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About The Cover

City Creek Center is a $1.5-billion, 20-acre, sustainable-design, downtown renovation project in Salt Lake City. Visitor comfort is provided by an impressive mechanical system. After you read the article, go to cbpmagazine.com/digital/janfeb2014 and download a large collection of information about the equipment that makes up the system. Start on p. 18.

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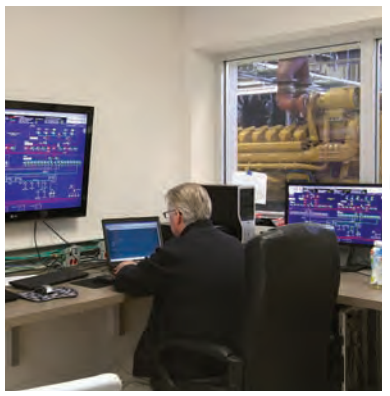

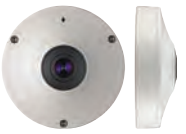

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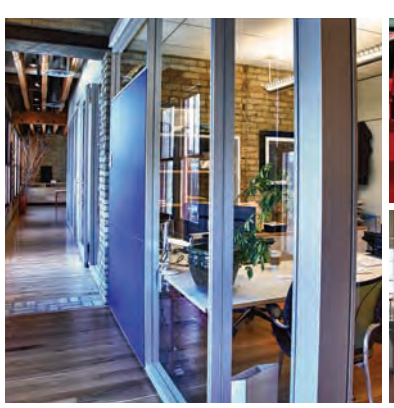

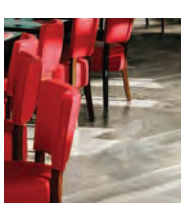

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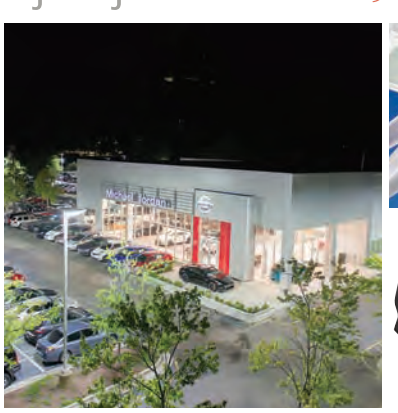

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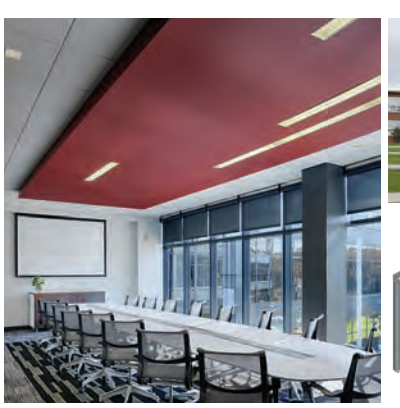

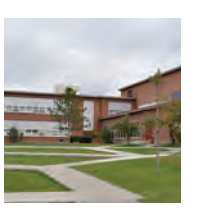

Urban Renewal, Utah-Style

At the crux of the 20-acre City Creek Center renovation project in downtown Salt Lake City is a sophisticated mechanical system that keeps occupants comfortable.

City Creek Center in Salt Lake City is a $1.5-billion development that includes an upscale, open-air shopping center, office and residential buildings, and a variety of water features. *Photo: City Creek Center*

There's a new and shimmering upscale tourism and retail destination in the heart of Salt Lake City that has won the attention of city planners worldwide. Some call it urban renewal on steroids. Others regard it as just one more extension of the buoyant and optimistic resource that is Utah.

The $1.5-billion development is an upscale, open-air shopping center that includes office and residential buildings and a variety of water features developed by Property Reserve Inc., the commercial real estate division of the Church of Jesus Christ of Latter Day Saints, Salt Lake City, and managed by Taubman Co., Bloomfield Hills, MI, and City Creek Reserve Inc., Salt Lake City.

The center encompasses nearly 20 acres of downtown Salt Lake City and is part of an estimated $5-billion sustainable-design project to revitalize the downtown area.

SMART BY DESIGN

At City Creek Center, mechanical systems were integrated smartly, by design. The mechanical plan was developed by a team of consulting engineers at Glumac's Los Angeles office and put into action by the 250-person firm, CCI Mechanical Inc., based in Salt Lake City.

To provide a sense of the project's enormity, all exterior walkways, stairs, and common areas in both of the project's city blocks are snow-melted. These areas cozy up to the large open or enclosed space of both malls, fully served with in-floor heating and cooling.

Planners set out to provide environmental control and comfort for two 160,000-sq.-ft. retail mall spaces, each connected by an enclosed, environmentally controlled sky bridge. Each of the malls can be opened to the elements and fresh air, or closed to provide optimal comfort inside, thanks to the automatically retractable roof and wall systems.

