

Portland State University Housing Complex 'Walks the Energy Talk'



After two years of operation, Epler Hall is using 48 percent less energy than a comparable facility built to code. It recently received a silver-rating certification in the U.S. Green Building Council's Leadership in Energy and Environmental Design program. Photo by Oregon Department of Energy.

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BY ANN GRIM
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In the 1960s and '70s, Portland State University was considered a "commuter" college. Most students were older, married, and worked part-time, if not full-time. As a result, students did not require typical on-campus housing. Indeed, the school's original charter actually prohibited it from providing housing on its downtown campus.

Today, PSU is the largest university in Oregon, and its demographics have shifted to a younger student population. Many students are going to school full-time and want the complete college experience, including living on campus. PSU is heeding the call.

"We still don't have student dorms," said Francis McBride, supervising architect in the university's Facilities and Planning Department, "but we now have about 1,200 apartment units available to students."

The latest residence hall is a special one. The \$10-million facility at Southwest 12th Avenue and Montgomery Street is a 65,000-square-foot building with 130 student apartments, ground-floor office space and three classrooms. It was built to meet the rigorous requirements of the U.S. Green Building Council's Leadership in Energy and Environmental Design, or LEED, rating system. This rating system is a national stamp of approval for high-performance, sustainable buildings. The PSU building is the first mixed-use building in Portland to receive LEED approval.

Because the building is so extraordinary, PSU named it in honor of the university's first president, Dr. Stephen E. Epler.

In order to meet silver-level LEED standards, Epler Hall had to satisfy a number of energy- and resource-efficiency measures. In the two years of operation since its opening in August 2003, the building has surpassed expectations and uses 48 percent less energy than a similar building constructed to Oregon code.

"We have been very pleased with Epler's performance," said McBride. With the reduced energy use, McBride reports few occupant

complaints, saying, "Students are comfortable – both in the summer and winter."

What makes Epler Hall so energy efficient?

The project began as a demonstration project to showcase PSU's Sustainability Program. The university chose Mithun Architects, Walsh Construction Company and Interface Engineering to work on Epler Hall based on their experience in sustainable design and the LEED rating system.

The project team brought sustainability expertise on board early in the design phase, including Portland-based Green Building Services Inc. and the Northwest Energy Efficiency Alliance's BetterBricks Program. In addition, city representatives and PSU students, the latter representing potential occupants, were included in the decision-making process.

The Oregon Department of Energy, through the State Energy Efficiency Design Program, was also involved with the project. The program requires energy review of all new state buildings and major renovations to ensure that they incorporate all cost-effective energy measures and make the buildings 20 percent more energy efficient than code. Buildings owned by state universities are required to participate in the program.

"By reviewing state construction projects early in the design phase, we can help ensure that the project meets the 20 percent requirement," said Betty Merrill, building technologies manager at the Department of Energy. "Our experienced energy analysts have reviewed over 100 state projects. Because they are only focusing on energy efficiency, they can often find energy measures that the project team members, who are looking at the entire project, had not considered."

Epler Hall has many energy-efficiency measures incorporated into the design and operation of the building.

Natural Ventilation

Epler Hall was designed for natural ventilation. There is no air conditioning. Each

apartment has operable windows. Even the elevator mechanical room is situated in a location where it takes advantage of the thermal mass of the concrete elevator shaft wall so that it does not require mechanical cooling.

Each of the five residence floors has a T-shaped corridor with operable windows at each end. When open, the windows flush cool air through the building and remove unwanted heat.

The first-floor classrooms and office space have ventilation shafts that lead to non-electric wind turbines on the roof. When a window is opened, a draft is created that draws the air naturally throughout the room, up the shafts and out of the building at the roof level. Fan coil units in the rooms for heating provide additional air movement for comfort conditions. Night pre-cooling is used to extend the season for free cooling. This shaft ventilation requires very little energy use.

Daylighting

Epler Hall is oriented so there is minimal external exposure to the sun. The length of the building runs north to south.

The east side of the building is a shaded plaza located between Epler and an adjacent building. It serves as a cool-air reservoir. The west side of Epler is on a street that has deciduous trees that extend to the top floor of the building and provide shade in the summer.

