

# CHILLED WATER DISTRIBUTION – BREAKING NEW GROUND WITHOUT TEARING UP TERRA FIRMA

## PROJECT:

University of Southern Mississippi, HVAC

## PRODUCTS:

**aquatherm blue pipe®**

## LOCATION/DATE:

Long Beach, MS Spring 2012

## AQUATHERM ADVANTAGES:

- Resistance to rust, corrosion, and chemicals was crucial in the salt-laden environment
- Natural insulation value allowed for a much simpler and quicker installation compared to metal pipe
- Aquatherm's heat-fused joints withstood the pulling force of the boring process

*The University of Southern Mississippi Gulf Park used a cutting-edge direct boring technique to tie its new Science Building into an existing physical plant without disrupting the root system of descendants of an iconic tree, tennis courts, and a road.*

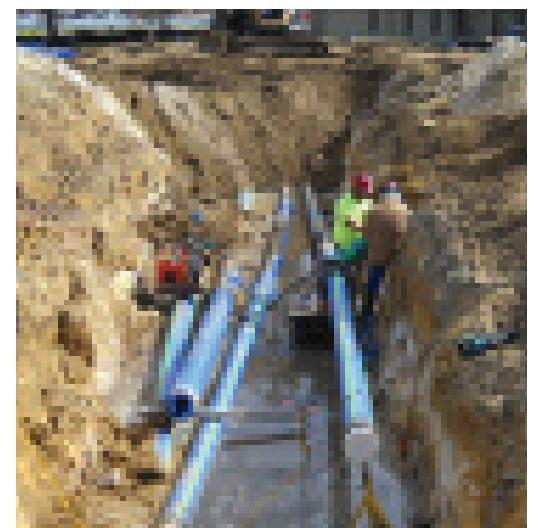
His Founded in 1910, The University of Southern Mississippi is a comprehensive doctoral and research-driven university with a proud history and an eye on the future. In just 100 years, Southern Miss has grown from a small teachers' college into a premier research university with a national reputation for excellence in both academics and athletics.

The University of Southern Mississippi's Gulf Park (USMGP) campus in Long Beach, MS has long been a beacon of learning and provides several courses of graduate and undergraduate study. The university's science programs are renowned, and to that end, school officials embarked upon the construction of a new \$10 million Science Building. The project is also part of a rebuilding effort necessitated by devastation resulting from Hurricane Katrina in 2005.

The three-story, 36,000-square-foot building features nine teaching laboratories, research space, approximately 20 faculty offices, the associate dean's office, and an 80-seat instructional classroom. The university sought to make the new building as energy efficient as possible and leverage the capacity of the existing physical plant. However, using the existing heating and cooling source presented a number of challenges.

## TYING INTO A PLANT – WITHOUT DISTURBING TREES

Located approximately 2,000 feet from the new science building the USMGP Physical Plant has served the campus for seven years. Tying the Science Building into a district energy plan made



perfect sense, but digging a trench from the plant to the new building meant tearing up tennis courts, a campus thoroughfare, and also potentially disrupting the root system of descendants of a campus icon: The Friendship Oak.

The Friendship Oak is over 500 years old, has a trunk circumference of nearly 20 feet, and has been a campus icon since its inception – and many other majestic oaks are located in the area. With lateral roots spreading over 150 feet, any disturbance of the ground near the tree (and other similar trees nearby) was cause for concern.

The project's engineering firm was Canon Engineering, LLC (Gulfport), which offers consulting engineering services to architects, government agencies, and local businesses, specializing in mechanical and electrical design. Canon had recently been introduced to Aquatherm polypropylene-random (PP-R) pipe, which has been rapidly gaining market share in PHVAC and industrial applications throughout North America over the last few years. Aquatherm has been proven around the world for nearly four decades but is relatively new to North America.





The local Aquatherm rep had presented and demonstrated the Aquatherm line to several Canon engineers and it was well received. Having performed work at USM and served as a consultant to Allred Architectural and others for the last 25 years, Canon possesses an intimate knowledge of infrastructure and the demands imposed by the marine conditions of being “on the beach.” And since the firm has designed USM’s existing cooling and heating infrastructure, the university engineering staff has an innate trust when it comes to selecting products that will work for the school.

