The 12-building Hilltop Apartment complex that houses students from the Univ. of Connecticut uses high-capacity, low-mass boilers to provide heat and hot water for student comfort and system efficiency.

Boilers Fast Tracked To Keep Students Comfortable

Space- and water-heating boilers from Laars were installed in student housing at UConn.

To keep students warm and comfortable, officials at the Univ. of Connecticut, Storrs, CT, decided to replace the existing heating/hot water systems in 12 student-housing units known as the Hilltop Apartments. The huge task had to be completed while the students were away for the summer, which put everyone on the project, including mechanical contractor P & D Mechanical Inc., Colchester, CT, on the fast track to get the job done on time for the student's fall return.

The existing water heaters were coupled with fan coil units to provide space heating and domestic water needs. These needed to be replaced for safety and environmental reasons. Plans called for removal of the water heaters while leaving the fan coil heat exchangers in place. Renovations would also entail some re-piping of the buildings. Space heating and hot water would then be supplied by centralized boiler rooms at four of the 12 buildings.

Since there was no space for boiler rooms in any of the buildings, general contractor Dimeo Construction Co., Providence, RI, had to construct rooms on the ends of four buildings with underground piping supplying the other buildings.

The redesign of the Hilltop Apartment complex was done by architectural/engineering firm URS Corp., Rocky Hill, CT. Engineers Viktor Daragjati and Myftar Zoto were the firm's team members responsible for the design of the new boiler systems for the 12-building complex. Boiler options from four manufacturers were studied before selecting Rheos+ boilers from Laars Heating System Co., Simi Valley, CA.

To make the new boiler rooms as inconspicuous as possible, Daragjati said the rooms were designed to match the exterior décor of the apartment buildings so they became simply an extension of the buildings. The overall size of the boilers meant space would only have to be added to four of the buildings instead of each building. "One of the concerns was the need to match the aesthetics of the residential complex. The boilers we used have a very small footprint and generate a lot of capacity in a limited space, and that's what we wanted," Daragjati said. There also were some ornamental features added to make the rooms blend with the buildings. "If you didn't know anything about it, you would think they were part of the original building construction."

URS's heat plant solution included the need for high-capacity, low mass boilers—not tandem, multiple boilers offered by one supplier. "Space was at a premium," Daragjati explained. The need for low NOx emission levels and ultra-high fuel efficiency were also important issues. "Basically, at the end of the day, we converged on Laars because, for that particular application, it seemed to provide all of the capacity, efficiency, and low emission that we were looking for." Specifically, the engineers established the need for boiler efficiency in the 95%+ range with condensing

Tod Hebert, Northeast regional sales manager for Laars, uses a combustion analyzer to assure optimal boiler combustion. The device measures CO_2, CO, and flue temperature.

systems because of the low operating temperatures. And, the boilers had to have lower than 10 ppm NOx emission rate.

The university has a cogeneration plant that requires the campus to meet a threshhold emission limitation. “Therefore, we felt that using the Laars boilers gave us low NOx emissions to begin with. Then with variable temperature control and increased efficiency resulting from operating in the condensing region, we would further limit those emissions, which we felt was a very important factor,” Daragjati said.

Finally, the university wanted a system that would give it some inherent redundancy and standby protection. So, rather than choosing a 5-billion-BTU-input boiler, the engineers chose multiple boiler plants for which the capacity and size of the boilers was a perfect fit. “This project was fast track all the way through. In fact, we had a program manager work with us doing constructability review and cost estimates as we designed. As we went along, the scope of the design was reconciled with the allowed budget. Basically we had to design to a fixed appropriation for time and materials that could not be exceeded. All facets of the job—and even preparation for it—were scrutinized. So the boilers and the underground piping were specified ahead of the rest of the bid package,” Daragjati said.

To ensure the timely completion of the project, Dimeo Construction pre-purchased the boilers even before the mechanical contractor was selected. The project began about the middle of May. The boilers had to be on site by July 1 and the project had to be completed by the third week of August.

According to Dave Warzecha, on-site project manager for P&D Mechanical, his company began by installing the site distribution piping, running it from the buildings to the boiler rooms, where the only holdup was the completion of the building additions to house the new boiler plants. This piping had to be covered by 4 ft. of earth and have 1 1/2 in. of insulation within the jacketing to meet energy code heat-loss requirements. P&D’s contract was for the underground piping and the installation of the four boiler rooms.

Another contractor removed the old water heaters and rerouted piping within the buildings. Ultimately, P&D stepped in to complete the work on the last of the four-building complexes. The project’s short timeline was a unique challenge for P&D. “We do a lot of work like that, but rarely on a track as fast as this one. There was little margin for error,” Warzecha said. His crews ranged from 37 to 40 people with a few more enlisted when the completion of the last building group was added to the contractor’s schedule.

While concealing the project as much as possible was the architects’ challenge, the design team was faced with the challenge of finding spaces to run the new piping system. “You had to be very clever about where you ran it. Piping was run in soffits through utility rooms, toilet rooms, and over kitchen

Dave Warzecha, onsite project manager for P&D Mechanical, uses a manometer to check boiler gas pressure differential to verify that the combustion gas-to-air ratio is correct.

cabinets. We found a way to accomplish the routing of pipes without impacting the ceiling height in areas where students are more likely to spend time," Daragjati said.

Three of the boiler plants are equipped with three 1.6-million-BTU-input Rheos+ boilers and the fourth has three 2-million-BTU units. The boilers are being controlled by a building automation system (BAS) through a 0- to 10-V DC signal that is fed to each boiler. The BAS fires the boilers as needed for heating and domestic hot water. They provide indoor/outdoor temperature reset for heating and maintain constant water discharge temperature when needed for domestic hot-water production. Each boiler plant distributes hot water to two nearby buildings to limit the need for boiler rooms.

To dispose of potentially harmful acidic condensate from the condensing boilers, each boiler is fitted with a neutralizer kit from Laars. The condensate is run through a marble chip bath that neutralizes it from an acidic ph range of 5.2 to 5.6 and then disposes of it down a typical sanitary drain.

The boilers have dedicated integral recirculating pumps with side-stream circulation. "Some other manufacturers require you to provide those pumps separately and, given our schedule, that was definitely a minus," Daragjati said. The pumps take water out of the heating loop, warm it up, and return it to the primary loop. According to Daragjati, the heating loop has its own secondary distribution pumps. These are variable-speed pumps located in each of the three boiler rooms. The reason for this design is "because of the high level of diversity you encounter during the various seasons of the year and especially as you go into the summer months when the buildings may not be fully occupied and the heating load is limited to domestic water demand," he said.

The boilers' ability to maintain discharge temperatures ranging from domestic hot water to peak heating requirements provided the best demand-to-output capacity match at the most efficient energy level. Maintaining the highest efficiency level provides an additional way of controlling emission levels, because the more efficiently the system operates, the less gas is burned and the fewer oxides are emitted.

Temperature sensors feeding an energy-management system from Andover Controls, Carrollton, TX, provide precise digital temperature control throughout the buildings. Students can change the temperature ±2 F and building managers can override the system to accommodate students with special needs. cbp

For more information about Laars' space- and water-heating boilers, circle 12 or visit www.cbpmagazine.com