External light shelves on the west and south sides of the building above the apartment windows block direct exposure to the sun but permit light to enter during the winter months.

The large windows are low-e, argon-filled and energy-efficient. The windows are sized to provide substantial amount of daylighting to each apartment.

Heating

Measuring 12 feet by 20 feet each, the studio apartments are small and well insulated so that one person's body warmth, room lights and a computer can heat a room. Manually operated electronic baseboard heaters provide heat during cold weather.

The design team was faced with a dilemma concerning the heating system. The city of Portland requires each apartment unit to be individually sub-metered for energy use. The sub-metering, however, would add considerable cost. The team appealed the requirement and cited the highly energy-efficient building design, and was granted the appeal. Heating costs are paid by the university and are included in the rent.

McBride noted that the energy savings might have been even greater if each unit had been individually metered and the students billed for electric use.

"During the first year of operation, I had to enter a number of student apartments," he said. "I can't tell you how often I saw the win-



A unique water-harvesting system captures rain from the Epler Hall's impervious rooftop and pavement, and then filters it through rocks and planters to a storage tank. The water is further filtered, treated and used in the building's first-floor restroom toilets and for drip irrigation. Photo by Oregon Department of Energy.

Financial Incentives: A little green goes a long way

A major benefit to building an energy- and resource-efficient facility like Epler Hall is that it is less expensive to operate throughout the life of the building. But the facility also may qualify for some incentives that offset the capital costs of the efficiency measures.

Here's a list of the incentives Epler Hall has received or is expected to receive:

- The Oregon Department of Energy offers a Business Energy Tax Credit for energy-efficiency measures. A sustainable building qualifies for the 35 percent tax credit if it earns at least a LEED silver certification, at least two points under Energy Performance (Energy & Atmosphere Credit 1) and at least one point under Additional Commissioning (Energy & Atmosphere Credit 3). Epler Hall received its LEED Silver rating, but was not awarded a point for additional commissioning. (It was partially commissioned.)

Epler Hall has applied for a Conservation Project tax credit and is itemizing all of its energy-efficiency measures. Because PSU has no state-tax liability, it will utilize the tax credit Pass-through Option and partner with a private business that has tax liability. PSU will receive a cash payment for 25.5 percent of the eligible project costs from its partner, and the partner will then accept the full 35 percent tax credit.

- The city of Portland's Office of Sustainable Development's G/Rated Program gave PSU a \$15,000 Emerging Technology Grant for its innovative rainwater harvesting system.

- The Northwest Energy Efficiency Alliance's BetterBricks Program paid for Epler's daylighting modeling costs.

- The Associated Builders & Contractors Pacific Northwest Chapter awarded Epler its 2004 Excellence in Construction Award.

dow open and the heat on." The responsibility for paying for the heating would likely have cut down on this energy use.

The university looked into hooking up a switch so the heaters would be turned off when the windows were opened, but this solution was not cost effective. McBride hopes more education and student awareness will

solve the problem.

Waste heat is recovered from apartment bathroom exhaust and then run through a heat-recovery unit on the roof that preheats ventilation air supplied inside the building. Because of the energy measures and improvements to the building exterior designed by Mithun, the major heating requirement for

the building is to heat make-up air.

Resource efficiency

Epler Hall has several other resource efficiency measures of note.

While the plaza on the east side of Epler is attractive, it also performs an important task. Rain that falls on Epler's roof and in the plaza is sent into a conveyance system with rocks to filter the water. KPFF, the civil engineer for the project, designed the system to direct the water to raised planter boxes that filter it into an underground storage tank. The filtered rainwater is treated and then reused for the ground-floor toilets and landscape irrigation. The system will save more than 100,000 gallons of water annually for flushing toilets.

The original building on the Epler site, the 13-unit Birmingham apartments built in the early 1900s, was deconstructed. The crew reused or recycled 90 percent of the building's materials.

Epler Hall is comprised of many locally manufactured products. It is estimated that 60 percent of the material cost for the building was for post-consumer and post-industrial recycled content materials. The kitchenette cabinets, for example, are made of environmentally friendly wheat board; the lobby step/benches are reclaimed old-growth timber.

