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CASE STUDY

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Eight Is Enough in Switch from Boilers to Tankless Water Heaters At Four Residence Halls at California State, Northridge

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Plumbing installer prefabs eight tankless units into a single multiunit system at each of four buildings, cutting energy consumption and complying with local emission-control standards while meeting the hot-water needs of student-residents.

NORTHRIDGE, CALIF. — Beverly Watson can easily laugh about the idea today, now that her recent tankless water heater retrofit project has been successfully completed and is fully meeting her requirements. But the associate director of operations for California State University, Northridge (CSUN), admits to wondering last summer while the work proceeded whether eight — as in eight tankless water heaters — were truly enough for her particular application.

"Frankly, to accommodate the hot-water needs of each of our students, I thought we were going to need more than that number at each of the four residence halls we were upgrading. So I kept asking the lead engineer on the project: 'Are you sure we don't need another tankless water heater or two?'"

Completed in late August, the CSUN project entailed the complete removal and replacement of the original atmospheric boilers and storage equipment installed when the four student-apartment buildings were constructed roughly two decades ago. These rooftop systems provided not only domestic hot water to the residents of all four structures, but also space heating (through a fan coil in each apartment). Besides no longer being able to handle the hot-water loads in an energy-efficient manner, the old boilers could not meet the rigorous emission control standards of the South Coast Air Qualify Management District (SCAQMD).

In short, it was time for a new solution at the four buildings, each spanning three or four floors and housing 37 to 52 individual apartments for two to four students apiece. The solution specified by James Valiensi, P.E., LEED GA of P2S Engineering of Long Beach called for each apartment building to have its own multiple-unit tankless water heater system, furnished by Noritz America. These eight units per building would furnish domestic hot water only, with a new and separate heat pump system handling the space heating.

During the design and installation process, Valiensi reassured his client that the four new tankless systems had been properly sized and engineered to meet the demands of her application. “I liked working for Beverly,” he says. “She’s very thorough, does a lot of research and asks a lot of questions because she wants things done right. She demands not only answers, but also documentation to support those answers. But like a lot of people, Beverly and her maintenance staff didn’t realize at first just how much hot water these tankless water heaters can deliver over a given time span.”

Two other individuals who did their homework on the CSUN project were Bryan Suttles, president of Suttles Plumbing and Mechanical Corporation, and his project manager Dan Boulais, who quarterbacked the installation. The final rooftop assembly at each building consists of four pairs of Noritz NCC199 condensing tankless water heaters, mounted back-to-back in two rows onto a custom-made steel rack. Designed by the P2S Engineering team, including the Pasadena-based Wheeler & Gray Consulting Engineers, the racks were engineered to handle the required static loads and seismic forces in accordance with the California Building Code. Adds Valiensi: “Suttles Plumbing subsequently enhanced our design in the process of making it easier to build.”

Prefabricated rack assembly of eight Noritz tankless water heaters staged on a flatbed trailer for shipment to one of the four CSUN apartment buildings in Northridge, Calif. Project manager Dan Boulais of Suttles Plumbing estimates that prefabrication cut “overall labor time in half.”

The installer also wisely decided against erecting these rack structures from scratch on the four rooftops. Instead, the Suttles Plumbing team chose to prefabricate them at their shop in Chatsworth, located only a mile and a half from CSUN. “Our proximity to the job site made this approach ideal,” says Suttles.

“We built the racks, fixed the water heaters to them, loaded the racks onto flatbed trailers and shipped them to the four job sites. Once there, the assemblies were hoisted by crane to the roof, where all we had to do was to fasten them onto the same rooftop platforms where the old boilers used to sit and connect them to the main piping. It all went very smoothly.”

Adds Boulais: “By avoiding the time and trouble of lugging all that material piecemeal up to the roof for assembly – water heaters, racking, piping, valves and fittings – we were able to cut our overall labor time in half.”

Clear-cut choice: The CSUN project commenced in July 2009, when Beverly Watson commissioned P2S Engineering to do a feasibility study: Could the university simply replace the four existing boilers with up-to-date and more efficient models, thereby gener-

ating all the hot water the apartments needed while also fully complying with the SCAQMD restrictions?

"We came up with several options," says Valiensi, "but the main alternative to a tankless solution was a boiler with a 200-gallon storage tank. At eight pounds per gallon of water plus the structure to support it, the storage-tank idea just wasn't cost-effective. We would have had to launch a complete structural study and upgrade of the building. Because of earthquake regulations, the engineering costs would have gotten really high."

Suttles agrees: "Tankless was the only practical option. The university would've had to restructure that roof to support the weight of any boiler-and-tank system."

To finesse the weight challenge, Watson and Valiensi did briefly consider mounting the storage tank at ground level alongside the building. But the university was not happy with the prospect of creating a shed to enclose the tank for aesthetic reasons, or with running pipe up the sides of the apartment exteriors or with building pipe chases on the inside. "Tankless quickly became the frontrunner," says Watson. "We decided to go as sustainable as we could and save as much energy as possible with the new water heating system."

