Building Reduced ***Water and Wastewater*** Costs into the Design

A guide developed by

Austin Water Utility
Water Conservation Program
Austin, Texas

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Building Reduced
Water and Wastewater
Costs into the Design

The life cycle cost for water and wastewater services can be significant. Building these savings into the design of the project can be a definite selling point for the property in the future as well as providing reduced operational costs from the start.

The Water Conservation staff of Austin Water Utility is available to provide input on how to achieve cost efficient design and equipment selection that will also help reduce water and wastewater costs.

Services available include:

- ❑ Information on sales and property tax exemptions for water conservation
- ❑ Information of possible rebates and financial incentives
- ❑ Technical information and input on an individual project basis by a licensed engineer and landscape irrigator

If any of these services are of interest, please ask for us at the one-stop-shop or call Bill Hoffman at 512-974-2893 or Dan Strub at 512-974-2559 or e-mail bill.hoffman@ci.austin.tx.us or dan.strub@ci.austin.tx.us .

Also, please look at the attached document entitled "Water Efficient Equipment and Design Guide for Non-residential Construction and Development." We look forward to working with you in helping design a project that will be able to take advantage of reduced water and wastewater costs.

Water Efficient Equipment and Design Guide for Non-residential Construction and Development

Austin Water Utility
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The following guide is intended as a source of information on equipment and design practices that can help achieve additional water savings above code requirements. This guide is targeted at new commercial and institutional construction projects, including major renovations of existing facilities. Where information is available, the estimated percent reduction in water use will be shown in brackets after the measure {##%}.

If you have questions, would like assistance with water conservation, or have suggestions for additional water saving equipment and design features that are not listed in this guide please call 512-974-2893 or e-mail your suggestion, questions, or information to bill.hoffman@ci.austin.tx.us.

Irrigation Equipment and Landscape Design

Because of the unique nature of each landscape, it is hard to determine the percent of water use reduction that will be achieved by each measure. In fact, even if every suggested design method and equipment selection in this list were followed, much of the potential savings could be lost if the system is not operated properly. With proper operation, however, water savings of 25% to 75% over conventional landscapes have been documented.

1. Selection of irrigation controllers
   - Select a weather based controller.
   - Pressure regulators should be installed when design pressure exceeds manufacturer's recommendations.
   - Freeze and wind shutoffs should be considered. Freeze sensors are required when watering the parkway strips.

2. Irrigation equipment and design
   - Drip irrigation should be used for shrub beds.
   - Matched precipitation spray and rotor heads should be used.
   - Areas should be hydrozoned, with beds and turf watered separately.
   - Systems should maintain manufacturer-recommended pressure to prevent misting and unnecessary pipe wear (excessive velocity).

3. Soil
    - Soil depth should be no less than 6”.
    - Soil should consist of between 25% and 35% compost.
    - Slope that exceeds 3:1 needs to be terraced.
    - Soil should not be added on top of tree roots.

4. Mulch
    - Mulch should be organic, preferably locally derived.
    - Rock mulch should be limited due to increased heat and reflection.

5. Watershed
    - Berms, swales and other landscape features are recommended to capture and direct water to planting areas.
    - Where possible, rainwater should be captured for use on site.

6. Plant selection
    - Plants should be selected from the Water Conservation Xeriscape Plant list.

7. Plant installation
    - Mature size should be considered during installation and/or design.

Plumbing Fixtures and Practices

1. All water closets are required to use no more than 1.6 gallons per flush. For tank-type toilets, greater efficiency can be achieved by installing:
    - Dual-flush toilets that use 1.6 gallons per flush for solid waste removal and 0.8 to 1.2 gallons for liquid waste; and
    - Pressure-assisted toilets that use less than 1.6 gallons per flush. {20%-25%}

2. For flush valve toilets, consider new dual-flush valves (e.g., Sloan) that reduce the liquid waste flush to about 1.1 gallons per flush. {20%-25%}

3. Urinals are required to use no more than 1.0 gallons per flush, but models using half a gallon per flush are available. Current City of Austin plumbing code does not authorize the use of waterless urinals. {50%}

4. Hand washing faucets should use no more than 1.0 gallons per minute. {30%-50%}

5. Showerheads should use no more than 2.0 gallons per minute. {15%-20%}

6. All decorative water fountains should be recirculating. {up to 99% over fill-and-drain}

7. Large ornamental fountains with over 250 gallons of storage should have meters on the makeup lines to help identify leaks and other operational problems.