Upon learning about Aquatherm, Canon’s Lead Mechanical Engineer, Lawrence Stephens, P.E., asked if PP-R could be used in direct boring applications – specifically, the Science Building job. “We were immediately impressed by the operational characteristics and durability Aquatherm offered in a salty environment,” he recalled. Also, the rust, corrosion, chemical resistance offered by PP-R was essential to Stephens: “We live in a salt-laden environment – Aquatherm does not corrode – enough said.” After extensive research, Aquatherm was written into the specification as an alternate, since it could be direct-bored instead of requiring open trenching around the sensitive areas.



## PREVENTING A RUN-AROUND

The mechanical contractor on the project was Ray C. Weaver Mechanical Contractors, Inc. (Gulfport) which brought a reputation for quality work in a huge range of PHVAC/R, process piping, laboratory and medical gases, etc., to the project. In the year 2000 Weaver helped build the physical plant, which at the time served three stories of classrooms, a new 3-story library, and an advanced education center with an auditorium.

*“..you can have total confidence when you bury [Aquatherm]. I can lay my head down on my pillow at night and rest knowing that it will be fine buried under the building and in the middle of a 300-foot buried run.”*

- Ray Bodin, Project Supervisor, Ray C. Weaver Mechanical Contractors, Inc., Gulfport, MS

Ray Bodin, Weaver Project Supervisor, explained that direct-boring with Aquatherm presented a solid, less

costly and less disruptive option than running steel pipe around the area. “The steel pipe was going to have to be installed around this whole area, which would have meant using around 200 more feet of pipe. And the pipe would have been Schedule 40 steel with 2-inch insulation and a 2-inch PVC jacket to protect the insulation,” Bodin explained.

Weaver won the bid and by choosing to use Aquatherm, the university received a 10-year multimillion dollar warranty on the pipe. “I was impressed that Aquatherm has the confidence in its product to basically put its money where its mouth is with a very impressive warranty that is obviously borne from years of positive results,” Stephens added.

“Aquatherm fits well into the sustainability arena and has a reduced carbon footprint relative to manufacture and recycle costs,” Stephens added. Additionally, Aquatherm is completely nontoxic, rustproof, and its production is significantly more eco-friendly than production of metal piping.\*

Further, fully recyclable Aquatherm pipe is engineered to last over 50 years, which reduces the need for costly repairs that would require more resources and further affect the environment. Aquatherm’s Climatherm SDR 11 is designed specifically for HVAC and industrial applications and via a fiber composite layer, offers thermal expansion capabilities similar to copper. And since Aquatherm has a natural R-value of 1 or more depending on pipe size and SDR, the direct-bored sections didn’t require insulation.

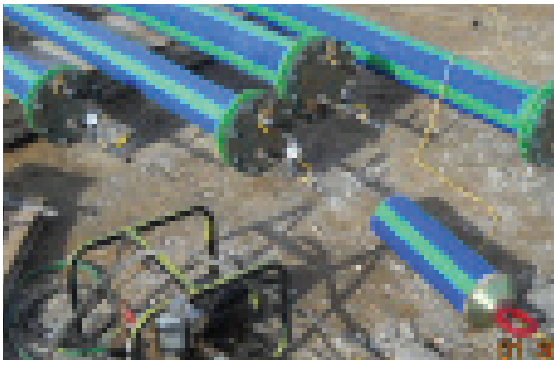
“Aquatherm’s insulation value cut a third off of the labor on this job and steel pipe would have been much heavier too. Plus the steel has to be pre-insulated, which has to be very carefully handled and each joint has to be insulated in place, which means leaving the trench [the 440 feet of line that’s not being bored] open more,” Bodin explained. As with any excavating project, the less time a trench is left open the better from both a cost and safety perspective.

## TRAINING AND GETTING STARTED

In fall 2011 after Aquatherm was specified for the project’s buried chilled and hot water lines, Weaver had several installers trained and factory-certified, and they picked it up quickly. “The learning curve with Aquatherm wasn’t too bad,” Bodin recalled.

“We’ve worked with HDPE so much that we just fell right in with it. From a connection standpoint it’s no





different than polyethylene pipe and we've been doing that since the '70s so it's not a big deal, and the basic procedure is very simple if you have mechanical skills and have been in the field for a while."

Weaver fabricated the necessary Aquatherm pipe beneath the Science Building, including stub outs, valve tie-ins, and penetrations. All those connections were tested to 200 psi and performed perfectly.

