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With water, gray is the new green

Central City Concern floats ambitious plan to reuse waste water

By Peter Korn

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The building that architect Lisa Petterson and colleagues would like to design will use hardly any water at all.

The nonprofit Central City Concern has chosen Petterson's firm, SERA Architects, to draw up plans for subsidized apartments aimed at families with children. The site at Northwest Ninth Avenue and Overton Street has been secured.

Petterson's dream is that the 16-story high-rise will be water independent. That means the building's tenants would neither need water supplied by the city nor create sewage requiring city disposal. The building would supply the tenant's needs by collecting rainwater and recycling its used water.

Petterson wants the building to reuse the water from bathtubs, showers, sinks and washing machines — called gray water — to flush the building's toilets. She'd also like to run the building's gray water through its sinks and tubs and washing machines and pump it outside to use for irrigation.

Sounds a bit like a pipe dream, or pipeless dream. But Petterson and Ben Gates, who is shepherding the project for Central City Concern, think they're getting close to a final design. Now they need permission from the Oregon Legislature and state agencies that regulate water use.

A number of states already have established regulatory guidelines for recycling gray water, but Oregon is not among them. Oregon Department of Environmental Quality water rules, for instance, don't distinguish between different types of wastewater.

The most important of the distinctions that needs to be made, according to Jon Gray, a consultant on sustainability projects at Portland-based Interface Engineering, is between gray water and black water.

Gray water, he says, is wastewater from bathroom sinks, showers, tubs and washing machines. But flushed toilet water, because of what it contains, is black water, as is water from kitchen dishwashers and sinks that contains potentially toxic soap and food residue. Current state rules prohibit using gray water in the manner that Petterson plans.

In fact, there is only one building in Portland that recycles its water on a large scale, and Oregon Health & Science University's Wellness Center received special permission to do so because it essentially committed to building a miniature wastewater recycling plant in its basement.

But that may be about to change. Since February, representatives of DEQ, the state Department of Human Services, the Oregon Building Codes Division and the Oregon Plumbing Board, as well as gray water proponents such as Petterson and Gates, have been hammering out new water rules that will make buildings such as Central City Concern's planned Pearl District high-rise possible.



Jonathan House / Pamplin Media Group
OHSU Wellness Center building engineer Mark Schnackenberg stands on a balcony that features a garden watered by the building's gray water. Central City Concern hopes to see gray water used at a 16-story high-rise apartment building in Northwest Portland.

And because all the state's major players are participating in the process of drafting the proposed legislation, there appears to be little opposition.

"The goal is to allow people to do simple practices that enhance our sustainability," says Brenna Bell, staff attorney for Willamette Riverkeeper, a nonprofit working to preserve the Willamette River Watershed, and co-chair of the committee working on changing the law.

Bell says the new rules would mean that homeowners could pipe gray water into their gardens for irrigation without running it through substantial chemical treatment.

People could stick hoses onto their washing machines and send the rinse water outside to water their lawns, Bell says. New homes could be constructed with dual piping, with systems built in to take gray water outside.

Bell says she has calculated that if everybody in Portland were to rescue their gray water to irrigate lawns and gardens, the city would save about 16 million gallons of water a day.

The new rules have been difficult to draft, according to Gates, Bell and others, because water use involves so many regulatory agencies, from the plumbing board with its code, to DEQ, which oversees water discharge.

Water rules are complicated, both in distinguishing what is gray and what is black, with gradations in between, and also determining what can be used for what. Plumbing code, for instance, dictates that captured rainwater, not considered gray or black water, can be used for almost anything in homes, but it can't be used in apartment buildings.

Petterson wants the Central City Concern building's gray water to combine with rainwater gathered by a rooftop collection system to be used to flush the building's toilets. She also intends to design a rooftop collection system so that rainwater can be used to flush toilets.

According to Gates, without the new rules being proposed, and other rules interpretations that have been put in place this year, Central City Concern could not have considered building its proposed water-efficient design.

Under current rules, Gates says, most buildings can hope to increase water savings by about 40 percent at best by utilizing dual-flush toilets, low-flow showerheads, aerators on faucets and efficient laundry machines.

While Gates believes that 100 percent water efficiency is impossible in the Central City Concern building, with the new legislation in place he expects the building to use only about 20 percent as much water as similar buildings.

A building that efficient, he says, is about more than just sustainability. It would also translate into lower water bills for the building's low-income residents.

Gray, who co-chairs the committee, says he expects a flood of new water-saving developments once the modified rules have been approved by the 2009 Legislature.

"You have enough people here who are passionate about it," he says. "You'll have enough owners who will want to do this, and developers who will want to incorporate this into their sustainability buildings."

Despite initial costs, new system saves OHSU bundle on water bills

When gray water advocates talk about planning buildings that use little or no city water, they do so with confidence because they have one local example of just how far water reclamation can be taken.

Oregon Health & Science University's 2-year-old Center for Health and Healing at South Waterfront not only recycles gray water from showers and sinks, it also reclaims its black water. That's the refuse from

flushing toilets.

OHSU had to obtain a number of special permits to install its state-of-the-art water system, which includes a membrane bioreactor in the basement that basically is a small-scale sewage plant. But the result is that the building uses 60 percent less water than most buildings its size, and its outflow to the city sewage pipes is virtually nonexistent. Toilets in the OHSU building have signs hanging in the stalls that read, "Reclaimed water, do not drink."

"That's one of the biggest jokes around," says Mark Schnackenberg, chief operating engineer at the center. "Who on earth would drink out of a toilet?"

Nevertheless, the signs are required by Portland plumbing code because the water used to flush those toilets, though crystal clear, comes from a variety of gray and black water sources.

The OHSU building incorporates both rainwater and groundwater collection systems on the roof and underground, which get mixed with the building's own gray water and sent to the basement treatment system. Reclaimed water is stored in cisterns before being pumped upstairs or sent outside to irrigate the building's grounds. Excess reclaimed water is piped into the nearby Willamette River.

Constructing the water system was expensive. Despite a \$50,000 grant from the Portland Office of Sustainable Development, and more than \$500,000 in system development charges the city waived because the building does not outflow into city sewage, Schnackenberg estimates the system won't have paid back its initial costs for at least 10 years.

Meanwhile, the building's \$12,000 water bill for all of last year is considerably less than the \$80,000 to \$100,000 bill OHSU estimates it would have paid without the water reclamation system.

And those signs warning people not to drink the toilet water, well, they've acquired a certain cachet of their own. Schnackenberg says he's had to deal with people stealing them.

"They've become a trophy," he says.