

# Schools

*Schools, colleges, and vocational institutions use water in many ways, including some similar to those of the following industries and processes: hospitality, food service, industrial laundry, image processing, water purification, vacuum systems, cooling towers and boilers, and cleaning, as well as industrial processes in vocational classes.*

## Plumbing

Appropriate water-saving technologies include high-efficiency toilets requiring not more than 1.3 gallons per flush and urinals that use 1 gallon or less per flush, with no automatically timed flushing systems. Choose self-closing faucets with flows of 0.5 gpm for hand washing. If available, and where codes and health departments permit, non-potable water may be used for flushing.

Other recommendations include:

- ◆ installing automatic-shutoff and solenoid valves on all hoses and water-using equipment.
- ◆ installing faucets on set tubs and janitorial sinks, with flows not to exceed 2.2 gpm.

## Cooling Systems

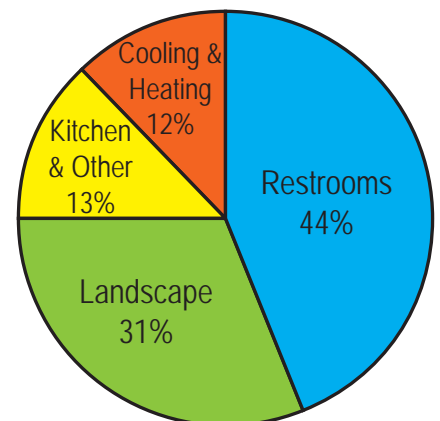
Generally, choose energy-efficient equipment to reduce waste heat, which could otherwise require larger water technologies such as cooling towers. Other water-efficiency practices include the following:

- ◆ prefer air cooling over recirculating cooling-water systems.
- ◆ use water treatment only when necessary.
- ◆ avoid once-through cooling with potable water.

Cooling towers may be required for some facilities. If such need is determined, there are numerous operational efficiency measures:

- ◆ conduct a life-cycle analysis, including all operating, capital, and personnel costs, to determine whether the use of a cooling tower is more cost-effective than air cooling.
- ◆ equip all cooling towers with conductivity controllers, make-up and blowdown meters, and overflow alarms.
- ◆ operate towers at a minimum of five cycles of concentration in regions with high water quality (low TDS) for towers using potable water, depending upon the chemistry of the make-up water, including considerations for reclaimed water or on-site sources.

**Schools use water in ways similar to many other operations, such as laboratories, office buildings, hotels, food service, and industrial processes.**



Typical water use in schools



- ◆ install high-efficiency drift eliminators that reduce drift loss to less than 0.002 percent of circulating water volume for cross-flow towers and 0.001 percent for counter-flow towers.
- ◆ avoid using cooling towers of less than 100 tons for air-conditioning systems.
- ◆ evaluate entire buildings or processes for maximum energy efficiency, since more efficient buildings will reject less heat to cooling towers.

- ◆ evaluate waste-heat recovery for beneficial uses rather than rejecting it to the tower.

**Highly efficient toilet and lavatory equipment is critical, since restrooms are the major water consumers in schools.**

### **Heating Systems**

Steam boilers and hot-water boilers provide heat and hot water in some buildings. Closed-loop systems return water and steam condensate to the boiler for reuse, saving energy and water. Open-loop systems expend the water or steam without return to the boiler.

Several water-efficiency measures are available:

- ◆ equip steam boilers of 200 boiler-horsepower (hp) or greater with conductivity controllers to regulate top blowdown.
- ◆ install condensate-return meters on closed-loop-system steam boilers of 200 boiler hp or greater.
- ◆ design closed-loop steam systems to operate at twenty cycles of concentration or greater (5 percent or less of make-up water).
- ◆ equip steam-distribution lines and equipment with steam traps meeting all codes.
- ◆ install make-up meters on feed-water lines to:
  - » steam boilers and water boilers of more than 100,000 Btus per hour.
  - » closed-loop hot-water systems for heating.
  - » make sure boiler-temperature and make-up meters are clearly visible to operators.
  - » make discharge pipes easy to inspect for flow, and incorporate visible indicators that will reveal whether the valve has been activated.

### **Special Purposes**

For laboratories, choose dry-vacuum systems rather than liquid-ring pumps. For vacuum and compressor systems, use air-cooled, radiator-cooled, or chilled-loop or cooling-tower systems.

For photography and medical and other imaging, employ digital technologies that allow images to be displayed on electronic video screens and stored in computer files. Where film imaging is required, use self-contained “mini-lab” developing units that require no plumbing or washing to develop the film. For paper or film image copies use laser or ink-jet printing.

### *Floor Cleaning*

Wet methods may be used for floor cleaning, but open hoses are discouraged as being wasteful. To increase water-use efficiency:

- ◆ install drains close to areas where liquid discharges are expected.
- ◆ arrange equipment for easy use of mop and squeegee systems or floor-cleaning machines.
- ◆ install self-closing nozzles, limiting flow of washdown hoses to 5 gpm.

### *Submetering*

Separate metering of individual water-using systems or building areas is recommended where possible in order to ensure that the costs of water use and, where feasible, wastewater disposal are equitably dispersed and accounted for accurately. Reflecting actual use and costs often offers a reliable incentive for water-use efficiency.

### *Other*

In addition to the water-efficiency measures identified here, refer to the following summaries for other efficiency practices:

- ◆ for water features, therapeutic pools, swimming pools, and landscapes, refer to the summary “**Water Features, Pools, and Landscapes.**”
- ◆ for kitchens and food service areas, refer to “**Restaurants and Fast-Food Outlets.**”
- ◆ for dormitories refer to “**Hotels and Motels.**”



***Mark fire-protection plumbing conspicuously to ensure no connections are made other than those for fire protection.***

*Wise practices to reduce waste heat can avoid the need for larger water technologies, such as cooling towers.*

- ◆ for laboratories refer to **“Laboratories.”**
- ◆ for vocational campuses, refer to **“Auto Service and Repair Shops,” “Metal Finishers,” “Hospitals,” “Hotels and Motels,”** and **“Industrial Bakeries.”**

TIP: Conspicuously mark fire-protection plumbing so no connections will be made other than those for fire protection, and install flow-detection meters on fire services to reveal unauthorized water flows.