

TCF BANK STADIUM WARMLY WELCOMES MINNESOTA VIKINGS WITH AQUATHERM PIPING SYSTEM



PROJECT:

TCF Bank Stadium/Radiant Field Heating

PRODUCTS:

aquatherm blue pipe®
coiled aquatherm blue pipe®

LOCATION/DATE:

Minneapolis / Spring 2014

AQUATHERM ADVANTAGES:

- Using heat-fused Aquatherm eliminated the need for roughly 4,000 mechanical joints, most of which would be buried beneath the playing field
- Designers liked that the entire field heating system, which included several hundred sections of pipe and thousands of fittings and manifolds would be seamless
- Aquatherm handled the required higher-than-normal temperatures necessitated by the aggregate substrate beneath the synthetic turf field
- The design team liked the fact that Aquatherm pipe has very low oxygen permeation and therefore did not require an oxygen barrier, saving additional cost

Cold weather and football just seem to go together, but frozen fields and football have a tendency to draw complaints, especially from NFL players who know that a frozen field is about as cushy as a slab of concrete.

That put the Minnesota Vikings, homeless last season (they had played previous seasons in the re-inflated Metrodome following the roof's collapse in 2010), between a rock and very hard place when it came to relocating to TCF Bank Stadium (home of the University of Minnesota Golden Gophers) for the 2014 and 2015 NFL seasons. After all, Brett Favre played his last career game there, sustaining a head injury when Chicago Bears Corey Wootton slammed him into the frozen TCF turf.

The memory was still fresh when the Vikings chose TCF as their temporary home while their new indoor stadium was being built. Some changes would have to occur before the stadium was ready for NFL play – among them the installation of a new hydronic heating system, complete with 38 miles of Aquatherm Blue Pipe® filled with DOWFROST™ HD Inhibited Propylene Glycol-based Heat Transfer Fluid, to keep the turf field from freezing.

A BOLD PLAY

While Aquatherm piping systems have been used on professional athletic fields throughout Europe, this installation would mark the brand's debut on a professional football field in the United States. It was not a decision that anyone took lightly during



The Aquatherm Blue Pipe manifolds that run around the field perimeter, with coiled Blue Pipe connecting to them via fusion outlets.

this highly collaborative process between the Vikings management, the University of Minnesota, and a host of engineering and installation professionals.

“At that level of the game, clients tend to use what they’ve used before,” said Brian Storm, President and CEO of Fields Inc., the firm the Vikings chose to oversee renovations to the TCF field.

Storm, whose firm has been involved in the installation of field heating systems for the Philadelphia Eagles, Denver Broncos, and Green Bay Packers, was first introduced to Aquatherm during the design process of the TCF renovation.

Local Aquatherm manufacturer's representative, Mulcahy Company, Inc., which serves the heating, cooling, and plumbing industries, provided extensive education and support that helped ease any concerns. “As we took a closer look, we

