Plastics Pipe Institute
BUILDING & CONSTRUCTION

Case Study – Project in Action

SNOW-MELT SYSTEM SNARES INDUSTRY HONOR

Keeps Path Clear for Thousands of Students Who Daily Transverse Utah's Longest Pedestrian Bridge

OREM, Utah - To enhance the safety of its students as they walk across the longest pedestrian bridge in the state during the winter, Utah Valley University (UVU) took advantage of the technology and the many benefits that a hydronic radiant snow-melt system would deliver.

The hydronic system for the bridge was named Project of the Year by the Building & Construction Division (BCD) of the Plastics Pipe Institute, Inc. Pipe manufacturers and PPI member companies Uponor (Apple Valley, MN) and REHAU (Leesburg, VA) received the honors during the association's annual meeting in May 2021. The association's annual awards program recognizes projects and members for exceptional contributions to the industry. Submissions in the association's divisions are reviewed, evaluated and voted upon by the PPI members. PPI is the major North American trade association representing the plastic pipe industry.

The pedestrian bridge was part of the UVU expansion plan as a way to provide access between the Intermodal Center in Orem, Utah and the UVU campus. The university knew that the 970-foot-long pedestrian bridge would need a consistent, reliable, long-life and low maintenance solution that didn't include salting or sanding surfaces, or moving equipment across the structure to remove snow and ice. Plus, the system would need a dependable way to supply the heated glycol solution. The $30.7 million bridge spanning I-15 is longer than three football fields, and at 15-feet wide has nearly 15,000 square feet of walkway.

Funding for the bridge was approved in 2016 and construction began in 2018. It opened in February 2021.

The new pedestrian bridge at the Utah Valley University is longer than three football fields. Photo courtesy of Uponor

"Orem, Utah receives an average of 40 inches of snow every winter," stated David M. Fink, president of PPI. "This makes maintenance incredibly important, but the size and positioning of the bridge makes around-the-clock manual snow removal nearly impossible and very difficult to maneuver any equipment. It is estimated that more than 5,000 students would be using the pedestrian bridge every day. With open sides, the walkway is subjected to blowing snow in wintertime so the university wanted a heated concrete walkway to increase pedestrian safety and to nullify the need for a multi-person crew to be on-site 24 hours a day. This is basically an unprecedented project that has rarely, if ever, been done before. It's a marvelous accomplishment that is most worthy of the PPI Project of the Year Award."

UVU brought the design challenge to Aron Frailey, owner and chief mechanical engineer of Thermal Engineering, LLC (Salt Lake City). The main concerns with the UVU Bridge project were the structure's height, that it would span an active interstate highway, a street and railroad tracks, plus be subjected to normal swaying. While Frailey has decades of

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experience in hydronic radiant snow-melt systems, he had never designed or installed a system for an elevated 15-foot-wide bridge that would be suspended 35 feet in the air over one of the most heavily trafficked roads in the state, which could not be shut down. To meet the university's goals, Frailey needed piping solutions that would be durable enough for the harsh conditions, but also be practical and viable for his construction crew. The supply and return loop under the walkway would have to be done without shutting down the roads or the rail lines.

The new pedestrian bridge at Utah Valley University required more than six miles of 5/8 inch REHAU RAUPEX O_2 Barrier PEX tubing for the snow-melting loops embedded in the concrete pathway. Photo courtesy of REHAU

Originally, the hydronic supply-and-return piping specification called for four-inch steel pipe. Because of its heavy weight, steel piping would require numerous installers, heavy lifts, and a lot of welding. Frailey was concerned about job-site safety of welding that high off the ground under the bridge deck while cars, trucks and buses would be moving underneath. He had several other concerns as well about the function of steel piping on the project. The weight of steel piping would have a significant impact on the structure. As all bridges are designed and constructed to move, rigid steel pipe would need special accommodations to withstand that movement. In addition, the corrosive chemicals used on the freeway below the bridge could splash up and impact metals on the underside of the bridge.

Investigating piping alternatives, Frailey learned about and eventually recommended PP-RCT — a durable, lightweight, non-corrosive polymer pipe that offered numerous benefits for the project. It would be easier for installers to handle high up on the bridge, it eliminated open-flame welding, it could flex with the bridge's movement, plus it could withstand the salt and magnesium chloride that Utah uses to melt snow and ice on its highways.

He looked to REHAU for the PEX tubing for the snow-melting loops embedded in the concrete pathway, and to Uponor for the PP-RCT supply and return piping, as opposed to steel or other metals. It would also be Thermal Engineering's first major project using polymer PP-RCT piping.

