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Helping patients at Missoula, Mont.'s new Community Cancer Care facility feel at ease

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Missoula, Montana's new Community Cancer Care facility at the Community Medical Center is a big improvement over the much smaller original oncology facility, although patient satisfaction has always been very high.

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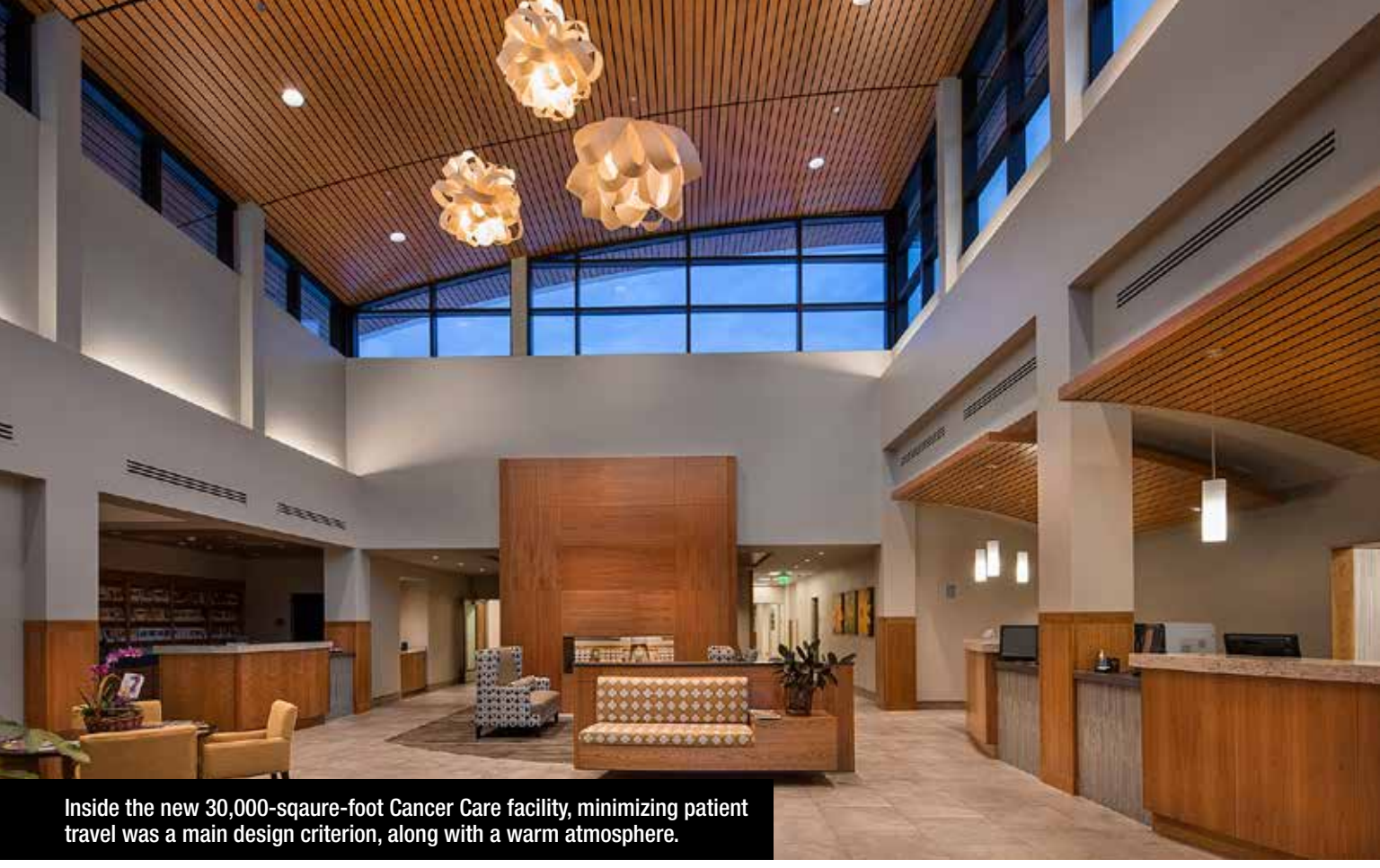

Inside the new 30,000-sqaure-foot Cancer Care facility, minimizing patient travel was a main design criterion, along with a warm atmosphere.

Comfortable, affordable healthcare

Cancer is a cruel opportunist, always taking away. Though lately, modern healthcare has won more battles against the disease than it's lost. And in Missoula, Mont., one facility is a solid example of how patients with the disease receive comfort with treatment. It's smart, deep-down comfort and energy savings from Mother Nature herself.

The new Community Cancer Care facility at the Community Medical Center benefits from a system that gives new meaning to comfortable, convenient healthcare.