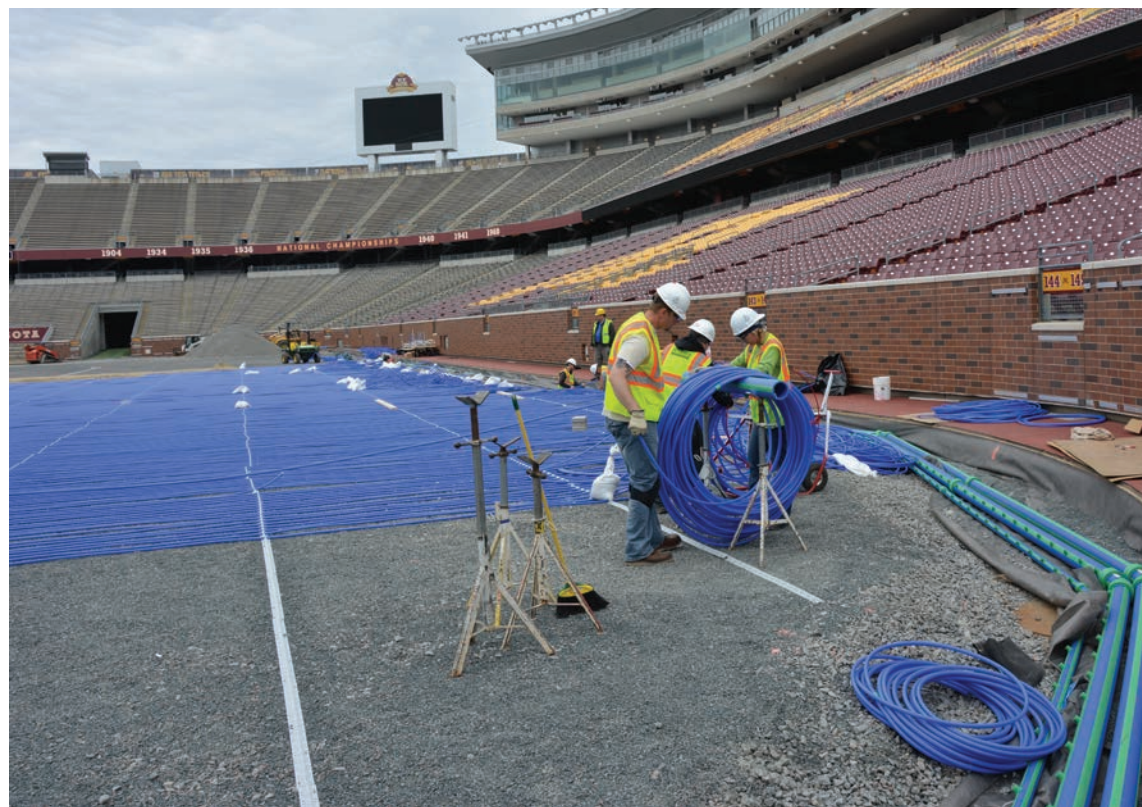




Installers connecting manifolds using the McElroy Spider™ 125 .

began to see that this product could meet and even exceed some of the interesting challenges of this project.”

Those challenges included working with the existing substrate beneath the Gopher’s synthetic turf field. Most heated synthetic fields have several inches of sand as a base, which helps to contain the heat, but TCF had 12 to 18 in. of aggregate. This type of base has many voids between the particles. All that open space creates a pathway for heat loss away from the surface. This meant that the heating pipes would have to be installed closer to the field surface and the heating temperature of the fluid would have to be higher than what traditional polypropylene or PEX tubing can handle.



Harris Companies installers unwinding the Aquatherm Blue Pipe coiled tubing and preparing to lay it out for connection to the manifolds via Aquatherm fusion outlets.

Aquatherm Blue Pipe®, however, is safe to use in applications from -5°F to 200°F (depending on pressure rating) with the company’s multilayer fiber composite, a fiberglass extruded layer that allows the pipe to remain rigid at temperatures that would cause other thermoplastic pipe systems to break.

The use of Aquatherm also eliminated the need for roughly 4,000 mechanical joints, most of which were to be buried beneath the playing field. Aquatherm pipe and fittings do not rely on mechanical connections. Instead they are permanently heat fused (melted) together

using a process that makes each connection at least as strong as the pipe itself.

Solid connections are particularly important whenever glycol-based heat transfer fluids are used because the addition of glycol to water lowers the surface tension, thereby increasing the propensity for leaks to materialize. A “water tight” seal is not always as tight when glycol is present. Aquatherm allowed workers to transform several hundred sections of pipe and thousands of fittings and manifolds into one seamless fluid transport system.

Of all the factors that distinguished Aquatherm from other radiant piping considered or used previously by Fields Inc. and Harris Companies,

warranty was perhaps the most compelling. When installed by factory-certified installers, Aquatherm piping systems come with a 10-year multimillion dollar warranty that covers not only material replacement but also property damage, personal injury, and loss of use of the facility. That’s a lot of insurance when you are talking about something as sacred as a season of NFL football.

“As we took a closer look, we began to see that this product [Aquatherm] could meet and even exceed some of the interesting challenges of this project.”

– Brian Storm, President and CEO, Fields Inc., Canton, GA

“We’d never had anyone offer that to us before. It was the nail in the coffin when it came to making this decision,” said Storm.

LEAVING IT ALL ON THE FIELD

Harris Mechanical of St. Paul, MN, was the mechanical contractor responsible for installing the field piping and associated mechanical equipment. Despite the fact that no one from the company had ever used Aquatherm before, the team managed to install the entire piping system in a matter of weeks and pass their first official pressure test without a single leak.