So Watson began visiting HVAC and plumbing product trade shows to talk with manufacturers of tankless water heaters. She also followed up on their referrals to a couple of recent tankless installations – one commercial and the other residential – to see how they were performing.

"I spoke to several people who had them installed in their homes, and they all thought tankless was great," Watson recalls. "But because ours is a 'multi-family' application, I wondered whether tankless could meet the needs of each resident. I wanted to be sure that two students at either end of a building could turn on the hot water at the same time and still experience a nice warm shower whenever they wanted."

Once Watson became sold on tankless, she next turned to the question of "Which brand?" She wanted a manufacturer who could provide her plumbing and HVAC maintenance team with service parts in a timely fashion — again, so that her students would never be without hot water for any appreciable length of time.

"I telephoned a few local distributors, and I contacted Noritz directly because they are located in Southern California," she explains. "Their answers to my questions persuaded me to choose them."

If the CSUN maintenance personnel were wary of tankless technology, their skepticism was fully dispelled in a special training session conducted at the Noritz headquarters showroom and training center in Fountain Valley, Calif. "Our plumbing and HVAC engineers all attended free of charge, which I very much appreciated along with the thoroughness of the instruction," Watson comments. "Our people are now fully capable of troubleshooting and servicing our equipment."

Noritz also trained Suttles personnel prior to their starting the project. "Noritz came right to our shop and certified all of the plumbers we wanted to be trained on tankless," says Boulais. "It took only 90 minutes, and we were ready to go."

"Cookie-cutter" strategy: Installation of the four, racked systems spanned approximately six weeks from June until August of this year. Shop fabrication of each assembly required approximately five days and two or three plumbers. Transferring and anchoring the assembly to the roof was done in a half-day, with another two days to finish all of the pipe connections within each apartment.

"The prefabrication actually took a bit longer than I had anticipated," says Suttles, "but it also prevented mistakes. The shop is a much more controlled environment than a job site. Once we finished the initial assembly and made our various adjustments to get the tankless units to fit into the racks, we just 'cookie-cuttered' the other three, using the same layout and measurements. Trying to duplicate the first assembly on the other three rooftops would have just killed us because of all the errors."

Designed by the P2S Engineering team, the racks were engineered to handle the required static loads and seismic forces. Adds project engineer James Valiensi of P2S: "Suttles Plumbing subsequently enhanced our design in the process of making it easier to build."

CAD (computer-aided design) technology played an important role in the prefabrication work, and Suttles is enthusiastic about the possibilities. "This tankless water heater installation is the largest prefab project we've ever done, but we experienced no serious problems.

"We are just getting into the world of CAD out of necessity," continues Suttles, whose 40-year-old firm specializes in school projects while maintaining an overall emphasis on commercial, institutional and industrial plumbing work. "CAD is all but required now on school jobs in this market. The owners feel there's less time lost and fewer problems with it – a much better product in the end. So we're currently scouting for new quarters, so we can create a larger prefab shop for this kind of work."

The only snag in the CSUN installation occurred after the fact when it was discovered that the pressure balancing valves in the apartment showers were past their operational lifetimes and not properly compensating for the differential pressures on the hot- and cold-water systems. The result was a crossover of excess cold water to the hot-water side of the valve, triggering hot and cold bursts to the new, low-flow shower heads.

To address this problem, Suttles opted to install a larger recirculation pump on the hot-water system to balance the system pressures and prevent the cold-to-hot bleed-through. This issue should be considered on all retrofit projects involving new low-flow fittings with older shower valves, so that appropriate actions can be taken.

More tankless retrofits to come: Watson not only quickly grasped the problem and its causes, but also intends to avoid it in the future by installing new shower valves whenev-

er retrofitting the domestic hot water system in any residence hall. And there will certainly be more retrofits: Watson recently conducted a survey of the students living in the four apartment buildings, and 77 percent reported themselves content with the new hot-water service. That high percentage convinced Watson that she had made the right decision in opting for a multiple-unit tankless solution, so she is ready to move forward on other CSUN properties.

"By year-end, we will have changed out the boilers in two more buildings, plus another four or five in 2011, and we will use tankless water heating in all of them," she affirms, adding that she looks forward to the results of her first energy-savings analysis of the new tankless setup versus the old boiler system toward the end of 2010.

Suttles predicts that the popularity of tankless water heaters in commercial projects like the CSUN apartments will only grow. "The product takes up so much less space than a boiler or commercial water heater," he says. "If you can hang the unit on a wall, it has no footprint at all."

Multiple-unit systems offer another distinct advantage to large end users like CSUN who simply cannot afford to be without hot water, Suttles points out: "If one unit goes down, you don't need to shut off hot water to the entire facility. The remaining units may not be able to meet 100% of demand, but at least the occupants have some hot water. In the case of a retail operation, such as a restaurant, you can keep it open and functioning even while the service work is being done.

"That's why, for a commercial installer like me, tankless is really a no-brainer."

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Hi-res versions of photographs to accompany this case study are available for immediate download in .tif format by using this link: http://www.noritz.oreilly-depalma.com/2010/cs-csun.shtml

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