

With Help of Water-Source Heat Pumps, Historic Minneapolis Building Reborn

Energy efficiency the driving force behind HVAC retrofit

Completed in 1928, Midtown Exchange in south Minneapolis served as a retail and distribution center for Sears, Roebuck and Co. until closing in 1994. A year later, it was added to the National Register of Historic Places. For the next nine years, the building sat vacant, until the city, which acquired the property in 2001, awarded development rights to Ryan Companies US Inc.

In 2006, Midtown Exchange reopened as a mixed-use development consisting of retail and office space, residential units, and a hotel.

Four hundred eighteen thousand of the building's 1.1 million sq ft serves as the headquarters of Allina Hospitals & Clinics, a not-for-profit network of health-care services. The building also includes 219 affordable and market-rate apartments, 88 condominiums, and 57 townhomes and flats. A 136-room, full-service Sheraton Hotel connected by walkways to Abbott Northwestern Hospital primarily serves hospital visitors, patients, and their families, as well as corporate guests.

New Hope, Minn.-based Horwitz/NSI was responsible for retrofitting the building's mechanical system.

"We chose super-efficient water-to-air heat pumps by ClimateMaster because—compared to traditional HVAC equipment—they can be installed for less money," Bill McKoskey, PE, president of Horwitz/NSI, said. "The heat pumps also offer the



Midtown Exchange is the second-largest building in Minnesota, trailing only Mall of America.

flexibility of being easy to zone. And you can add heat pumps to the overall design as needed, so they give you an advantage in scalability."

With hundreds of heat-pump components to connect, circulator pump stations were a key consideration.

"We installed three large Taco pumping stations," McKoskey said. "One is a variable-flow heating-water loop which matches flow to the building's loads through the use of variable-speed drives. The other loops serve the heat-pump core water loop and the cooling-tower loop."

As Tom McCormick, product manager, commercial pumps, for Taco Inc., explained, "When the speed of the pump motor is varied to meet changing climate conditions—both inside and outside the building—the motor uses the least amount of energy."

Meanwhile, "The pumping stations they chose provide the maximum wire-to-water efficiency, taking into account the combined efficiency of the pump and motor together,"

McCormick added.

Chief among environmental considerations was noise.

"Several professionals involved in the project raised concerns about this," McKoskey said, "so ... we built a mock-up vertical heat pump at an older building here in town. And when it was operational, we led a group there to see and hear the system in operation. Everyone was favorably impressed."

As an added precaution, the developer chose to install insulated G-panels on all heat-pump enclosures in the residential units, further dampening any operational noise.

Another important consideration stemmed from the building's status as a registered historic structure.

"One of the things about historical buildings is the need not to see anything new," McKoskey said. "We were able to satisfy that requirement because all of the individual water-source-heat-pump units integrated with the boiler and cooling tower for the exchange of heat, and the only thing visible on the exterior is the cooling tower itself, which, in this case, is in a Level 13 penthouse. That worked out to everyone's satisfaction."

"In contrast," McKoskey continued, "one of the essentials for a conventional VAV (variable air volume) system would be louvers, and they're an immediate deal-breaker with the folks who guard against visible, exterior signs of modern systems. They're not permitted on historical buildings, or at least to be apparent."

“But with water-sourced heat pumps,” McKoskey concluded, “the only air we’re moving is the ‘makeup’ air, so that means you’re using a much smaller duct, which, in this case, is a definite advantage for the heat pumps in maintaining the integrity of the historical appearance throughout the building.”

An exception to the use of water-to-air heat pumps was made in the Allina Hospitals & Clinics headquarters, where a traditional VAV heating-and-cooling system was installed.

“But even there we also installed some ClimateMaster heat pumps because Allina has a critical 24/7 temperature requirement for their data facility,” McKoskey said. “So we just tied that to a dry-cooler loop, which is a totally separate system from the rest of the building.”

Further challenges grew out of what some on the project called the building’s “bunker construction.” For instance, the building sits atop a 6-ft-thick, 150,000-sq-ft slab.

“Like they say, ‘They don’t build ‘em like they used to,’” Scott Rollings, chief executive officer of Blaine, Minn.-based Energy Efficient Resources, said. “It was as though, during construction, the rule of thumb was, ‘When in doubt, add more concrete.’”

Walls were almost as sturdy as the floors, complicating the task of modernizing the building systems.

“As a design/build contractor, I’m always working closely with architects,” McKoskey said. “At this job site, this was important in determining favorable HVAC routes through ceilings, walls, and floors. And on this project, there were a number of architects involved—separate architects for the condos and apartments, for Allina, and for retail. Of course, because of the old construction techniques, there were aesthetic treatments and designs that became extremely challenging to bring about.”

In the residential areas of the build-



In the bowels of Midtown Exchange are many ClimateMaster water-source heat pumps and several Taco pump stations.

ing, Horwitz/NSI technicians installed 1- to 3-ton vertical heat pumps with integral risers or piping, stacking as many as they could, linking them as part of the closed water loop.

“Unfortunately, the building didn’t ‘stack’ perfectly, so we used a lot of offsets, which solved many problems, but were a key challenge in making it all come together,” McKoskey said.

According to Rollings, many horizontal water-to-air heat pumps, including 10-, 15-, and 20-ton units, were used throughout the project.

“Up at the top of the tower—all the way up 17 floors—is where they used to store fire-protection water,” McKoskey said. “And within that tower today, from floors 13 through 17, there are now many elegant condominiums.”

McKoskey said the building also has a high-rise smoke-control system that includes fire floor exhaust, stairway pressurization, and elevator-shaft relief. If the heat pumps had been permitted to cross many fire barriers with large ducts, as in a VAV system, the installation process would have been more

involved, requiring the use of large and costly smoke-control dampers.

“No doubt, we were dealing with a very tough building,” McKoskey said. “It’s unusually shaped, and it’s extremely well-built The mechanical solution we settled on was ideally suited to the challenge and also to the developer’s stated need for high-efficiency operation.”

Information and photographs courtesy of John Vastyan (cground@ptd.net), a Manheim, Pa.-based communications professional whose work focuses on the plumbing and mechanical, radiant-heat, and geothermal industries.

Circle 101

For Design Solutions author guidelines, call Scott Arnold, executive editor, at 216-931-9980, or write to him at scott.arnold@penton.com.