piping, irrigation and plumbing equipment. Such damage should be expected to generate associated costs of repair.

1304.8 Abandonment. When a gray water system is to be abandoned, all re-piping necessary to supply the irrigation and/or plumbing system with another water source will require applicable permits along with a set of plans to be approved by the Building Official.

Supplemental Information

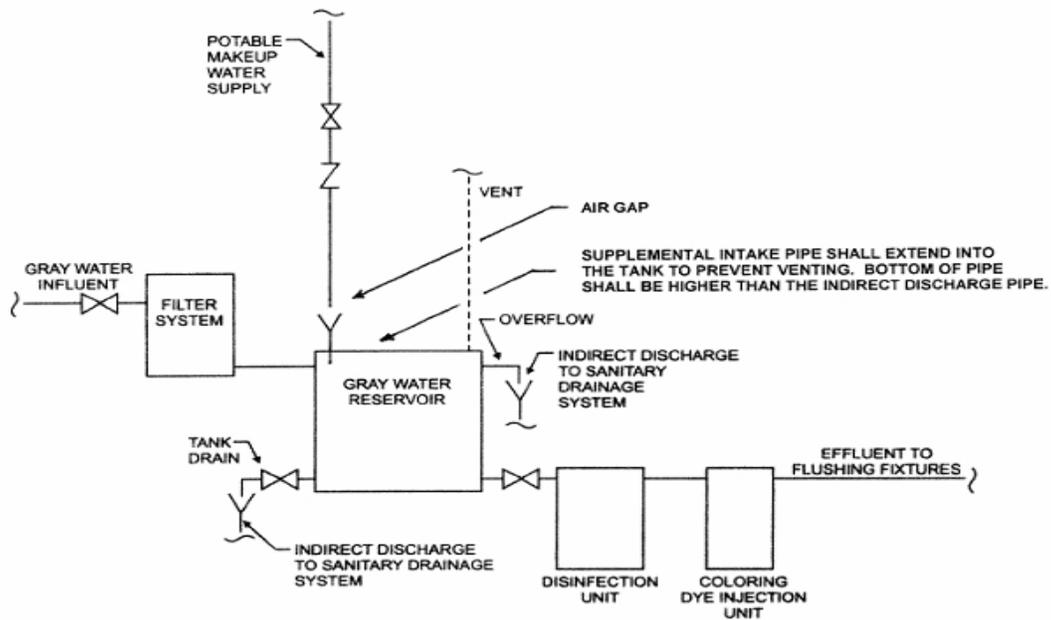


FIGURE AO101.1(1)
GRAY WATER RECYCLING SYSTEM FOR FLUSHING WATER CLOSETS AND URINALS

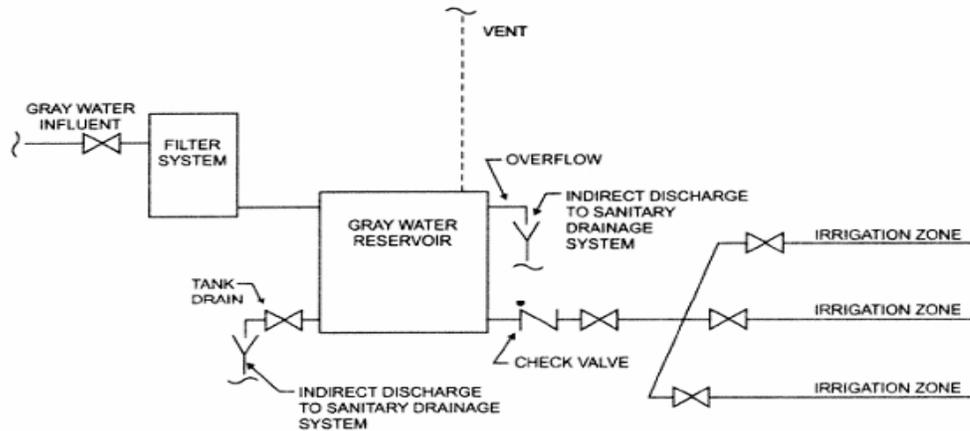


FIGURE AO101.1(2)
GRAY WATER RECYCLING SYSTEM FOR SUBSURFACE LANDSCAPE IRRIGATION

1305 - Industrial Reclaimed Water Systems

1305.1 Scope. The provisions of this Division shall apply to the installation, construction, alteration, repair and maintenance of Industrial Reclaimed Water Systems. Industrial Reclaim Water is when reclaimed water comes from on-site sources or equipment, such as cooling towers or evaporators. See Section H504.4 for more detail. This type of water is only allowed to be used within the boundaries of the industrial facility or within the boundaries of property that is contiguous to the facility and owned or operated by the producer.

This division shall apply to the entire Industrial Reclaimed Water System.

Exception: Any piping, joints and equipment used for irrigation systems that occur after the pump shall be subject to any applicable provisions in the Benbrook Water Authority Irrigation regulations. An irrigation and/or backflow permit may be required by the Benbrook Water Authority.

1305.2 Definitions. All definitions listed in this section are intended to be in agreement with the Benbrook Water Authority regulations and the State of Texas laws. Any definition not listed shall be as defined in this code, other city codes or State Law.

BENEFICIAL USE - An economic use of wastewater in accordance with the purposes, applicable requirements, and quality criteria of this division and State Law, and which takes the place of potable and/or raw water that could otherwise be needed from another source. The use of reclaimed water in a quantity either less than or the economically optimal amount may be considered a beneficial use as long as it does not constitute a nuisance.