8. All cold water pipes that may be exposed to freezing should be insulated.

9. Signs should be prominently posted in all restrooms, shower facilities, laundries, kitchens, and other water using areas providing telephone numbers or contact persons to promptly report leaks.

10. Use non-potable sources of water for toilet and urinal flushing.

Metering and Sub-metering

Metering and sub-metering alone does not reduce water use, but it is a key to identifying water use by type of activity and more importantly, identifying leaks and other operational problems.

1. Each new commercial site or campus must have separate master and irrigation meters in accordance with City Code. Campuses with multiple buildings or tenants should install separate building or tenant sub-meters to aid in the detection and location of leaks or abnormal water use by each building or tenant.

2. A meter should be installed and regular monthly records kept for all major water-using functions such as ornamental outdoor fountains over 250 gallons, pools and spas, cooling towers, major process equipment, and individual buildings. This is a key safeguard to determine equipment malfunction or leaks.

3. All sub-meters should be tested yearly to ensure that they are still operating properly. For smaller meters, the bucket and stopwatch method at both a high and low flow rate is adequate. For other test methods, refer to the manufacturer or call Austin Water Utility – Water Conservation at 974-2893 for suggestions. Austin Water Utility guidelines must be followed on meters used for billing or for the evaporation credit program.

4. If pressure is too high, install pressure regulators that keep pressure to all fixtures below 65 pounds per square inch.

5. Where applicable, use wastewater meters. Austin Water Utility has both an evaporation credit program for cooling towers and a wastewater metering program. The important factor here is that if either of these programs is officially entered in to, the facility does not have to pay for wastewater for that portion that is evaporated or consumed.

6. Place the wastewater cleanouts in a convenient location so that wastewater flows can be observed to detect leaks of flows of unknown origin that need to be investigated.

Heat, Ventilation, and Air Conditioning Equipment

For cooling towers and boilers to operate efficiently, they must first have conductivity (TDS) controls and meters on them that allow the operator to monitor their function.

1. Eliminate all once-through cooling, replacing with an air-cooled system or a cooling tower. {95% to 100%}

2. Cooling towers should have both makeup and blowdown meters that comply with the City of Austin's Evaporation Credit Program, and have conductivity controllers for dissolved solids control.

3. Cooling towers should be equipped with overflow sensors on the overflow pipes to alert the operator to problems that can waste thousands of gallons of water a day.

4. Cooling towers should achieve at least five cycles of concentration. {15-35%}

5. Boilers should be equipped with makeup meters and conductivity controllers for blowdown control.

6. Steam condensate should be returned to the boiler or reused wherever possible.

7. Makeup meters should be installed on all recirculating closed water loops used for heating and cooling systems.

8. Install overflow alarms to alert the operator to overflow conditions.

9. Install side-stream softening and filtration equipment to help increase the cycles of concentration in cooling towers.

10. Remember that design that reduces heat load also reduces cooling tower water use.

Water Treatment Equipment

1. The City of Austin water is softened to approximately 95 milligrams per liter of hardness as $CaCO_3$. Therefore, additional softening should not be necessary for most operations.

2. If softeners are used, they should be recharged based on volume of use or by a hardness controller. Softeners with timers should be prohibited.

3. Reverse osmosis (RO) and nanofiltration equipment should be used only where absolutely necessary. Where used, the water reject rate should be less than the volume of filtered water produced. The reject water should be reused beneficially wherever possible.

4. Where pumps are used, they should have mechanical seals instead of packing glands wherever allowed by code. Packing glands should have some weepage, but limited to ¼ to ½ gallon per minute for most building pumps, higher for larger industrial pumps. As the packing ages, it leaks at a faster rate and thus wastes water.

Pools and Spas

1. Recover filter backwash water for reuse on landscaping or other beneficial uses. It is illegal in the City of Austin to discharge filter backwash water into either the sanitary sewer or the storm sewer.

2. Use water-saving equipment such as filters with cartridges where feasible.

3. Meter makeup water and track use to determine if leaks are occurring.

4. Minimize the use of fountains and waterfalls; aeration loses a significant amount of water to evaporation.

5. Pool filter equipment should be equipped with a pressure drop gauge to determine when the pool needs to be backwashed. The filter should also have a sight glass so the operator can determine when to stop the backwash cycle. Backwashing uses hundreds to over a thousand gallons of water depending on the pool size, filter type and its operation.

6. If the pool or spa is equipped with an overflow line, ensure that the line can be easily plugged in when large groups swim in the pool to prevent water loss through the line due to sloshing water.

