

**STATE ENERGY CONSERVATION OFFICE
SUGGESTED WATER EFFICIENCY GUIDELINES
FOR BUILDINGS AND EQUIPMENT
AT TEXAS STATE FACILITIES**

The 77th Legislature directed the State Energy Conservation Office to develop a set of water efficiency standards for state agencies. This document represents SECO's response to that request.

We wish to thank the Texas Water Development Board and the City of Austin Water Conservation Office for their assistance in preparing these guidelines.

The following is a guideline that should be followed for new buildings and facilities and purchase of any new or used equipment by the State. These guidelines would also apply when purchasing new or used equipment to replace existing equipment, or for making major modifications to existing systems or equipment that equals more than half the original purchase price of the equipment. These should also be used as guides for upgrading existing equipment. A system approach should be used when examining water use in this sector. The goal shall be to balance water, wastewater, energy, and related costs to achieve the lowest lifecycle cost when purchasing new equipment or making modifications to existing equipment.

Irrigation Requirements

Automatic irrigation systems should comply with the following guidelines. These guidelines should be noted on a plan drawn by the agency, licensed irrigator or licensed landscape architect.

1. Adjustable flow controls valves on circuit remote control valves. Pressure regulation component(s) shall be required where static pressure exceeds manufacturer's recommended operating range (30-60 psi). This component(s) may be installed at the valve or at the head.
2. Valves and circuits shall be separated based on water use, (hydro-zoned) so that turf and shrub areas, sun and shade areas, as well as high and low runoff areas may be watered separately.
3. The minimum precipitation rate that can be applied by any zone of conventional irrigation should be in accordance with State regulations established by the Texas Natural Resource Conservation Commission. Sprinkler heads shall have matched precipitation rates within each control valve circuit.
4. Serviceable check valves shall be required where elevation differential may cause low head drainage adjacent to paving areas.
5. Sprinkler head spacing shall be designed for head-to-head coverage or heads shall be spaced as per manufacturer's recommendations and adjusted for prevailing winds. The system shall be designed for minimum run-off. There shall be no direct over spray onto impervious areas (i.e. paving and structures).
6. All automatic irrigation systems shall be equipped with a controller capable of dual or multiple programming. Controllers should have multiple cycle start capacity and flexible calendar program, including the capability of day of week or day interval watering. All automatic irrigation systems shall be equipped with a rain sensor shut-off device.
7. Irrigation construction plans shall include a water budget. A water budget should include:

- a) Estimated monthly water use (in gallons per application) and the area (in square feet) irrigated.
 - b) Precipitation rates for each valve circuit.
 - c) Monthly irrigation schedule for the plant establishment period (first three months) and recommended yearly watering schedule, including seasonal adjustments.
 - d) Location of emergency irrigation system shut-off valve.
8. All in-ground irrigation systems shall have backflow prevention device installed that meet local code.
 9. In addition to local requirements, all irrigation systems must comply with the Texas Natural Resource Conservation Commission rules and regulations.
 10. Where available, reclaimed water will be used for all purposes allowed by rules established by the Texas Natural Resource Conservation Commission, if the reclaimed water is less costly than potable water or other water currently being used by the purposes that reclaimed water can be used.
 11. Sources of water such as water from foundation and basement sump pump discharges, air conditioner condensate, captured stormwater or rainwater, and other sources should be explored and used as long as local plumbing codes are followed.

Landscape Design Standards (Based on the Landscaping Guidelines adopted by the General Services Commission pursuant to SB 814, 73rd Legislature)

1. Irrigated turf areas and planting beds should be limited to as small an area as possible.
2. Areas that are irrigated shall have at least six inches of a good quality soil in the areas to be watered.
3. Plants having similar water needs shall be grouped together and shall be selected based on use, soil and sun/shade conditions, adaptability to geographic and climatic conditions, and upon ability to survive, once established, on normal rainfall or minimal irrigation.
4. Irrigated turf shall be used sparingly and only in circumstances where other landscaping media will not satisfy the site's needs.
5. Turf and overhead sprinklers should not be placed along curbs and in parkways and planning islands less than 6 feet wide.
6. All new construction projects shall include specifications for soil analysis and amendments, such as compost, in type and quantity necessary to enhance plant growth and maximize water retention. All landscape planting selections must, be appropriate for the soil as analyzed and amended.
7. In planted areas, mulches of two inches or more shall cover most soil surfaces to minimize soil moisture evaporation.
8. Turf shall be limited to 90% of landscaped areas.
9. Turf grass selection shall be determined by facility need and geographic location. Use of different types of turf for distinctive purposes is encouraged. Turf types that can be maintained on natural rainfall is encouraged.

