Sustainable Design at EPA's Kansas City Science and Technology Center

EPA Science Forum 2004
Healthy Communities and Ecosystems

Overview

A typical laboratory uses 5 to 10 times more energy and far more water per square foot than a typical office building because of intensive ventilation requirements and other health and safety concerns. When EPA decided to design and construct a new building to serve as its Region 7 laboratory in Kansas City, Kansas, it also decided to employ as many energy, resource, and water-efficient characteristics as possible in its design and construction to preserve natural resources, ensure occupancy health, and serve as a model for future laboratory design. EPA incorporated many green features and strategies into the construction and operation of the laboratory, including:

In its first nine months of operation, the laboratory was consuming energy at a rate of approximately 275,000 Btus per gross square foot per year, or 24 percent less energy than the average of what is used by EPA's other new variable air volume laboratories (365,000 Btus per GSF per year).

A plate and frame heat exchanger system was added to the initial design after energy modeling revealed additional energy efficiency opportunities.

Laboratory corridors have abundant natural daylighting.

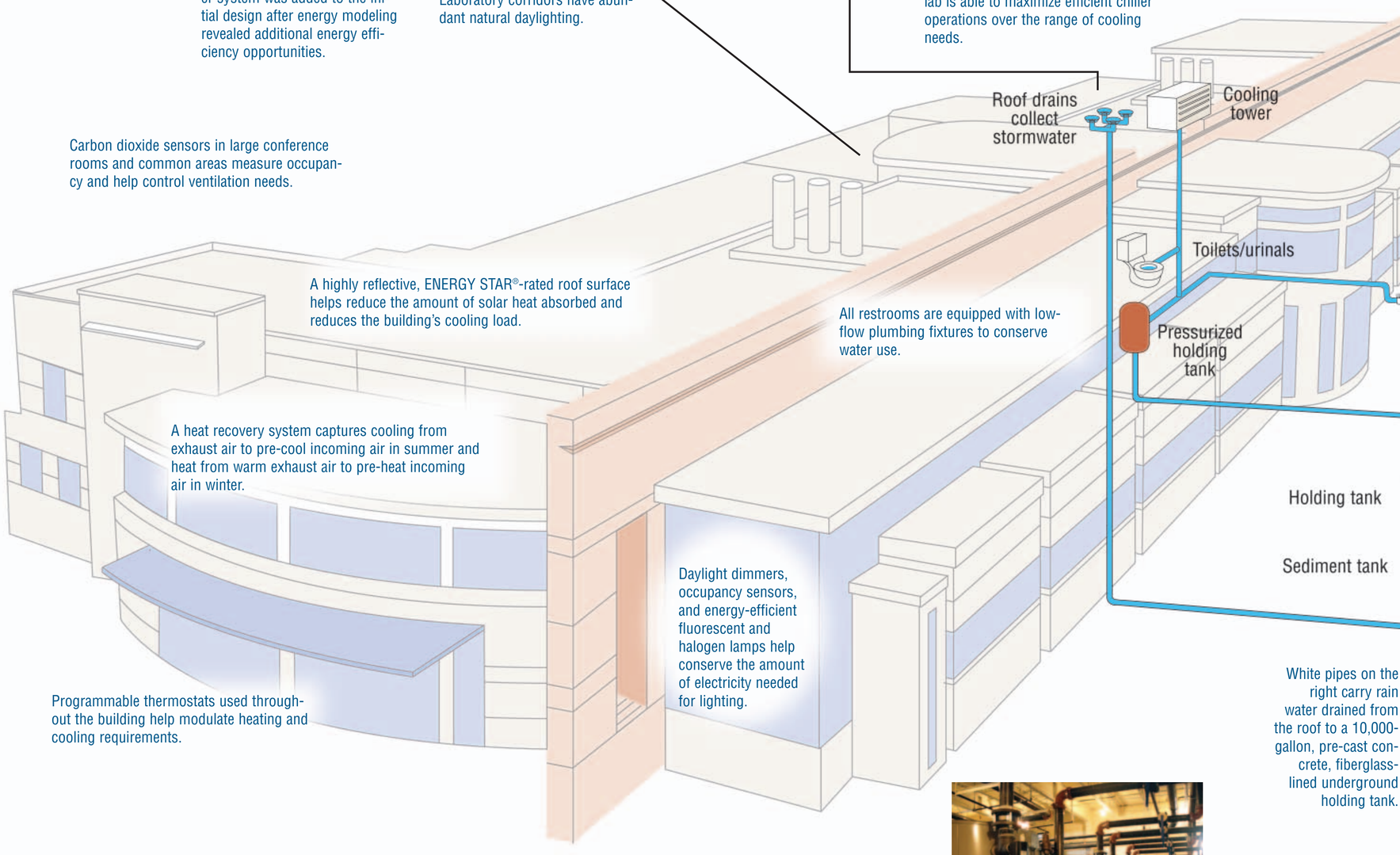
By coupling a variable frequency drive chiller with two conventional chillers, the lab is able to maximize efficient chiller operations over the range of cooling needs.

The lab design team implemented a construction waste recycling plan for concrete, metals, wood, asphalt, and paper. The team was able to divert 72 percent of construction debris from area landfills.

EPA promotes alternative transportation options with the inclusion of electric car recharging stations, designated car pool parking spaces, shower facilities, and bicycle racks and storage.

Sophisticated variable air volume (VAV) fume hoods and systems allow ventilation, cooling, and heating requirements to be reduced when hoods are closed, at night, and on weekends.

During construction, the HVAC system and duct work were sealed on a daily basis to prevent infiltration of any dust, chemicals, or odors due to construction. Before occupancy, the system was flushed and fresh air filters were added.



Carbon dioxide sensors in large conference rooms and common areas measure occupancy and help control ventilation needs.

A highly reflective, ENERGY STAR®-rated roof surface helps reduce the amount of solar heat absorbed and reduces the building's cooling load.

All restrooms are equipped with low-flow plumbing fixtures to conserve water use.

A heat recovery system captures cooling from exhaust air to pre-cool incoming air in summer and heat from warm exhaust air to pre-heat incoming air in winter.

Daylight dimmers, occupancy sensors, and energy-efficient fluorescent and halogen lamps help conserve the amount of electricity needed for lighting.

Programmable thermostats used throughout the building help modulate heating and cooling requirements.

White pipes on the right carry rain water drained from the roof to a 10,000-gallon, pre-cast concrete, fiberglass-lined underground holding tank.

The main lobby desk includes native flower insets.

Low volatile organic compound paint, adhesives, glues, carpet, and floor tiles were used to finish the building.

Absorptive materials such as carpet, ceiling tile, and furniture were installed after chemical odors dissipated.

Xeriscaping, a landscape design incorporating native plants, proper soil types, and mulches, helps retain soil moisture and conserve water use.

The high-ceiling, open bay office area has large clerestory windows specified with low emissivity glass, which allows beneficial light to pass through while increasing the thermal efficiency of the windows.

Five natural gas-fired boilers are more efficient than a traditional mega-boiler, since individual boilers can work more often in their highest efficiency ranges.

With EPA's rainwater recapture system, potable water usage for sewer conveyance is offset by 100 percent, and the Agency saves approximately $2,800 annually in water costs. An innovative rooftop rainwater recapture system collects approximately 735,000 gallons of rainwater per year from a 31,000-square-foot portion of the roof, based on Kansas City's average annual rainfall.

Science and Innovation to Protect Health and the Environment