"From the outset, the main design criterion of this project was patient comfort," says Dennis Greeno, partner at OZ Architects, the firm that designed the facility. "From the floor plan that minimizes patient travel inside, to the heating and cooling system at work behind the scenes, the goal to provide comfort for patients was woven into every aspect of the building."

Input from staff and patients weighed heavily into the building's design.

The 30,000 square foot, state-of-the-art cancer treatment facility, also referred to as the Oncology Center, rests a mere 40 feet above the Missoula Aquifer. The massive underground aquifer is all that remains of prehistoric glacial Lake Missoula, which at one point held as much as 600 cubic miles of water – roughly half the volume of Lake Michigan.

According to the University of Montana, the aquifer flows at three to four per day; a rapid pace compared to most aquifers, which move that distance over the span of a year. In Missoula, the water is consistently around 50 degrees F. It is the ideal resource for groundwater cooling applications.

To make good use of the aquifer, the Oncology Center uses a "pump-and-dump," groundwater cooling system to tap the aquifer. Water is drawn from the ground, pumped through a large plate-and-frame heat exchanger, and injected back into the aquifer.

"The Montana DNRC (Department of Natural Resources and Conservation) handles well permitting here," says Adam Perine, Sr., Hydrologist with NewFields, a national environmental consulting firm. "If water use is non-consumptive, and under 350 GPM, it's a pretty simple process to acquire the correct permit."

Perine designed the three wells that serve the facility. Although the system only calls for 300 GPM, the wells have been tested at 500 GPM.

The project broke ground in late 2012, and saw its first patients in August of 2013.

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"It's the most holistic approach to geothermal cooling," says Jared Swartz, office manager for Associated Construction Engineering Inc. (A.C.E.), the company that designed the mechanical, electrical and fire suppression systems at the Oncology Center. "No compressor, no refrigerant; just a pump and a stainless steel heat exchanger to handle the building's 1M BTUH cooling load."

Tapping the aquifer

"The pump-and-dump cooling system isn't that unusual here in Missoula," says Cory Hanninen, project manager at 4G Plumbing and Heating Inc. "The system is designed to bring in groundwater at about 53 degrees – 55 degrees F, and return it to the ground at roughly 65°F. The aquifer is so huge that every building in Missoula could use it for cooling and it wouldn't make a noticeable effect on the source temperature."

"With the new facility, we set out to provide the best atmosphere and service possible. Patients and family members now tell us every day how much they love it."

– Devin Huntley, VP of operations at Missoula Community Medical Center

The cooling system that A.C.E. designed stems from redundant, 10-inch bore extraction wells, each 130-feet deep. Each supply well has a 20-HP submersible pump. Groundwater moves through the 350-GPM plate-and-frame heat exchanger, and is then returned to the aquifer via an injection well. On the building side of the big heat exchanger, redundant 15 HP, VFD-powered Taco FI3011frame-mounted, end-suction pumps circulate a glycol-based solution to rooftop air handling units that supply ducted AC.

"We've completed roughly 25 buildings in Missoula that tap the aquifer for cooling," Swartz says. "It's more prevalent here than anywhere in the state, but they're starting to follow suite elsewhere along the western side of Montana, where the water table aquifers are large and easily accessible. Last year, we designed a similar system for a large hospital in Kalispell."

The new Kalispell Regional Medical Center Surgical Services Addition uses two, 1,200 GPM wells to feed a similar, but more complicated ground-source cooling system. The water is used to provide direct cooling similar to Community Medical Center.

In addition to the direct cooling, two more heat exchangers are piped in series to provide condenser water-cooling for two 350-ton water-cooled chillers. The return water – at approximately 65 degrees F – is then used to cool a 240 ton IT load prior to be injected back into the aquifer.

A.C.E. and 4G work together routinely. Both Montana-based firms are accustomed to the design factors seen in the intermountain west; long, cold winters with high snowfall and short, hot summers with very low humidity.

"We've concentrated on medical facility work and have been very fortunate to work on many facilities throughout the Northwest," Swartz says. "On average, we complete $250 million in construction each year, with medical facilities accounting for more than half of that. They're a diverse firm with 30 employees in five different locations: Missoula, Belgrade and Billings, Mont., Minot, N.D., and Sheridan, Wyo."

Similarly, 4G's focus is commercial and industrial work, also with specialization in

4G Project Foreman Hans Halverson works on one of four VFD-powered pumps that serve the oncology facility's heating and cooling systems.

4G Project Manager, Cory Hanninen programs a VFD during commissioning.

hospital work. The mechanical firm's 45 employees have worked on many medical facilities throughout the Northwest.

Warmth and healing

While the groundwater system at the Oncology Center is a unique way of cooling a building, the heating side of the system includes its own uncommon elements. There are some interesting and underutilized approaches to providing patient comfort.