Plumbing Fixtures and Practices

1. All water closets shall comply with state plumbing standards as administered by the Texas Natural Resource Conservation Commission.
2. Faucet aerators in public lavatories and hand washing facilities shall have a flow rate of no more than 1.0 gallons per minute. All other faucet aerators shall comply with state plumbing standards as administered by the Texas Natural Resource Conservation Commission.
3. Faucets in high use restrooms shall be self-closing or shall be equipped with on-off sensors.
4. Showerheads for lockers, dorms, and other non-medical purposes shall use no more than 2.0 gallons per minute. All other showerheads shall comply with state plumbing standards as administered by the Texas Natural Resource Conservation Commission.
5. All water fountains shall be self-closing.
6. All hot water lines shall be insulated.
7. All water pipes subject to freezing shall be insulated.
8. Special plumbing fixtures other than the ones mentioned above should be chosen based on their water and energy efficiency and functionality.
9. All major new buildings, cooling towers, and irrigation systems shall be separately metered and records kept to determine use.
10. Signage requesting that leaks and other plumbing problems be promptly reported shall be placed in each restroom, shower facilities, kitchen, laundry, pool, and other high water use areas. The signage shall also have the phone number where to report such problems.

Heating, Ventilation, & Air Conditioning Equipment

1. Cooling towers and boiler chemical contracts shall specify the cycles of concentration to be achieved. The cycles of concentration should be set to match local water chemistry but shall exceed at least four cycles unless the blowdown from the tower is being beneficially reused for landscape irrigation or other uses.
2. Steam condensate shall be returned to the boiler unless volumes are too low to justify condensate return loops. In the latter case, the condensate shall be reused beneficially wherever possible.
3. Condensate from the air conditioner cooling coils should be captured and used for cooling tower makeup or other purposes where feasible. Building design should be considered that would help facilitate the easy capture of condensate by convenient location of air handling units.
4. Cooling tower side stream filtration shall be investigated when new systems are purchased.

Water Treatment Equipment

1. If water softening is used, regeneration shall be controlled by actual hardness or by a flow volume control that is based on the hardness of the water to be softened. Softeners that use timers for recharging are prohibited.

2. If reverse osmosis or nano-filtration is used, reject waste volumes shall be reused for landscape irrigation or other beneficial purposes.

Refrigeration Equipment

1. Once through cooling of any refrigeration equipment is prohibited. Refrigeration equipment (i.e. refrigerators, walking coolers, ice cream and yogurt machines, and similar equipment) of 10 tons per hour or less shall be air-cooled or be fed with water from a closed cooling water loop.
2. Ice flake machines should be used instead of ice cubes makers whenever possible. Ice flakes require less water to produce. If ice cube makers are used, they shall be air-cooled and use no more than 20 gallons per 100 pounds of ice produced based on the Air-conditioning & Refrigeration Institute's annual Directory of Certified Automatic Commercial Ice-Cube Machines and Ice Storage Bins.

Warewashing

1. New warewashing equipment shall use less than 1.2 gallons of fresh water per rack based on National Sanitation Foundation information.
2. Conveyor-type dishwashers shall have electronic eye sensor system so that the machine only operates when there are dishes present on the conveyor belt, not continuously. If the conveyor is continuously running, expecting another load of dishes, water and chemicals are also spraying, to clean the ware that is not even there. This is a waste of energy, water, and chemicals.

Garbage Disposals

1. Manually scrap dishes into a garbage can or scrap basket to reduce the need for pre-rinse and/or pre-rinse time.
2. Manual pre-wash units shall have shut-off's that turn the water off when the operator lets go of the nozzle.
3. Garbage grinders and disposals should not be use where manually scrapping and the use of a scrapping basket with the pre-wash spray can be efficiently done.
4. All garbage disposals shall be equipped with solenoids that shut water flow to the disposal off when not in use.
5. All garbage disposals shall be air-cooled.
6. A scrapping system, a complete pre-rinsing and disposing system, that can increase efficiency in some kitchens. A recirculated water plume in the salvage basin allows the ware to be simultaneously soaked and rinsed, increasing scrapping efficiency and because the water is recirculated, new water does not need to be added. Waste falls from the salvage basin into a collection basket.
7. Where volume of use makes it feasible, install a recirculating "pot scrubbing" or Jacuzzi-style sink to loosen up foodstuff rather than under a stream of running water.
8. A fresh-water trough system, used for scrapping and pre-rinse, can use up to 14 gallons a minute and is not recommended. The amount of pressure and water needed to keep the waste

moving down the trough to the disposal or scrap basket is not efficient. A recirculating trough system, with water flow controls can cut water use in half. However, recirculating pre-rinse and scrapping basins are more water efficient than trough systems in general. If possible do not even use a trough.

Steamers

1. Steamers shall be of the self-contained, boilerless type that does not have a direct connection to a water supply.
2. Steamers that are connected directly to a water line, at the best, have a continuous blowdown of a quarter of a gallon per minute, but most continuously dump much more. They are significantly less energy efficient and require soft water with no more that 60 parts per million of total dissolved solids or require that very large volumes of water be continuously passed through to the sewer for water quality control.