For the section of pipe that crossed vacant land, Weaver dug an open trench measuring approximately 440 feet long, by 7 feet deep by 10 feet wide and installed Aquatherm in it. They also installed tie-in points that required an open trench that was 11 feet deep and 14 feet wide.

The total run of pipe from the plant to the Science Building amounted to 800 feet, with slightly less than half of that distance crossing the road, tennis courts, and treed area. Four individual bores were dug about one foot apart from each other; two 8-inch lines and two 10-inch lines.

The chilled water and hot water lines from the central plant tie into the Science Building and feed all of its HVAC equipment. (See sidebar for mechanical equipment breakdown.)

The project involved using the following lengths and sizes of Climatherm:

- 1,216 feet of 10-inch
- 1,311 feet of 8-inch
- 133 feet of 6-inch

## GROUNDBREAKING IS NEVER BORING

The boring process was truly a pioneering event for PP-R in North America. The company in charge of boring and pulling the Aquatherm pipe through the



sandy soil was JW Lee Co, Inc. Founded in 1995, JW Lee performs work for a variety of utilities and is also certified and qualified for natural gas and pulling communication conduit, manholes, etc.

"We were breaking new ground to some extent since Aquatherm hasn't been used much in this application in the U.S. and the pipe sizes are metric. We had to experiment a bit," said the company's Director, Wendell Lee.

The biggest concern at the outset was to ensure that the Aquatherm heat-fused joints would withstand the pulling force of the boring process. Aquatherm is connected in the 6- to 10-inch sizes used on this job (and up to 24-inch) by butt fusion welding. The process turns the pipe and fitting into a single material – creating monolithic connections that last a lifetime and eliminate potential leak paths.

Bodin explained that considering it was Weaver's first experience with Aquatherm, the project went quite smoothly: "Our installers made some really nice butt welded joints. It's just a superior product. It really is."

JW Lee did have to experiment a bit when designing the pipe pulling rigging. Since the Aquatherm pipe is metric (with Imperial equivalents) and has different wall dimensions than metal pipe, getting the puller into it was a challenge.

"The 6-inch pipe is almost a 6-inch outer diameter instead of a 6-inch inner diameter so we ended up having to try out some different sizes of pullers," explained Jay Lee, Wendell's son and Vice President of the company.

JW Lee used a Melfred Borzall puller designed for 5 3/4"-6 1/4" pipe and shaved down the inside of the pipe by roughly 1/8" to get the puller to engage. "We got it inside the pipe, expanded it, and it worked fine. Getting the cutting head into the pipe was the only real issue we ran into when working with the product for the first time – other than that there wasn't much different about it," Wendell said.

He added that while the fusing times are different from other plastics they've worked with, that wasn't an issue. They bored underneath some sewer and communications lines they had installed a few years earlier, boring under the tennis courts at about 13-14 feet deep. The Ditch Witch model JT2720 boring rig used on the job had the capability of 30,000 lbs of pulling pressure and the Aquatherm pipe used on the project withstood pulling pressures of up to 2,000 pounds.

The Weaver crew removed the UV protecting plastic wrap from the Climatherm and made the fusion connections in 300-foot sections of pipe as they went. The boring aspect of the job took roughly a week and both Wendell and Jay said they enjoyed working with a new type of pipe. "We enjoyed working with it because the pipe doesn't have a casing on it like others – and that casing makes it so you can't bore with it. With steel or some poly-pipes, you have to have the insulation."


Added Jay: "I think Aquatherm has great potential, especially in an underground setting – and in directional boring applications. The pipe is so much easier to work with than an insulated type pipe."



For his part, Bodin was quite impressed with Aquatherm. "If you've got quality, skilled people who have worked in the trades, you can have total confidence when you bury this product. I can lay my head down on my pillow at night and rest knowing that it will be fine buried under the building and in the middle of a 300-foot buried run."

## A GROWING (CENTRAL) PLANT

With the building scheduled to be occupied in July 2012, USM is also using Aquatherm for the underground cooling and heating mains tying a new Nursing Building located nearby into the central plant. Additionally, valves were put into the system for future expansion: A community center building situated approximately 75 feet from the Science Building will be renovated and will eventually tie into the system with trenched Aquatherm carrying the chilled water and hot water loops.

Tying these other buildings into the district energy system will provide significant savings because they won't need separate boilers, chillers, pumps, and accessories – a considerable savings possible thanks to a new application of a proven product. 

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



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