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## The Business Journal PORTLAND

### EXCLUSIVE REPORTS

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## PSU's deep, heat-sucking hole in the ground

**Geothermal technology comes to downtown**

**Wendy Culverwell**

Business Journal staff writer

On a sunny Friday afternoon, traffic on Southwest Fourth Avenue sails by the workers constructing Portland State University's newest building, the Northwest Center for Engineering, Science and Technology. Maybe that's because the most interesting part of the project is happening underground.

The \$44.5 million project calls for the drilling of two wells -- one 240 feet deep, the other 750 feet deep -- that will form the functional heart of the geothermal system for the Northwest Center for Engineering, Science and Technology. The job involves boring through hundreds of feet of soil, rock and water in a space a little wider than a planting strip.

The 130,000-square-foot building, funded by gifts, donations and the sale of bonds, is in the early stages of construction and will open in December 2005 at 1930 S.W. Fourth Ave. Five stories tall, it will contain laboratories, classrooms, offices and an auditorium and will be home to PSU's Maseeh College of Engineering and Computer Science.

When it's finished, the project will boast an intriguing lineup of resource-saving features, from natural ventilation in its five-story atrium to a rainwater harvesting system that will supply water for toilets. But the most unusual feature is the geothermal heating and air conditioning system, based on aquifers deep in the ground.

To meet the U.S. Green Building Council's standards for a silver LEED (Leadership in Energy and Environmental Design) award, designers incorporated natural lighting, rainwater harvesting and natural ventilation into the project.

But to heat and cool it, they looked to the ground itself. The 55 degrees Fahrenheit (or so) water in the Troutdale gravel aquifer underneath PSU will supply heat in winter and serve as a heat sink in summer.

"This is the first time we've done it in a downtown urban area," said Matt Pearson, project manager for Lease Crutcher Lewis Builders, the contractor for the project. Zimmer Gunsul Frasca Partnership is the architect and Gerding/Edlen Development Co. is managing the project, which will include retail space at street level.

The geothermal system exploits the difference between outside air temperatures and the relatively constant temperature of the Troutdale gravel aquifer.

Water pumped from the Troutdale aquifer will pass through a heat exchanger. In summer, heat energy will flow from the building to the water to cool the building. In winter, it will be reversed, with heat energy extracted from the well water to warm the facility.

The "waste" water will be pumped back to the ground, to the Columbia River Basalts some 500 feet below the

Troutdale aquifer.

The geothermal approach is rare for Portland, but not unprecedented.

More than 50 years ago, engineer J. Donald Krosker, incorporated groundwater heat pumps in several projects, most notably the award-winning Equitable Building, at 421 S. W. Sixth Ave.

Now called the Commonwealth Building, the 13-floor office building opened in 1948 and boasted a number of architectural firsts, including first building in the Northwest to use a groundwater heat pump for heat.

It was subsequently honored by the American Institute of Architects and listed as a National Historic Mechanical Engineering Landmark.

But the technology didn't catch on, at least not locally.

Its comeback is fueled by rising energy costs and the increasing desire to design buildings with energy-saving features. Modern computer controls make it easier to control the technically complex systems too, said Mark Firestone, an engineer with PAE, which designed the mechanical systems.

"We are seeing more done this way across the country," he said.

Dick Piekenbrock, project architect for PSU, said geothermal heating and cooling surfaced as an option when designers discovered a pattern of high-performing wells near the proposed construction site. That suggested there was enough water present to provide the kind of flow the system needs to operate.

While it may cost more to drill wells and install a heat exchange system, the payback is considerable: The new engineering building will exceed minimum energy efficiency standards by 30 percent.

PSU, in particular the engineering department, is an ideal owner, too.

"The technologies really tie in with the educational program at Portland State University," said Firestone.

Students won't just attend classes in the new facility -- it will be a laboratory where they can monitor how well its innovations perform over time.

"They will probably advance the state of the technology," he said.

The construction site, between College and Hall streets on Southwest Fourth Avenue, posed a significant challenge.

For starters, the new building will be erected over a parking garage that needs to stay open during construction. The drilling itself is taking place in a planting strip between the sidewalk and the 1900 S.W. Fourth Avenue Building, just beyond the windows of PacifiCorp offices.

At 50 feet, a drilling rig produces an earsplitting 85 decibels. To dampen the sound, the contractor installed acoustic windows. Pearson said there had been no complaints midway through the work, which is expected to take about 100 days.

Between sidewalk and rhododendrons, the drillers have to manage the water they use for drilling (it is recycled) and collect the "cuttings" washed from the hole. The cuttings have to be separated, with solids -- namely dirt and rocks -- collected into a container that is periodically hauled off for recycling.

*Contact Wendy Culverwell at [wculverwell@bizjournals.com](mailto:wculverwell@bizjournals.com) or 503-219-3415.*

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