BLOWDOWN - The discharge of recirculating water for the purpose of discharging materials contained in the water, the further buildup of which would cause concentration in amounts that could damage or impair machinery, equipment, or systems.

INDUSTRIAL USE means an approved use of reclaimed water for industrial or commercial processes as defined by 30 Texas Administrative Code, Chapter 210.

INDUSTRIAL RECLAIMED WATER means any industrial wastewater that is non-domestic or non-municipal which has been treated, if necessary, to a quality suitable for land application or for beneficial use. See Sections H504.1 and H504.4.

IRRIGATION USE means an approved use of reclaimed water for landscape, horticultural, or agricultural irrigation as defined by Title 30 Texas Administrative Code, Chapter 210.

MUNICIPAL WASTEWATER means waste or wastewater discharged into a publicly owned or a privately owned sewerage treatment works primarily consisting of domestic waste.

NON-CONTACT COOLING WATER - Water used for cooling which does not come into direct contact with any raw material, intermediate product, waste product, by-product, or finished product.

NUISANCE - Any distribution, storage, or use of reclaimed water, in such concentration and of such duration that is or may tend to be injurious to or which adversely affects human health or welfare, animal life, vegetation, or property, or which interferes with the normal use and enjoyment of animal life, vegetation, or property.

ONCE-THROUGH COOLING WATER - Water passed through main cooling condensers in one or two passes for the purpose of removing waste heat.

ON-SITE INDUSTRIAL RECLAIMED WATER shall mean the use of industrial reclaimed water within the boundaries of the industrial facility or within the boundaries of property that is contiguous to the facility and owned or operated by the producer.

RECLAIMED WATER is domestic, municipal or industrial wastewater which has been treated to a quality suitable for beneficial use. Such water is either collected in a quality, or has been treated to a quality, that meets or exceeds Title 30 Texas Administrative Code, Chapter 210 requirements.

TYPE I RECLAIMED WATER USE means use of reclaimed water where contact between humans and the reclaimed water is likely.

TYPE II RECLAIMED WATER USE means use of reclaimed water where contact between humans and the reclaimed water is unlikely.

