

MARRYING OLD AND NEW REDUCES BTUS

Guests at the Fantasyland Hotel are invited to sleep under the stars on an African Safari, to soak in a decadent Roman tub, or to slide between satin sheets on an Arabian oasis.

The four-star, 5.2 million square-foot complex is nestled within the West Edmonton Mall in

Alberta. Since it opened in 1986, nearly four million guests have stayed at the hotel, creating a thirsty demand for plenty of hot water year round.

With 355 guest rooms, of which 118 are themed retreats with large tubs, domestic water downtime is not an option. "Of course, for our guests, it's simply taken for granted that hot water is readily available," said Marino Martinez, the hotel's chief engineer. "But from my side, the mechanics of making that happen is serious business."



Jarek Padjasek and Kyle Kellar (front), plumbing technicians, T&P, tear down the old boilers in the demolition phase.

HEARTBEAT OF THE HOTEL

Greg Blais, president and managing director of T&P Mechanical Services, Ltd. in Edmonton recalls the gradual recognition of a looming water problem within the hotel. "Occupancy exceeded expectation and it was clear that the original boilers had lost their ability to meet the demand for hot water," stated Blais, who is a mechanical engineer.

"The complexity of the boiler replacement with essentially no downtime, required careful planning on the front end. It also called for close cooperation between our shop, Marino Martinez at the hotel and Vic Carriere and Barry Graham at DC Sales, the manufacturer's rep firm who was consulted in the planning stages of the system's primary/secondary piping," said Blais. "There really was no room for error. The hotel is a living, breathing entity with demands that had to be maintained.

"We were also thrilled to have an application for three high-efficiency, modulat-

ing boilers," added Blais. "Boiler controls monitor the demand for hot water and automatically adjust each boiler's capacity to meet the required heating load from 1.2 million to 2.4 million Btu's with variability of modulation between 100 per cent and 25 per cent of the input rate."

"Another key need was the units we selected would need to have a much smaller footprint than the old boilers. The new boiler's compact size allowed us to install three new units in place of the two older ones," stated Martinez. "And because of their smaller size, we were able to open significantly more floor space in the mechanical room. The high efficiency boilers have also reduced the amount of natural gas required to heat the domestic water, lowering energy consumption and operating cost."

PRIMARY/SECONDARY PIPING

According to Blais, T&P redesigned the mechanical room piping to optimize

recovery from the boilers and storage tanks. "The primary/secondary piping system was designed with total serviceability in mind, incorporating bypass piping so that any piece of equipment within the system can be isolated for maintenance without disrupting the supply of hot water to the hotel," he said.

As is typically seen with a primary/secondary (P/S) piping system, when the hot water temperature at FantasyLand drops below the system set point, the boiler pump(s) switch on, drawing water from the secondary piping header. The water is heated by the boilers and injected back into the secondary piping loop and, when the water reaches the desired temperature within the system, the boiler pumps switch off and wait in standby mode.

"The hot water continues to circulate through the secondary piping and the storage tanks without passing through the boilers," explained Blais. "By preventing hot water from circulating through the boiler when in standby, there's no heat loss to the atmosphere through the vent stack/heat exchanger, increasing system efficiency. The water instead flows through the two tees that were installed in the secondary piping, flowing by the primary piping as if the boilers weren't even there."

And because each boiler has its own circulation pump, the water flow rate through the heat exchangers and the design temperature between the inlet and outlet water are maintained optimally.

REDUCING DOWNTIME

At the design stage, Blais studied the preliminary heat load calculations to determine the actual hot water demand for the hotel and the required reserve supply to meet peak demand. At the same time James Hill, T&P project manager, drafted

a dimensional layout of the existing mechanical room, comparing piping scenarios, and searching for boilers that would meet the required heating demand and fit within the limited room size. This was especially important because Martinez directed T&P to install the new boilers around the existing working system to reduce downtime.

T&P technicians Reynold Johnson, Jarek Padjasek and Kyle Kellar removed the existing three million Btuh boiler and heat exchanger arrangement, freeing access to the penthouse mechanical room. "Removal of this equipment allowed full access to the mechanical room from the rooftop," said Blais, "and gave us the required floor space for the first two of the three new boilers to be installed."

With no access for a crane from below, T&P chose to move the new boilers up to the 12th floor by two sets of elevators. They were then hoisted individually up two flights of stairs, out across the roof, and finally through an access door cut in the side of the mechanical room wall.

"To minimize disruption of domestic hot water supply to the hotel we had to schedule four-hour, minimum-demand-time shutdown periods to remove the existing piping and transition to the new boiler header piping for the first two boilers," said Hill. "We also fabricated our tie-in header piping and primary/secondary piping in sections, complete with boiler isolation valves, electrical, and controls in advance."

During the early start-up phase, T&P ran the two newly installed boilers for a week to prove their ability to meet initial domestic hot water needs. The second existing boiler remained off but ready for duty as they closely watched and trended performance of the new system. "We were very pleased with the performance and, a week later, the last of the old boilers was retired from service and removed," said Martinez.

"From the beginning, we decided to set up the new systems with lead-lag redundancy, exercising each of them uniformly and to permit non-disruptive off cycles for preventive maintenance tasks as required," explained Blais.



Jarek Padjasek makes preparations to run new stainless steel venting into the existing venting plenum for support.



Greg Blais (l) and James Hill (r) of T&P Mechanical discuss operation of the new system with Marino Martinez, chief engineer, Fantasyland Hotel.

OPEN LOOP

Typically, P/S piping is found in a closed-loop hydronic system, isolating water for heating. "But at the FantasyLand Hotel, we developed an open loop [domestic] system," explained Blais. "We used the two 3,000-gallon hot water storage tanks to temper the water before entering the boilers." Each of the three boilers has its own boiler pump and primary piping. The secondary piping consists of a secondary circulating pump, piping, and the storage tanks. The boilers are connected as three separate injection sources to the main loop.

Another interesting facet of the job, and what became a safety buffer for the old systems in meeting the hotel's growing hot water demand, was the existence of two, well-insulated 3,000-gallon storage tanks inside the mechanical room. With these, the facility had 6,000 gallons of storage. While the old systems limped along, the storage tanks greatly improved the hotel's water capacity and reduced the influence of the boiler's poor recovery time.

The storage tanks were originally immersion-heating boilers that were later relined and modified and, for a number of years, served simply as storage tanks. In the new system, cold water make-up is introduced at storage tank one where it is mixed with hot water circulating through the system. The tempered water then flows through the secondary piping, passing two of the three

boilers. Then, according to Blais, the water "is drawn in by each of the boiler pumps and through the boilers to be heated if and when required. The water continues on through the secondary piping to the second storage tank where water is drawn off and used by the hotel."

The surplus water from the second storage tank is circulated through the piping where it is bypassed, or heated again by the third boiler if required, and carried on back to storage tank one to mix and temper the cold make up water.

"The system is a huge improvement for the hotel," said Martinez. "T&P Mechanical designed and installed a fully capable and efficient system that will serve us well for years."

HPAC

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