The only previous experience the installers had with the product was less than a single day of required hands-on instruction in Aquatherm’s Installer Training Program. Eight Harris Mechanical installers completed the program, which teaches participants how to make reliable heat fusion connections using socket fusion, butt weld fusion, and electrofusion equipment.

Harris Mechanical project manager, Justin Knopps, and his crew took these newly acquired skills straight to the TCF field in spring 2014 where they set to work joining sections of piping which they had prefabricated in the shop. They used McElroy Manufacturing heat fusion tools for the job, including a socket fusion tool and the McElroy Spider™ 125.

“The fusion equipment is pretty simple to operate. It was an easy switch from some of the techniques we’ve used before on projects using HDPE (high-density polyethylene) pipe systems,” said Knopps.

Knopps also liked the fact that Aquatherm pipe has very low oxygen permeation and therefore did not require an oxygen barrier. Many





The mechanical room for the field heating system features large diameter Aquatherm Blue Pipe connecting to Bell & Gossett, ABB and other mechanical equipment.

competing products do require an oxygen barrier, which involves additional costs.

Knopp's crew worked seven days a week in order to get the field system installed within the allotted timeframe, which kept shrinking due to construction scheduling and virtually every kind of springtime weather Minnesota can dole out.

Given the tight schedule and the overall complexity of the system, it was fortunate that installers were able to stick with one pipe material for the entire system, from the 8-in. hot water supply pipe to the ½-in. nominal (20 mm) pipe installed in the field. Traditional thermoplastic systems are not available in such large sizes and would have required various transitional points between piping materials. Knopp's explained that transitional points between piping materials are always a concern for Harris Mechanical.

BRINGING THE HEAT

The primary goal of the heating system is to keep TCF field above freezing, especially during games and practices. A 50/50 mixture of DOWFROST™ HD Inhibited Propylene Glycol-based Heat Transfer Fluid from Dow



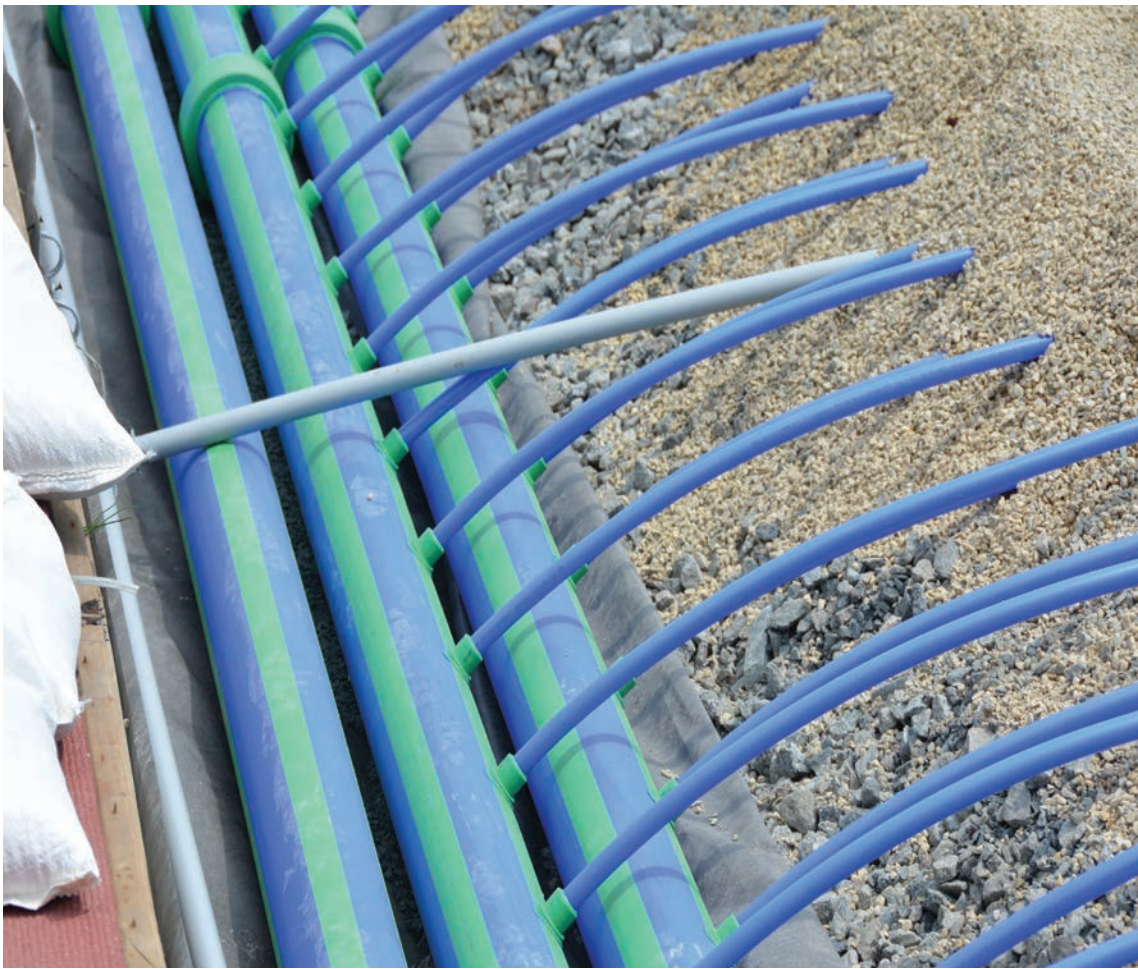
A skid-steer grades the sand layer that covers the Aquatherm Blue Pipe coil grids that heat the field.