1305.3 Permits required. No special permit(s) is required by this department for an industrial reclaimed water system beyond the permits already required by this code and other city codes. Examples, but not an all-inclusive list, of possible permits are as follows:

- a. Industrial reclaimed water system that conveys water to an above ground tank, such as a rain barrel, for gravity flow (hose flow) irrigation distribution:
 1. no permits are required. However, the following provisions are mandatory:
 - i. mosquito protection
 - ii. the tank (the barrel) must be in compliance with the tank provisions listed herein to prevent algae growth, provide overflow protection, etc.
- b. Industrial reclaimed water system that conveys water to an above or below ground tank for pressurized distribution, such as through a pump:

Permits are required for:

1. the pump and its electrical service;
2. all piping, joints and equipment after the pump when the system enters a building or structure. The entire system starting from the delivery point is subject to compliance and inspection;
3. other than the pump, as listed above, no permits are required by this department when the system is for irrigation only and does not enter a building or structure. However, an irrigation and/or backflow permit may be required by the Benbrook Water Authority. The following provisions are mandatory:
 - i. mosquito protection
 - ii. the tank must be in compliance with the tank provisions listed herein to prevent algae growth, provide overflow protection, etc.
- c. Industrial reclaimed water systems in which the industrial reclaimed water is combined with another water recovery source or domestic water:
 1. the most restrictive permit requirements shall be applicable, and the entire system starting from the delivery point is subject to compliance and inspection.
- d. Any piping, joints and equipment used for irrigation systems that occur after the pump shall be subject to any applicable provisions in the Benbrook Water Authority Irrigation regulations.

When a permit is required through this department, even if just for the pump, plans and diagrams must be submitted showing compliance with the provisions of this appendix.

Exception: Plans need not be provided to this department for any portion of the irrigation piping that occurs after the pump. Plans must be submitted to the Benbrook Water Authority for any portion of the irrigation piping that occurs after the pump and approval from the TCEQ in compliance with 30 TAC 210 is required.

1305.4 System Limitations/Restrictions.

1305.4.1 Quality of Industrial Reclaimed Water. Industrial reclaimed water obtained from a source approved by the State of Texas shall be assumed to meet the quality as specified in the State written approval. When industrial reclaimed water is obtained from an internal on-site source to be used on-site, a water quality report, stamped by an engineer licensed to practice in the State of Texas, qualified in water purification systems, will be required. The report shall contain the following:

1. a description of the purification and filtering system to be employed for the source supply piping and the storage tank;

2. the chemicals, bacteria, virus, etc. that the treatment is designed to control. At a minimum, the treatment shall be for Fecal Coliform, Legionella pneumophila and Salmonella typhi;
3. the maximum quantity levels expected to not exceed;
4. a description of the chemicals used in equipment cleaning and/or service (such as the cooling tower maintenance), any expected hazards associated with the quantities used, the methods, if any, to prevent the chemical from reaching the end use in an unacceptable level of concentration;
5. a schedule of continual on-site testing to occur at the storage tank and the discharge fixture, identifying when the purification system may need maintenance and/or replacement.

Industrial reclaimed water shall not leave the site at which it is obtained except when approved as a producer or provider through appropriate State approval process.

1305.4.2 Allowable occupancies. Industrial reclaimed water systems are not permitted in Residential Occupancies. In mixed-use occupancies, industrial reclaimed water systems may only be used in those areas that are non-residential (commercial and/or common area) in nature, when such areas are clearly separate and distinct from residential uses.

Exception: When permitted by the Director of the Benbrook Water Authority, Residential Occupancies may use industrial reclaimed water for landscape irrigation.

1305.4.3 Connection to potable water systems. The industrial reclaimed water system shall have no connection to any potable water system, with or without mechanical backflow prevention devices. When the industrial reclaimed water system tank is supplemented with a potable water source, such connection shall be made with an air gap. Exposed piping shall be resistant to damage from UV rays and must have adequate freeze protection. Public water system customers that also have a reclaim water system must install a reduced pressure zone (RPZ) backflow preventer at the service meter.

1305.4.4 Industrial reclaimed water. On-site collection of water from the following sources shall be permitted as Industrial Reclaimed Water:

- i. Air conditioner condensate; compressor condensate; steam condensate; or condensate that forms externally on steam lines and is not process wastewater;
- ii. non-contact cooling water;
once through cooling water;
- iv. water treatment filter backwash;
- v. water from routine external washing of buildings, conducted without the use of detergents or other chemicals;
- vi. cooling tower blowdown with a total dissolved solids concentration less than two thousand (2,000) milligrams per liter.

