

# Laboratories

*The term “laboratory” refers to a broad range of facilities, including those for medical research and analysis, research and analytical testing, industrial and commercial activities, and imaging. New technology has benefited all these facilities and considerably reduced water consumption.*

## **Standards and Practices**

Cleaning and sterilizing instruments — Equip all stand-alone steam sterilizers with condensate-tempering systems. Promote the use of condensate-return systems for sterilizers.

Equip all vacuum sterilizers with mechanical vacuum systems. Install dry-vacuum systems that do not use water for the pump seal.

Fume hoods should employ dry hood-exhaust systems wherever possible. Use recirculating systems in hood scrubbers. Perchlorate hoods should employ self-closing valves on fume-hood washdown systems.

For X-rays, MRIs, CT scans, and other imaging, employ digital technologies that allow images to be displayed on electronic video screens and stored on computer files. Where film imaging is required, use self-contained “mini-lab” image-developing units that require no plumbing or washing to develop the film. Produce paper or film copies of images using laser or ink-jet printing technology. Where large x-ray film technologies are retained, employ Water Saver/Plus™ recycling technology to vastly reduce water waste.

## **Cooling Systems**

Have adequate refrigerator space for thawing frozen materials. Avoid thawing under running water.

All vacuum and compressor systems should be air-cooled or use a radiator cooler or a chilled-loop or cooling-tower system.

**There are many types of laboratories with varied purposes and many types of water use. Water quality is often of significant importance for laboratory operations, regardless of the type or function.**





**Modern medical imaging systems employ digital technologies that allow images to be displayed on video screens and stored in computer files, minimizing consumption of a variety of resources.**

Dry (air) cooling is more water efficient rather than recirculating cooling-water systems and should be used wherever possible.

Install a closed-loop system, such as a chilled-water or cooling-tower system, or install a recirculating chiller unit.

Absolutely avoid once-through cooling with potable water.

### **Heating Systems**

**Boiler-water efficiency** — Closed-loop systems return water and steam condensate to a boiler for reuse, saving energy and water. Open-loop systems expend the water or steam without return to the boiler. Install make-up meters on feed-water lines to steam boilers and water boilers of more than 100,000 Btus per hour and closed-loop hot-water systems for heating. Situate boiler-temperature and make-up meters to be clearly visible to operators. Equip steam boilers of 200 boiler hp or greater with conductivity controllers to regulate top blowdown.

For closed-loop steam systems, install condensate-return meters and operate at twenty cycles of concentration or greater (5 percent or less of make-up water). Reduce plumbing leaks due to repeated openings of water-temperature and pressure-relief valves (TPRVs). Make discharge pipes easy to inspect for flow and ensure that valve activations are visibly indicated.

### **Water Reuse and Recirculation**

Recover and reuse sources such as reverse-osmosis reject water, air-conditioner condensate, rainwater, foundation drain water, and any other applicable source for use as irrigation water, scrubber-water make-up, and cooling-tower make-up. Water used for heat-transfer usually remains relatively clean and is an excellent source of water for reuse.

### **Water Treatment**

Measures to improve efficiency in water treatment include:

- ◆ using water treatment only when necessary.
- ◆ for all filtration processes, install pressure gauges, then back-wash or change cartridges based upon pressure differential. Avoid use of timers for softener recharge systems.

- ◆ for all ion-exchange and softening processes, set recharge cycles by volume of water treated or based upon conductivity controllers.
- ◆ use reverse-osmosis and nanofiltration systems with the lowest reject rate for size.
- ◆ if distillation equipment is required, choose equipment that uses air-cooled coils. If water-cooled, the still should recover at least 85 percent of the feed water.

### *Ice Machines*

Select:

- ◆ ice-making machines that are air-cooled, using remote heads to expel warm air outside the work space and customer areas. Air-cooled machines are preferred over cooling-tower loops.
- ◆ energy-efficient flake or nugget machines rather than cube-ice machines. If cube-ice machines are used, those that meet CEE Tier 2 efficiency standards are preferred. Tier 3 machines are even more efficient (CEE Commercial Kitchens).

### *Plumbing*

In restrooms use high-efficiency toilets using 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 hand washing faucets with flows of 0.5 gpm. If available, and where codes and health departments permit, use non-potable water for flushing.

### *Floor Cleaning*

Recommendations for floor cleaning include:

- ◆ floor cleaning may use wet methods, but wasteful open hoses are discouraged.
- ◆ install drains close to areas where liquid discharges are expected.
- ◆ arrange equipment for easy use of a mop and squeegee system or floor-cleaning machine.
- ◆ install self-closing nozzles, limiting flow to 5 gpm on wash-down hoses.

### *Submetering*

Major water-using systems and building areas should be separately metered. Submetering helps ensure that the costs of water

***All stand-alone steam sterilizers should be equipped with condensate-tempering systems and should provide for condensate return.***

***Technologies are available to treat and reuse many water resources, such as reverse osmosis, collection of air conditioner condensate, rain, foundation drain water, and scrubber-water make-up.***

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***

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.

Many energy- and water-efficiency practices for laboratories are common to those described in the summaries for “**Office Buildings**” and “**Schools**.” Where irrigated landscaping is present, refer to “**Water Features, Pools, and Landscapes**.”

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