The construction crew recycled 75 percent of the discarded construction materials.

Low-flow plumbing fixtures were used throughout Epler Hall so water usage is 30 percent below that of a similar residential building designed and constructed using conventional methods.

Facing the future

Building on the success of Epler, McBride sees more sustainable buildings in PSU's future. Current PSU projects awaiting LEED certification include The Broadway, a housing project, and the new NW Center for Engineering, Science and Technology.

"I believe all new construction and major remodeling projects will be LEED silver certified or the equivalent in the future," McBride said.

For Mark Heizer, senior mechanical engineer with Interface Engineering who worked on Epler, this is good news. He said approximately 20 percent of the projects he works on are being designed to qualify for LEED certification.

"The integrated design process that happened on Epler was important to its success," said Heizer, "and working with the Department of Energy as one of those design partners is critical. If you don't plan for it early, things just don't happen."

PSU planned for Epler Hall to be a showcase for its Sustainability Program. The results are evident in its outstanding performance in its first two years of operation.

Help for Oregon Business Owners Who Want to Save Energy and Money

SAVING ENERGY AT THE OFFICE

Saving energy is on the mind of companies as the cost of energy climbs. By following the tips below, businesses can trim energy bills and reduce energy demand, benefiting Oregon's economy.

LIGHTING

- Turn off lights when not in use.
- Install motion detectors so lights are automatically turned off if no one is present.
- Eliminate unnecessary exterior lighting.
- Install motion detectors on outdoor security lighting.
- Exchange incandescent light bulbs for compact fluorescent bulbs.
- Use low-wattage bulbs in closets or hallways.
- Consider turning off general lighting near windows during the day.
- If limited staff is in the office at any one time, consider turning off some of the general lighting and using task lighting.
- Keep light bulbs and fixtures clean. Dirty fixtures reduce light intensity by as much as 25 percent.
- Replace lighting with energy-efficient systems. They can pay for themselves over time, and state tax credits and other types of incentives may be available.

HEATING/COOLING

- Tune-up heating, ventilation and air-conditioning systems to make sure they run as efficiently as possible.
- Check heating/cooling ducts and ensure they do not leak.
- Use a programmable thermostat to set heating/air conditioner to come on 30 minutes before the office opens and to go off up to two hours before the office closes.
- Clean or replace heating, ventilation and air-conditioning system filters once a month.
- Insulate attic, walls and crawl spaces.
- Find and seal air leaks with caulking or weather-stripping.
- Replace old windows with energy-efficient windows.
- Shade west-facing windows with awnings or trees. Exterior shading is more effective than interior shading.
- For unshaded windows, draw curtains and use reflective blinds.
- Don't block registers, baseboard radiators or cold-air returns.
- Seal off unused areas such as storage areas, and don't heat or cool them.

WATER HEATER

- Ensure water heater thermostats are set no higher than 125 degrees to 130 degrees.
- Install faucet aerators.
- Fix leaky fixtures.
- If there are shower facilities, install low-flow showerheads.

EQUIPMENT

- Turn off computers when not in use for more than one hour. Ensure that computers and workstations are operating in the "sleep" mode when not in use for more than five minutes. Screen-savers do not save energy.
- Use controls that turn off shared printers, copiers and fax machines when not in use.
- Buy Energy Star-rated office equipment.

TRANSPORTATION

- If you have business cars, consider purchasing alternative-fuel or new hybrid vehicles.
- Encourage employees to ride-share or use public transportation to travel to and from work.
- Encourage employee to telecommute for one or more days per week, if possible.

HELP FOR YOUR EMPLOYEES

Saving energy isn't just for the office. You also can help your employees access information on how to save energy – and money – at home. The Oregon Department of Energy Web site has information on:

- Residential Energy Tax Credits;
- State Home Oil Weatherization Program;
- Energy Loan Program;
- Ways to conserve energy;
- Renewable energy;
- Links to other programs with incentives.

Interested in finding out more information? Contact the Oregon Department of Energy: E-mail us at energyweb.incoming@state.or.us or visit our Web sit at www.oregon.gov/energy or call us toll-free in Oregon 1-800-221-8035.