Left. Each of the malls at City Creek can be opened to the elements and fresh air or closed to provide optimal comfort inside, thanks to the retractable roof and wall systems. *Photo: City Creek Center*

Below. Workers installed 18 1/2 mi. of 3/4-in. Watts Radiant PEX+ tubing for the 84,365-sq.-ft. snowmelt systems alone. Another 102,600 lineal ft. (5/8-in. size) circulates fluids within the 25 indoor radiant heating and cooling zones. *Photo: Chris Caldwell*

Above. All exterior walkways, stairs, and common areas in both of the City Creek's two city blocks are snow-melted. These areas cozy up to the large open or enclosed space of both malls, which are fully served with in-floor heating and cooling. *Photo: City Creek Center*

Yet, as substantial as the mechanical infrastructure is, a key attribute of the plan was the effort to simplify all facets of the design so that the overall system's many mechanical parts and pieces wouldn't be strewn across the two-city-block-sized space.

Though there are thousands of interconnected components and many key mechanical stations, there are arguably two main elements of the vast mechanical systems at City Creek Center. First, there are the evaporative cooling towers and the water-sourced heat pumps connected to them. And there's the interior, in-slab radiant heating and cooling systems, as well as much larger exterior areas with snow-melting capability.

EVAP/CONDENSER SYSTEM

"The cooling tower arrangement is unique," said CCI's Seth Roth, who for 36 months, supervised and coordinated the work of as many as 60 CCI craftsmen at City Creek Center. "There are three large closed-circuit fluid coolers and two smaller open-circuit cooling towers, all raised on 8-ft. pedestals on a rooftop–with raised work platforms for access to the cooling towers–an arrangement that provides space for mechanical systems below them, including a bank of large pumps."

"The low-noise Evapco, Taneytown, MD, cooling towers were chosen for their suitability for an urban environment," said Roger Johnson, sales engineer for Salt Lake City-based manufacturer's rep firm, TMS Inc.

The closed-circuit Evapco ESWA induced-draft hybrid cooling towers–connected to large water-to-water heat-pump systems–have stainless-steel heat exchangers. "The cold-water basins are also made of stainless for durability," added Johnson. "Two of the closed-circuit towers are rated at 4,052 gpm [40% glycol, 90 F in/80 F out with 65 F entering wet bulb], and one is a 2,038-gpm system."

According to CCI HVAC technician Nathan Gover, who supervises all ongoing mechanical system service and maintenance needs at City Creek, the open-circuit UT Evapco cooling towers are of an induced-draft, counter-flow design. One is rated at 1,400 gpm and the other at 2,800 gpm; both with 90 F in/80 F out and 65 F wet bulb. They serve the heat-rejection needs for five, 280-ton Daikin Magnitude magnetic-bearing centrifugal chillers. Daikin is based in Minneapolis.

The key challenge in connecting these large systems was how to orchestrate the movement of fluids between the cooling towers, water-sourced heat pumps, and the fluid-cooler heat exchangers.

Five Cranston, RI-based Taco TA horizontal split-case, 60-hp pumps rated at 2,026 gpm at 75 head/ft. serve the fluid coolers and water-source heat-pump system. Five more TAs–sized at 25 hp and 840 gpm at 75 head/ft.–and four FI base-mounted, end-suction pumps, each rated at 125 hp and 2,375 gpm at 130 head/ft.–serve the condenser water loop.

"The TA pumps can be mounted horizontally, so this was especially useful for installation in the space that was created under the cooling towers," continued Roger Johnson. "The FI

Right. There are 34 Taco KV vertical in-line, direct-coupled pumps rated at 130 gpm and 6 TC 40-hp, 480-gpm pumps serving 38 zones of snowmelt and the indoor radiant systems. *Photo: Chris Caldwell*

Below. At City Creek Center, Watts 909 reduced-pressure principle assemblies were installed to protect the domestic water supply from possible contamination. *Photo: Chris Caldwell*

pumps were installed inside the building."

All of the large, multi-horsepower pumps connected to the heating and chilled water systems are connected to variable-frequency drives (VFDs).

For the radiant and snowmelt systems, the VFDs modulate flow to precisely track heating or snow-melting demand as ambient temperatures change. On the cooling side, the VFDs adjust flow based on the need to transport and reject heat. Naturally, during the evening hours, as the load diminishes, flow and electricity usage are reduced.

Condenser water-loop fluid cooler spray pumps were not connected to VFDs because the cooling towers require a set, consistent flow during operation to avoid fouling of the evaporative media.

Protecting the domestic water supplies in the main mechanical areas at City Creek Center are five Watts backflow assemblies. There are three 3-in. 909 reduced-pressure principle assemblies (RPZs), one each to serve makeup water for the cooling towers, the glycol side of the water-source heat pump condenser loop, and another connected to the makeup water for the water-source heat pumps. Watts, a Watts Water Technologies brand, is based in North Andover, MA.

Also, there are two 2-in. 909 RPZs. One serves the makeup water for the boilers; the other is connected to makeup water for the chillers.