Clothes Washing Equipment

1. Commercial clothes washing equipment such as those found in central laundry facilities shall use no more that 1.6 gallons per pound washed.
2. Clothes washers shall have double dump valves and equipment of 150 pounds capacity or greater shall be equipped so that the final rinse water can be returned for use in the first flush wash.
3. Smaller residential type clothes washers intended for personal use by clients or inmates shall have a water use factor of 9.5 gallons per cubic foot of washer volume or less. This is a different standard from the one cited for commercial laundries above. Information for this can be obtained Oregon Residential Tax Rebate Program at the following web site <http://www.energy.state.or.us>.

Pumps

Water pumps shall have mechanical seals unless prohibited by code.

Metering

1. All buildings intended for daily occupation or for water using equipment operation shall be metered separately and records of its water use maintained by that agency.
2. If any one, single activity or piece of equipment at a facility accounts for more that 20% of the total water use at that facility, it shall be metered separately and records of its water use maintained by that agency.
3. Any water use that does not create waste water should be metered separately to better align waste water costs with actual usage.

Vehicle Washing

1. New softeners installed at carwash facilities shall not use timers to determine when to recharge. Recharge cycles shall be controlled by instruments that measure volume of water treated or the actual quality of the water being softened

2. Reverse osmosis or nano-filtration reject water shall be reused beneficially for vehicle washing.
3. Chamois wringer shall have self-closing valves on their faucets

In-bay: Hand held spray wash equipment including spray wands and foaming brushes shall use no more than 3.0 gallons of water per minute and shall be equipped with trigger shutoffs. The shutoffs shall have weep holes or other devices to allow for drainage and pressure surges. All pressure wash equipment shall be equipped with unloader valves.

Conveyor, drive-through, and rollover type car washes: Equipment for automobiles and small truck and vans shall use no more than 15 gallons per vehicle. Washes designed specifically for buses and tractor-trailer rigs shall use no more than 40 gallons per vehicle washed. All such equipment shall be equipped with re-circulation or reuse equipment.

Bench Mark Indices¹

For Texas, the amount of outdoor water will vary with location ranging from 20 inches per year in Far East Texas to 48 inches a year in Far West Texas. For the San Antonio to Dallas line, the demand is about 36 inches per year or about 22 gallons per square foot of use. Many state facilities do not water the whole campus and when they do, they use under that amount. Most schools do not irrigate in Texas. For your use, the conversion from inches to gallons per square foot is 0.623 gallons of water per inch per square foot. In other words, if a campus irrigates 10,000 square feet at a rate of 40 inches a year, they will use { 10,000 X 40 X 0.623 = } 249,200 gallons a year.

As for the numbers above, they represent the low end from an American Water Works Association study completed in 2000. The range of use we see in public facilities can be significantly higher. For example, in a study of over 300 schools in Texas, the water use ranged from two gallons per student per day to over 130 gallons per student per day. The high number was from a school that has now made **MAJOR** repairs to a basket case of a plumbing system. High schools should be at the high end of the table above, while most elementary schools can use under 10 gallons per student per day.

Office Buildings

End Use/Benchmark Measure	N***	Efficiency Benchmark Range*
INDOOR USE		
Gal./sf/year	62	9 - 15
Gal./employee/day	72	9 - 16
COOLING USE**		
Gal./sf/year	49	8.5 - 22
IRRIGATION USE**		
Inches per year	47	26 - 50
TOTAL WATER USE**		
Gal./sf/year	62	26 - 35

* Developed from combined methods (field studies, audit data, and modeling results).

** Appropriate benchmarks will depend upon local climate.

***Sample size.

¹ Information provided by Bill Hoffman, City of Austin, Water Conservation Department (2001).
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Schools

End Use/Benchmark Measure	N***	Efficiency Benchmark Range*
INDOOR USE		
Gal./ sf /year	142	8 - 16
Gal./school day/student	141	3 - 15
COOLING USE**		
Gal./ sf /year	35	8 - 20
IRRIGATION USE**		
Inches per year	132	22 - 50
TOTAL WATER USE**		
Gal./ sf /year	142	40 - 93

* Developed from combined methods (field studies, audit data, and modeling results).

** Appropriate benchmarks will depend upon local climate.

*** Sample size.

Bench mark indices continued

Food Service

End Use/Benchmark Measure	N***	Efficiency Benchmark Range*
INDOOR USE		
Gal./sf/year	142	8 - 16
Gal./school day/student	141	3 - 15
COOLING USE**		
Gal./sf/year	35	8 - 20
IRRIGATION USE**		
Inches per year	132	22 - 50
TOTAL WATER USE**		
Gal./sf/year	142	40 - 93

* Developed from combined methods (field studies, audit data, and modeling results).

** Appropriate benchmarks will depend upon local climate.

***Sample size.