



Urban Renewal

Utah-Style

Snowmelt in Downtown Salt Lake City

By John Vastyan

There's a new and shimmering upscale tourism and retail destination in the heart of Salt Lake City that's 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 Utah is.

When Salt Lake City planners looked at many options for a revitalization of their downtown area, they wanted ambitious ideas. Today, the mixed-use City Creek Center is the realization of that dream.

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 Latter Day Saints, and managed by Taubman Company and City Creek reserve, Inc.

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.

City Creek Center is an 800,000 sq. ft. space, covering two entire city blocks that now serves as the economic driver for the city's Renaissance.

Smart by Design

At City Creek Center, mechanical systems were integrated smartly, by design. The mechanical plan was put into action by the 250-person firm, CCI Mechanical, Inc., based in Salt Lake City. The firm (with revenues of about \$60 million annually) is involved in the design, installation, and maintenance of mechanical systems for commercial and industrial facilities throughout the Western United States.

To give you a sense of the enormity of the project, all exterior walkways, stairs and common areas in both of the project's city blocks feature snowmelt systems. 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.

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 n' pieces wouldn't be strewn across the two city-block-sized space. Fluid systems integrate immense heating and cooling functions, connected through the efficient exchange of BTUs at many levels.

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's 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, and 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 up



CCI Mechanical supervisor Seth Roth said, "If I never see another zip tie, I won't mind at all" after his crews used the most cautious means of connecting PEX tubing to rewire in the upper levels of the malls at City Creek Center.

to 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 eight-foot pedestals on a rooftop – with raised work platforms for access to the cooling towers [also supplied by Evapco] – a smart arrangement that provides space for mechanical systems below them, including a bank of large pumps."

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

According to CCI's Nathan Gover, CCI HVAC technician, 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; 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.

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 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 TA's – 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



More than 102,000 lineal feet of 5/8" Watts Radiant PEX+ tubing was installed in throughout both of the City Creek Center malls, providing warmth in the winter and cooling in the summer.

installation in the space that was created under the cooling towers,” continued Johnson. “The FI 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.

For the radiant and snowmelt systems, the VFDs modulate flow to track heating or snowmelting demand precisely 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 three-inch 909 reduced pressure principle assemblies (“RPZ”s), 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.

Also, there are two two-inch 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. And 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 18.5 miles of 3/4-inch Watts Radiant PEX+ tubing for the 84,365 sq. ft. snow melt systems alone. According to Gover, there’s another 102,600 lineal feet of Watts Radiant PEX+ (5/8-inch in size) to circulate fluids within the 25 indoor radiant heating and cooling zones (for a total of 47,656 sq. ft.).

“We chose Watts Radiant tubing for the project for a couple of reasons,” said CCI’s Roth. “The design reports or tubing layouts provided by [the Salt Lake City-based rep firm] Lundquist Sales are very detailed and accurate. Their service is excellent. We also appreciate the 1,200-foot rolls of tubing; only a few suppliers offer that. At City Creek, we had the giant rolls on wheeled uncoilers and simply cut off four 300-foot 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

RADIANT BONANZA

or cooling zones. In “Block 76,” 13 snowmelt zones and 13 radiant zones were installed.

Each zone is served with a tekmar 090 snow and ice sensor; each is nestled into an 091 socket. The 090 is an in-ground sensor which automatically detects snow or ice on solid exterior surfaces. The sensors are set up to activate the vast snowmelt systems when snow or ice is present, while also providing slab temperature feedback to the control.

CCI installers also used 2,400 lineal feet of 5/8-inch 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’s got to be a source for it, and of way to move heat from one place to another. For the snowmelt system, CCI pros installed 30 three million BTU boilers which stand ready to wage war with the area’s expected 60+ inches of snowfall each year.

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 three million BTU Aerco boilers is partnered with a 1.5 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 cutthroat trout.

Six large Taco “TC” vertical split case pumps, connected to the bank of boilers, avail well over 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.



Exterior stairways at City Creek Center receive snow-melting warmth from three-quarter inch Onix tubing, chosen for its superior flexibility.

The mechanical recipe includes a broad list of Taco hydronic components, including large suction diffusers, multi-purpose valves, two 1,056-gallon expansion tanks, six 6-inch 4900 Series air separators, four 12-inch air seps and one 14-inch air sep on the chilled water system.

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 it, and the involvement of many people at CCI, it’s been very rewarding for a lot of it 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.”

He added that, even in a snowstorm, most people marvel at the steam. “But we have an appreciation for what’s going on just inches below the surface, and how it came to be. And, in the summer, when the mall is closed, I’ll sit on a bench just to enjoy the heat being wicked away almost unnoticeably.

“Radiant cooling is amazing,” concluded Katsanevas. “The source of comfort – just as it is with the heat for winter snowmelting – comes from equipment that was installed with care by a fine group of professionals who I’m proud to work with. The mechanical systems perform just as designed, according to a system design that works amazingly well, a masterpiece.” **RJ**

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