and deionized water is heated and pumped throughout the field piping which is laid out on 6-in. centers. The flow volume varies based on the heating demand during operation, and the temperature modulates according to readings from 12 Johnson Controls temperature sensors strategically located in the field. The temperature of the DOWFROST HD mixture is adjusted according to the coldest reading to maintain a sub-base temperature of 40° — just enough heat to keep any freezing from occurring between the base and the turf.



Two installers in front of a sea of blue coils installed on the TCF Bank Stadium field before the coils were covered with sand.





The supply and return lines along the edge of the field, with the fusion outlet-connected coil tubing covered by sand.

Bell & Gossett shell and tube heat exchangers, housed in an adjacent equipment room, serve as the heat source for the field. Roughly 7,000 gal of the DOWFROST HD inhibited propylene glycol mixture are pumped through the heat exchanger tubes, supply piping, and loop field. The 50% solution of DOWFROST HD and water has an effective operating temperature range of 0° to 325° and provides freeze protection down to -30° and burst protection to -60°. The system is

designed to deliver approximately 10-MMBTU at design conditions, delivering 120° water to the field via Bell & Gossett pumps with ABB VFDs.

The heat exchangers are installed with 100% redundancy – because there is no room for failure on game days. DOWFROST HD is fully formulated with corrosion inhibitors, pH buffers and contains patented anti-scaling additives, all of which help to provide long



Close up of the supply and return lines, which carry DOWFROST™ HD Inhibited Propylene Glycol-based Heat Transfer Fluid (this photo was taken on a rainy day, thus the water droplets on the piping).




Fox Sports reporter Jennifer Hale showed a cutaway of Aquatherm pipe when explaining how well the field heating system was performing during the Vikings-Panthers game in November 2014.

term protection and operability of system heat exchangers, pumps, valves and other metal based components.

GAME ON!

During the 2014 season, the Vikings' focus was on football – not which field they would call home or if the field beneath them would be frozen solid. Additionally, in a November that was one of the coldest on record, the state high school football finals and an Ohio State-Minnesota football game were played on a field that held up amazingly well.

Meanwhile, everyone who partnered on the project, including installers, designers, and many of the University of Minnesota's own technical and engineering staff, can breathe a collective sigh of relief that NFL football will go on uninterrupted in Minnesota while the Vikings and their fans await completion of the new indoor Vikings Stadium scheduled for completion in 2016. 

The German-manufactured pipe has been one of the world's most durable and greenest piping systems for four decades and proven successful in 70-plus countries. Aquatherm piping systems offer many performance and environmental benefits, such as:

- Eliminating toxic materials, glues and resins, and open flames from the piping installation equation
- An R-value of 1 or more per inch or greater depending on pipe size and SDR
- The fusion welding process, which creates seamless connections that last a lifetime without leaking or failing
- An optional fiber-composite layer in the pipe reduces linear expansion of the pipe by up to 75% compared to plastic piping



801-805-6657
www.aquatherm.com **aquatherm**