Shipped in 19-foot lengths, a stick of 125 mm (four-inch) PP-RCT weighs 63 pounds — a fraction of its steel counterpart. The lighter weight not only made installation faster and easier, but also eliminated the heavy weight burden on the structure itself. Plus, PP-RCT connections are heat fused as opposed to welding steel pipe with an open flame. This was a big benefit for Frailey, who is always concerned about the job-site safety of his workers.

Additionally, the ability of the PP-RCT to form a monolithic pipeline and still be flexible enough to follow the movement of the bridge was one of the biggest advantages for Frailey. "The structure is intended to move in every direction all the time — left to right, backwards and forwards, up and down," he said. "I was concerned about the joint integrity of a steel

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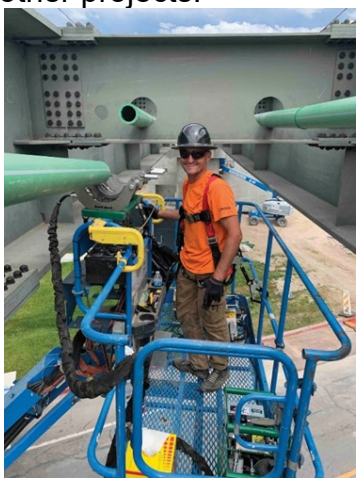
piping system with all that movement, and I really liked the flexibility of PP-RCT to handle it. PP-RCT is an awesome product — the flow characteristics of the pipe, its light weight and flexibility, and the ease of lifting and maneuvering it — all these benefits are huge compared with steel. In fact, we're already using it on other projects."



The Uponor PP-RCT supply-and-return pipe system provides heated antifreeze for the snow-melting loops of the new bridge. Photo courtesy of Uponor

The snow melting loops were also designed with the movement of the bridge in mind. "We designed to match the way they wanted to pour the bridge, so the PEX loops would never cross an expansion joint", he continued. "Each loop connects to its own custom-built manifold in the slab of that section of the bridge, which then connects to the PP-RCT pipe. REHAU supplied custom coil lengths to minimize the number of circuits and optimize the radiant design."

The design used 34,500 feet of 5/8 in. REHAU RAUPEX O_2 Barrier PEX tubing for the snow-melting loops embedded in the concrete pathway, which is supplied with heated antifreeze through 1,900 feet of 75 mm (2 ½ inch) to 125 mm (4 inch) Uponor PP-RCT supply-and-return pipes. PP-RCT is a polypropylene random copolymer with modified crystallinity and temperature resistance. PP-RCT piping products are rated for continuous operation at 180ºF (82ºC) temperature, with pressure rating depending on their wall type (SDR). PP-RCT pipes also may include reinforcement layers for benefits such as reducing longitudinal thermal expansion/contraction.

The 5/8 in. PEX tubing was fastened directly to the bridge deck rebar at 6 inch on-center spacing before being encased within concrete. The tubing was connected to fabricated manifolds that are installed within the bridge deck and accessible via access panels. Each manifold is supplied with a heated antifreeze solution by the PP-RCT pipes.

"The UVU Bridge project is an excellent example of how polymer piping materials such as PEX and PP-RCT can meet demanding project needs that metals just can't provide," stated Lance MacNevin, P. Eng., director of engineering for PPI's BCD. "The polymer piping materials were able to provide benefits for not only the installer — in relation to faster, easier and safer installations, but also to the structure itself — regarding weight, flexibility and corrosion resistance. The bridge is a showcase to professionals in the commercial construction industry that polymer pipe is the future of smarter building design, capable of meeting project and installer demands while providing long-lasting service and performance. Upon completion, the UVU Bridge project became the first large-scale use of Uponor PP-RCT in North America and the largest installation of a hybrid PP-RCT and PEX snow- and ice-melting system so far."

Frailey concluded, "This bridge is a very effective application of a hydronic snow and ice melting system. I can't imagine any other practical way of removing the snow, and it operates very cost effectively as well."

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More information can be found at https://plasticpipe.org/buildingconstruction

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About PPI:
The Plastics Pipe Institute, Inc. (PPI) is the major North American trade association representing the plastic pipe industry and is dedicated to promoting plastic as the materials of choice for pipe and conduit applications. PPI is the premier technical, engineering and industry knowledge resource publishing data for use in the development and design of plastic pipe and conduit systems. Additionally, PPI collaborates with industry organizations that set standards for manufacturing practices and installation methods.

A Pipe Performance Report from the Field