The heat exchanger-separated glycol/water mix circulates between the water-source heat pumps and the radiant tubing below the retail stores, lobbies, and walkways. Essentially, this circulatory system conditions the huge spaces in both of the controlled-environment malls. If the expansive snowmelt system is thrown in for good measure–involving about 30 acres of space through tubing embedded in the concrete slabs and under pavers–the job takes on extraterrestrial proportions.

ALL THINGS RADIANT

CCI craftsmen installed 18 1/2 mi. of 3/4-in. Watts Radiant PEX+ tubing for the 84,365-sq.-ft. snowmelt systems alone. According to Gover, there's another 102,600 lineal ft. of Watts Radiant PEX+ (5/8-in. in size) to circulate fluids within the 25 indoor radiant heating and cooling zones (for a total of 47,656 sq. ft.). Watts Radiant, a Watts Water Technologies brand, is located in Springfield, MO.

"We chose Watts Radiant tubing for the project for a couple of reasons," said Roth. "The design reports or tubing layouts provided by [Salt Lake City-based rep firm] Lundquist Sales are very detailed and accurate. We also appreciate the 1,200-ft. rolls of tubing; only a few suppliers offer that. At City Creek, we had the giant rolls on

Below. CCI Mechanical service techs Craig Huggard (foreground) and Jacob Brady check fan-belt alignment and tension inside one of the Evapco ESWA cooling towers. The proprietary fan design provides a 9 to 15 dB(A) reduction in sound. *Photo: Chris Caldwell*

wheeled uncoilers and simply cut off four 300-ft. rolls from each. We could cover a lot of ground quickly. The tubing is easy to work with and reliable."

In Block 75, CCI technicians installed 15 snowmelt zones and 12 radiant heating or cooling zones. In Block 76, 11 snowmelt zones and 9 radiant zones were installed. Each zone is served with a Watts Water Technologies Tekmar 090 snow and ice sensor; each is nestled into an 091 socket. The 090 is an in-ground sensor that automatically detects snow or ice on solid exterior surfaces. The sensors are set up to activate the snowmelt systems when snow or ice is present, while also providing slab temperature feedback to the control.

CCI installers also used 2,400 lineal ft. of 5/8-in. Watts Radiant Onix EPDM synthetic rubber tubing to provide snowmelting capability for several exterior stairways. "CCI requested that they be allowed to buy the tubing specifically for the stairways because of its superb flexibility–a valuable attribute when doing stairs and risers," said Mike Lundquist, president of Lundquist Sales Inc.

SOURCE OF WARMTH

Of course, for all this warmth there has to be a source for it and a way to move heat from one place to another. Enter CCI.

For the snowmelt system, CCI installed 30, 3-million-Btu boilers, which stand ready to wage war with the area's expected 60-plus in. of annual snowfall.

There are 34 Taco KV vertical in-line, direct-coupled pumps rated at 130 gpm and six TC 40 HP, 480-gpm pumps to move Btus about the entire developed space, serving 38 zones of snowmelt and the indoor radiant systems. Each of the 3-million-Btu AERCO boilers is partnered with a 1 1/2-hp KV pump so that warmth is provided for all space heating and snow melt needs. Btus are even shared with a large, indoor fish habitat that includes a created stream and pond, home to several schools of trout. AERCO is located in Blauvelt, NY.

Six large Taco TC vertical split-case pumps, connected to the bank of boilers, avail more than 90-million Btus to remove snow and ice outside or to provide indoor radiant heat, whenever there's demand. The boilers provide 190 F fluid into a large main which is then injected and tempered-down to feed circuits for the radiant heat and snowmelt zones.

MECHANICAL MASTERPIECE

"Naturally, we're very proud of the work our crews did at City Creek Center," said CCI's Dave Katsanevas, vice president and senior partner. "Considering the overall scope and magnitude of the job, the duration of the project, and the involvement of many people at CCI, it's been very rewarding for us to see it come to fruition this way.

"When we walk those snow-melted pavers while shopping in the winter, we have a unique understanding for what's involved," he added. "In the cold months, it's easy to imagine all of the interconnected parts, and the mechanical systems serving tubing below." In the summer, when the roof is closed, the same network of tubing wicks away heat almost unnoticeably. CBP

DATA CACHE

Want more information? The resources below are linked in our digital magazine at cbpmagazine.com/digital/janfeb2014

For general information from the following companies, **Circle** the appropriate number on the Reader Service Card. **Evapco: 17, Taco: 18, Watts: 19, WattsRadiant: 20**

- Download a data sheet for the Evapco ESWA closed-circuit cooler.
- Download a PDF that shows sound data for the Evapco ESWA-672-46N fan.
- Obtain product information for Taco TC pumps.
- Obtain product information for Taco KV pumps.
- Obtain product information for Taco 4900 Series air separators.
- Obtain product information for Taco CA and CX expansion tanks.
- Download a data sheet for the Watts Series 909 reduced-pressure zone assemblies.
- Visit the product data page for the Watts LF909 lead-free reduced-pressure assemblies.
- Visit the data resource center for Watts Radiant floor heating and snowmelt equipment.