Such water may have an end use which includes one or more of the following and is on-site:

1. landscape irrigation;
2. toilet or urinals.

For the purpose of this subsection, on-site shall mean "The use of industrial reclaimed water within the boundaries of the industrial facility or within the boundaries of property that is contiguous to the facility and owned or operated by the producer."

Informational: While irrigation systems are not covered by this division, the operator should be aware of the requirements under State Law. Some of the items listed in Texas Administrative Code (TAC), Title 30, Part 1, Chapter 210, Rule 210.24 and 210.56 are as follows:

General irrigation requirements.

- a. The irrigation application rates and application times shall be developed so as to minimize "wet grass" conditions in unrestricted landscaped areas during the periods the area could be in use.
- b. Irrigation systems shall be designed so that the irrigation spray does not reach any privately-owned premises outside the designated irrigation area or reach public drinking fountains.
- c. There shall be no application of effluent when the ground is water saturated or frozen.
- d. Distribution systems must be designed to prevent operation by unauthorized personnel.
- e. Irrigation operations shall be managed in a manner to minimize the inadvertent contact of reclaimed water with humans.
- f. Operations or tail water controls shall be provided to preclude discharge of reclaimed water from irrigation sites.
- g. When using industrial reclaimed water, the system shall be designed and managed to prevent contamination of groundwater or surface water and to prevent the occurrence of nuisance conditions. Tail water control facilities shall be provided, where necessary, to prevent the discharge of any industrial reclaimed water from irrigated lands into or adjacent to water in the state.
- h. No industrial reclaimed water may be land applied when the ground is frozen or saturated or during rainfall events.
- i. When applying industrial reclaimed water to land, a buffer area must be maintained around water wells to prevent the possibility of waste transport to groundwater via the well or well casing. Industrial reclaimed water shall not be applied within 250 feet (76200 mm) of a private water well (used for domestic or irrigation use) or 500 feet (152400 mm) of a public water supply well.

1305.4.5 Storage Tanks. Storage tanks, their foundation and their installation method must be capable of holding the imposed weight. Also, the water and its clarity may be affected by exposure to sunlight and the tank material, lining, or any paint that might be used. Tank water is subject to algae growth and mosquito breeding. Algae can affect the clarity and odor of the water. Mosquito breeding is a health hazard. Therefore, the following provisions are required.

- a. Storage tanks must be opaque, either upon purchase or painted later, to inhibit algae growth.
- b. Tanks must be covered and vents screened to discourage mosquito breeding.
- c. Tanks should be protected for direct sunlight if possible.
- d. Tanks are required to have an overflow design, and the overflow discharge shall be to an approved disposal method.
- e. Tanks should be placed on a stable, level pad.
- f. Underground tanks within 5 feet (1524 mm) of the foundation of a building or structure require an engineered design to insure the stability of that building or structure.
- g. If supplied with supplemental water from a potable water source, the connection must be made through an air gap and must be inspected as part of the permit for the extension of the potable water line.

1305.4.5.1 Tank size. When used to supply plumbing fixtures, the tank shall be a minimum of twice the volume of water required to meet the daily requirements of the fixtures supplied, but not less than 50 gallons (189 L).

Informational: When a plumbing fixture is operated, such as flushing a water closet, it is important to have the necessary quantity of water in the tank to meet the demand. Otherwise, the tank may empty faster than the supplemental line can refill.

1305.4.5.2 Makeup water. When industrial reclaimed water used to supply plumbing fixtures, potable water or approved well water from a dependable supply, shall be provided as a source of makeup water to the tank. Such connection to the tank shall be made with an air gap. Further, an adequate internal cross-connection control program is required to be demonstrated to the Benbrook Water Authority.

1305.4.5.3 Overflow. When the supply of industrial reclaimed water has the potential of exceeding the storage capacity in an uncontrolled delivery system, an approved alternate means of disposal shall be provided.