"There's not one pleasant thing about receiving chemotherapy treatments," Swartz says. "So a design criterion for the heating system was to make the physical atmosphere as comfortable as possible for patients that will already be uneasy and distressed. The chemotherapy infusion rooms have in-wall radiant panels that provide the first stage heat."

Two 1.5M BTU, condensing Aerco Benchmark boilers are set up in lead-lag fashion. A 300 MBH, Taco brazed-plate heat exchanger pulls heat from the building's 180 degrees F, 6-inch primary heating loop to supply 120 degrees F water to the radiant panels. The 16 small rooms are split into four zones.

The low-temp branch stemming from the small heat exchanger also heats 2,400 square-feet of sidewalk outside the main doors. Before the building approach was poured, 4G installed three-quarter-inch Watts Radiant PEX+. The concrete is kept dry throughout Montana's October through April snow season; adding further to patient comfort, safety and convenience.

For common areas, offices, and supplemental heat to infusion rooms, high-temp water is pumped to the rooftop air handler and multiple VAV Boxes throughout the building. The big primary loop uses a 7.5 HP, VFD-powered Taco base-mounted pump.

"We like to use Taco and Watts Radiant products because of the local support we get from Vemco Sales," Hanninen says. "Beyond that, it's good to know we have the performance we need and manufacturers willing to stand behind their products."

4G also completed the plumbing for the Oncology Center. DHW is supplied by a 100-gallon gas-fired water heater, so that the boilers don't need to run through the summer.

Challenges

The groundwater cooling components came together smoothly, and the radiant portions of the project were no challenge for the 4G crews. "But we were up against a fast-track, nine-month timeline," Hanninen says. "Between drilling, plumbing, heating, cooling and working around other subcontractors, we had our hands full for most of 2013."

Construction for the first phase of the project started late in 2012, and wrapped up this past August. Phase 2, which will offer radiation oncology services, is slated for spring completion.

Western Montana doesn't see seismic activity like California, but Big Sky Country isn't inactive.

At the Oncology Center, seismic restraints were used for potable water lines, and the pumps and boilers were anchored to the concrete slab. On the roof, the large air handler rests on a seismic-compliant Vibro-Curb unit with integral spring vibration isolation.

The big mechanical room provided ample space for the main system components, but in-ceiling space was at a premium. Ductwork left minimal room for hydronic piping, electric, fire suppression and domestic hot water lines.

Missoula's Community Medical Center is one of two large hospitals in town.

Three's company

Montana is the fourth largest state by landmass, but it's 44th in total population. A population density of 6.8 inhabitants per square mile simply means dealing with the same folks more often. Rep, installer and engineer relationships are no exception.

"4G works frequently with A.C.E, and it definitely benefits both companies," Hannineen says. "But our rep relationships are just as important. In Montana, we're farther down the supply chain for a lot of things. Nothing is right around the corner, so Jared and I both lean on Dennis Nisbet, at Vemco Sales, a little harder than a contractor in New York might have to."

"We do our best to be a resource to both firms," says Nesbit, who is in outside sales for the 35 year-old Northwestern manufacturer's representative firm. "We get involved in as many projects across the state as we can. A.C.E. usually designs the systems and sizes boilers, pumps, etc. I help them select the appropriate equipment for the application. As you can see at the Oncology Center, we often get into some unique applications."

Nisbet worked closely with Swartz as he did most of the front-end engineering work at the Oncology project. "I think our biggest challenge was staying under budget and ahead of the 12-month design/construction timeframe," Swartz says. "Dennis definitely helped with both, as he does on all our projects."

Affordable healthcare

The fast-flowing aquifer, which constantly is recharged by the Clark Fork River, is a boon to the Missoula community. When coupled with engineering and mechanical aptitude – it indirectly makes healthcare more affordable for those nearby.

"The hospital received a $43,000 rebate from the local utility for installing the groundwater cooling system," Swartz says. "But we've calculated that the system also provides an energy savings of around 150,000 kWh per year when compared to a traditional chiller system – meaning an additional benefit of $11,000 or so per year.

"Before this building was complete, we enjoyed very high satisfaction with our cancer treatment services, but we wanted a facility that could offer even more," says Devin Huntley, VP of operations at Missoula Community Medical Center.

"With the new facility, we set out to provide the best atmosphere and service possible," Huntley says. "Patients and family members now tell us every day how much they love it. From an administrations perspective, I can honestly say that this is the first project I've worked on in a long time that far exceeded my expectations."

The building is positioned to take advantage of the mountain views and the soon-to-come healing garden. Few people who enter the facility know about the natural resource that lies beneath their feet, helping to make the building a reality. FC