7. If the pool has splash troughs, make sure that they drain back into the pool system.

8. Pool filling should be monitored to prevent overflow.

9. Use shrubs and fences to reduce water losses due to wind evaporation.

10. Install pool covers to reduce evaporation and keep water cleaner so that the number of backwashes and shock treatments are reduced.

Laundry Operations

1. Large commercial operations should consider water recycling or ozone systems to minimize use. {20%-35%}

2. Large commercial equipment should be set to use no more than 2.5 gallons per pound of laundry. {20%-40%}

3. Smaller clothes washers under 4.0 cubic feet should have a water factor of less than 6.5 gallons of water use per cubic foot. {30%-50%}

4. Residential equipment should be equal to or better than the 2007 standard set by the National Energy Policy Act. {30%-50%}

5. Dryer equipment should have dry lint collection systems.

Vehicle Washing

1. Vehicle washing equipment should have water reuse equipment where feasible. {50%-80%}

2. New rollover and conveyor equipment should use less than 35 gallons per vehicle for automobiles and light trucks and less than 75 gallons per vehicle for bus and large truck washes. {50%-80%}

3. Handheld spray wand equipment should use no more than 3.0 gallons per minute for automobile washing and no more than 3.5 gallons per minute for buses and large trucks.

4. Handheld spray wand, foamy brush and similar systems should have positive shutoff valves so water will not run when the equipment is not in use.

5. Other water using equipment at vehicle washing facilities:

    - New softeners installed at carwash facilities shall be controlled by instruments that measure volume of water treated or the actual quality of the water being softened.

    - Reverse osmosis or nanofiltration reject water shall be reused beneficially for vehicle washing in all rollover and conveyor type systems.

    - Chamois wringers shall have self-closing valves.

Food Service

All water-cooled equipment should be eliminated unless it uses a closed loop and a cooling tower. This includes refrigeration equipment, ice makers, ice cream machines, confectionary faucets, steam tables and steamers, steam kettles, garbage disposals/grinders, washing equipment, pot soakers, pulpers and sluice troughs, pre-rinse spray valves, faucets, and water-cooled woks.

1. Eliminate garbage disposals and sluice trough systems in favor of garbage cans and strainer baskets. {50%-100%}

2. Use boilerless (connectionless) steamers. They do not need either a water supply or a wastewater drain. {80%-95%}

3. Ware (dish, sheet pan, etc.) washers should use under 1.0 gallons per rack and have operational solenoid shutoffs where applicable, especially in conveyor-type washers. {15%-50%}

4. A new state law requires that pre-rinse spray valves use 1.6 gallons per minute or less. {25%-60%}

5. Ice cream scoop faucets should use no more than 0.5 gallons per minute.

6. Ice machines should use no more than 20.0 gallons per hundred pounds of ice made. Flake ice machines are more water-efficient (12 gal/100 lbs) and should be used where possible. {15%-50% if replacing an air-cooled unit and 75%-95% if water-cooled}

7. Hand-washing faucets should use no more than 1.0 gallon per minute. {25%-50%}

8. All other equipment should be operated in the most efficient way possible and ENERGY STAR rated where possible.

9. Sufficient refrigerator capacity should be available to minimize thawing of food under running water.

10. Floor Washing
    - Good– Use hoses with self-closing nozzles.
    - Better – Use pressure washing equipment.
    - Best- Use self contained spray and vacuum systems similar to carpet cleaners but designed for food service use.

    In all of the above cases, the kitchen should be designed for easy cleaning and the easy use of squeegees and mops.

Special Considerations for Other Types of Facilities

1. Film processing (X-ray or photographic) should minimize water use by adjusting equipment and choosing equipment that is water- and energy-efficient. For large frame X-ray equipment, install water misers on the cooling water loops of the film developers. {10%-30%}

2. For all film applications, strongly encourage digital technologies that eliminate water use. {100%}

3. For medical and dental vacuum pump systems, choose dry vacuum systems to eliminate water use and save energy. {100%}

Alternate On-Site Sources of Water

Alternate on-site sources of water are most economic to capture if included in the original design. Common uses for these sources include landscape irrigation, ornamental pond filling, cooling tower makeup, and toilet and urinal flushing.

Sources that have been successfully employed include:

- Air conditioner condensate;
- French drain system water;
- Harvested rain and stormwater;
- Gray water (water from showers, baths, laundry, and hand washing sinks);
- Water from on-site wastewater treatment systems;
- Swimming pool backwash water: and
- Reclaimed water from a municipal system.