Informational: When the delivery system of a source of water, such as chilling towers or cooling evaporators, can provide more water than is used during periods of low demand, an approved means of disposal of the excess water must be designed in the system. An approved means of disposal may mean into the municipal wastewater system, if such disposal would have been allowed before the installation of a reclaimed water system.

1305.4.6 Holding Ponds. Using holding ponds as water storage must be in accordance with State Law and requires separate approval by the Building Official.

1305.4.7 Treatment. Filter systems installed after the pump may be necessary to remove sediment and disease-causing pathogens and to reduce the number and size of particles that are distributed in the system.

Recommended Practice:

Disinfecting industrial reclaimed water for indoor use is desirable to control microbial growth which could cause fouling and affect the operation of plumbing fixtures. A 5 micron filter may be sufficient. Disinfection can be accomplished by passing the water through ultraviolet light or by treating it with chlorine. If using non-potable water inside a building, e.g. toilets and urinals, filtering to remove small particles that might clog valves and equipment should be considered. If using industrial reclaimed water for irrigation, filtering to remove small particles that might clog valves and equipment should be considered. Treatment generally consists of filtration and disinfection processes in series before distribution. Treatment options include:

- a. Cartridge Filters and Ultraviolet (UV) Light. Two in-line sediment filters—the 5 micron fiber cartridge filter followed by the three-micron activated charcoal cartridge filter—followed by ultraviolet light.
- b. Ozone. Chemically, ozone is O₃: essentially a more reactive form of molecular oxygen made up of 3 atoms of oxygen. An ozone generator forces ozone into storage tanks through rings or a diffuser stone. Ozone is unstable and reacts quickly to revert to O₂ and dissipates through the atmosphere.
- c. Membrane filtration (reverse osmosis and nanofiltration). Membrane filtration, such as reverse osmosis and nanofiltration work by forcing water under high pressure through a semipermeable membrane to filter dissolved solids and salts.
- d. Chlorination. A chlorine pump injects chlorine in to the water as it enters the building. A practical chlorine contact time, which is critical to kill bacteria, is usually from 2 minutes to 5 minutes with a free chlorine residual of 2 parts per million (ppm).

1305.5 Special Design Criteria

1305.5.1 Material Identification. Industrial reclaimed water piping and fittings shall be as required in this code for potable water piping and fittings. All industrial reclaimed water pipe and fittings, hose bibs and faucets shall be purple in color as follows:

1. Piping and fittings shall be manufactured with purple color integral to the plastic, painted purple or wrapped with purple tape. Piping shall be marked on opposite sides to read

"CAUTION: RECLAIMED WATER, DO NOT DRINK" in intervals not to exceed 3 feet (914 mm), or may be continuously wrapped with purple-colored Mylar tape. The wrapping tape shall have a minimum nominal thickness of 0.0005 inch (0.127 mm) and a minimum width of 2 inches (50.80 mm). Tape shall be fabricated of poly (vinyl chloride) with synthetic rubber adhesive and a clear polypropylene protective coating or approved equal. The tape shall be purple (Pantone color #512) and shall be imprinted in nominal ½ inch (12.7 mm) high, black uppercase letters, with the words **"CAUTION: RECLAIMED WATER, DO NOT DRINK."** The lettering shall be imprinted in two parallel lines, such that after wrapping the pipe with a ½ width overlap, one full line of text shall be visible.

2. All hose bibs and faucets shall be painted purple or manufactured with an integrated purple color and designed to prevent connection to a standard water hose. Such design may include a different size outlet such that standard water hoses cannot be attached.
3. All valves except fixture supply control valves shall be painted purple or manufactured with an integrated purple color and be equipped with a locking feature.
4. All mechanical equipment which is appurtenant to the reclaimed water system shall be painted purple or manufactured with an integrated purple color to match the Mylar wrapping tape.
5. All purple paint shall be of an approved type designated for this type of use and installed in accordance with the manufacturer's installation instructions.

1305.5.2 Installation.

1. Hose bibs shall be located in locked, below grade vaults which shall be clearly labeled as being of non-potable quality. As an alternative to the use of locked, below grade vaults with standard hose bib services, hose bibs may be placed in a non-lockable service box which can only be operated by a special tool so long as the hose bib is clearly labeled as non-potable water, in accordance with subsection H505.3.
2. Industrial reclaimed water pipes shall not be run or laid in the same trench as potable water pipes. A 10 foot (3048 mm) horizontal separation shall be maintained between pressurized, buried industrial reclaimed and potable water piping. Buried potable water pipes crossing pressurized reclaimed water pipes shall be laid a minimum of 12 inches (304.80 mm) above the reclaimed water pipes.
3. Industrial reclaimed water pipes laid in the same trench or crossing building sewer or drainage piping shall be installed in compliance with Sections 603.2 of this code. Industrial reclaimed water pipes shall be protected similar to potable water pipes.

1305.5.3 Signs.

1. **Restroom entrance signs.** All installations using industrial reclaimed water for water closets and/or urinals shall be identified with signs. Each sign shall contain ½ 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) shall be visible to all users entering the restroom. The number and location of the signs shall be approved by the Authority Having Jurisdiction and shall contain the following text:

TO CONSERVE WATER, THIS BUILDING USES RECLAIMED WATER TO FLUSH TOILETS AND URINALS

2. **Equipment room signs.** Each equipment room containing industrial reclaimed water equipment shall have a sign posted with the following wording in 1 inch (25.40 mm) letters on a purple background:

**CAUTION
RECLAIMED 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 industrial reclaimed water equipment.

3. **Valve access door signs.** Each industrial reclaimed water valve within a wall shall have its access door into the wall equipped with a warning sign approximately 6 inches by 6 inches (152.40 mm x 152.40 mm) with wording in one-half ($\frac{1}{2}$) inch (12.7 mm) letters on a purple background. The size, shape, and format of the sign shall be substantially the same as that specified in subsection 2, above. The signs shall be attached inside the access door frame and shall hang in the center of the access door frame. This sign requirement shall be applicable to any and all access doors, hatches, etc., leading to industrial reclaimed water piping and appurtenances.
4. **Valve seals.** Each valve or appurtenance shall be sealed in a manner approved by the Authority Having Jurisdiction after the industrial reclaimed system has been approved and placed into operation. These seals shall either be a crimped lead wire seal or a plastic breakaway seal which, if broken after system approval, shall be deemed conclusive evidence that the industrial reclaimed water system has been accessed. The seals shall be purple with the words "**RECLAIMED WATER**" and shall be supplied by the industrial reclaimed water purveyor or by other arrangements acceptable to the Authority Having Jurisdiction.
5. **Storage areas and hose bibs.** Signs having a minimum size of 8 inches by 8 inches (203.20 mm x 203.20 mm), as shown in Figure 1, shall be posted at all storage areas and on all hose bibs reading, in both English and Spanish, "**RECLAIMED WATER, DO NOT DRINK**" or similar wording. The area shall be secured to prevent access by the public.

FIGURE 1: 30 TAC §210.25(b)(1)



**DO NOT DRINK THE WATER
NO TOMAR EL AGUA**

1305.6 Inspection and testing. Industrial reclaimed water piping shall be tested as outlined in this code for testing of potable water piping. Associated back-flow devices, as required by this code and the Water Department, shall be tested as required for potable water systems.

1305.7 Maintenance. The system must be maintained or appropriately abandoned in an approved manner as provided for in Section H508.

Informational: The system owner should take into consideration the maintenance required to keep the system functioning as designed. Any failure to maintain the system can lead to damage to the tank, pump, piping, irrigation and plumbing equipment. Such damage should be expected to generate associated costs of repair.

1305.8 Abandonment. When an industrial reclaimed water system is to be abandoned, all re-piping necessary to supply the irrigation and/or plumbing system with another water source will require applicable permits along with a set of plans to be approved by the Building Official.

END