



ASHRAE Headquarters Building Atlanta, GA



Commercial Case Study

ClimateMaster Geothermal System Facilitates Education and Energy Savings at ASHRAE Headquarters Building



In July of 2008, completion of a \$7.65 million renovation at the 33,570 sq. ft. headquarters facility of the American Society of Heating, Refrigerating and Air Conditioning

Engineers (ASHRAE) in Atlanta, Ga. marked the advent of a new "living laboratory" for research in sustainable design and construction. One of only six buildings in the state to secure a LEED® (Leadership in Energy & Environmental Design) Platinum certification from the U.S. Green Building Council (USGBC), the ASHRAE headquarters received several upgrades that would make it a model for enhanced energy efficiency and the incorporation of renewable energy sources. In addition, a learning and meeting center was integrated into existing second-floor office space to provide a designated area for connecting ASHRAE members to research and ongoing performance data collection from all HVAC systems in the building.

Central to improved HVAC efficiency, a geothermal system supplied by water source and geothermal heat

pump manufacturer ClimateMaster was installed to condition the headquarters building's 15,290-sq. ft. second floor. The 23-ton geothermal system includes a 14-zone heating and cooling design with 12 ClimateMaster Tranquility® 27 (TT) Series horizontal two-stage water-source heat pumps and 2 Tranquility® High Efficiency (TRC) Series console water-source heat pumps with R410A refrigerant. Additionally, a closed vertical loop geexchange field installed adjacent to the east side of the building consists of twelve 400-ft boreholes with 1¼-in. HDPE pipe and thermally enhanced grout.



The complete hybrid mechanical system was designed by Atlanta-based mechanical engineering firm Johnson, Spellman & Associates, Inc., and also included a 38-ton multi-split Variable Refrigerant Flow (VRF) fan coil unit-driven system with zoned inverter-driven-outrsource heat pumps that is installed on the building's 18,510 sq. ft. first floor. In addition, design and specifications for the loop field were provided by ClimateMaster.



“With buildings accounting for nearly 40 percent of all U.S. energy consumption, there is no doubt that ASHRAE members will play a crucial role in reshaping our energy future,” said Daniel Ellis, president of ClimateMaster Inc. “We are pleased that we were able to assist ASHRAE in demonstrating its leadership by making its headquarters a model of energy efficiency and environmental stewardship.”

Following completion of the system design and removal of existing HVAC equipment in 2007, installation of the new system began in early 2008. Mechanical contracting firm Batchelor & Kimball, Inc. oversaw installation of all ClimateMaster geothermal heat pump units and ancillary system components, as well as all other plumbing and HVAC systems in the building.

“While the piping and installation of the water source heat pumps was a very standard part of the job for us, integrating the ground source borehole field was a new experience,” said Jim Wright, project manager at Batchelor & Kimball. “We were glad to not only have ease of installation and start-up of the ClimateMaster units, but also a high level of cooperation and customer service from the company itself. ClimateMaster was there all along the way, taking full ownership for the

water source aspect of the project and helping us to confidently navigate the process for the first time.”

Drilling of the borehole field, now located under a section of the building’s parking lot, began in February of 2008 with assistance from geothermal drilling contractor Geo-Energy Solutions and sub-contracted firm Middle Georgia Water Systems.

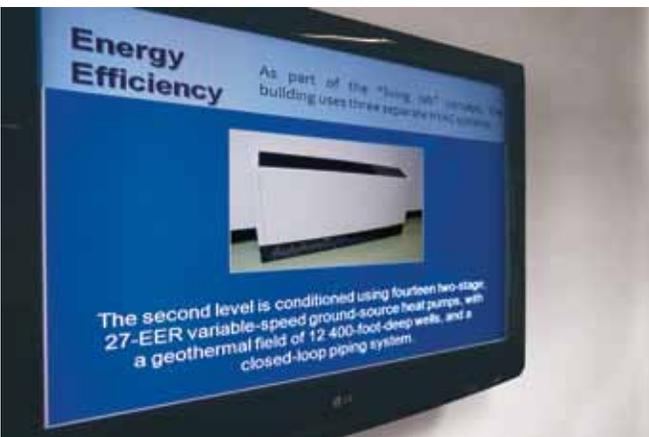
“We installed the loop field according to design specifications received directly from ClimateMaster, which made things quite easy for us,” said O. Bard Phillips, field engineer at Geo-Energy Solutions. “Besides the good old Georgia granite we encountered during initial drilling and then had to navigate through during the headering process, this was a standard job, and we’re happy to know things have been running smoothly with the loop system ever since.”

Installation and testing of the entire geothermal system was completed during the second quarter of 2008, and officially went online later in the summer of that same year.



Data collected since the completion of the renovation in 2008 includes a performance comparison between the ClimateMaster geothermal heat pump system and the VRF system installed on the first floor. The VRF system’s 28 tons of heat recovery was designed with a 121 percent diversity factor to effectively handle 34 tons of fan coil capacity. It also works in concert with conditioned ventilation air from the building’s DOAS units.

Based on data collection from 2010 through 2013, the ClimateMaster geothermal heat pump system performed notably more efficiently than the VRF system during the heating season, while cooling performance was ultimately comparable. Data specifically exemplified more than a 50 percent energy savings from the geothermal heat pump system when comparing the average heating/cooling performance of both systems since their installation.



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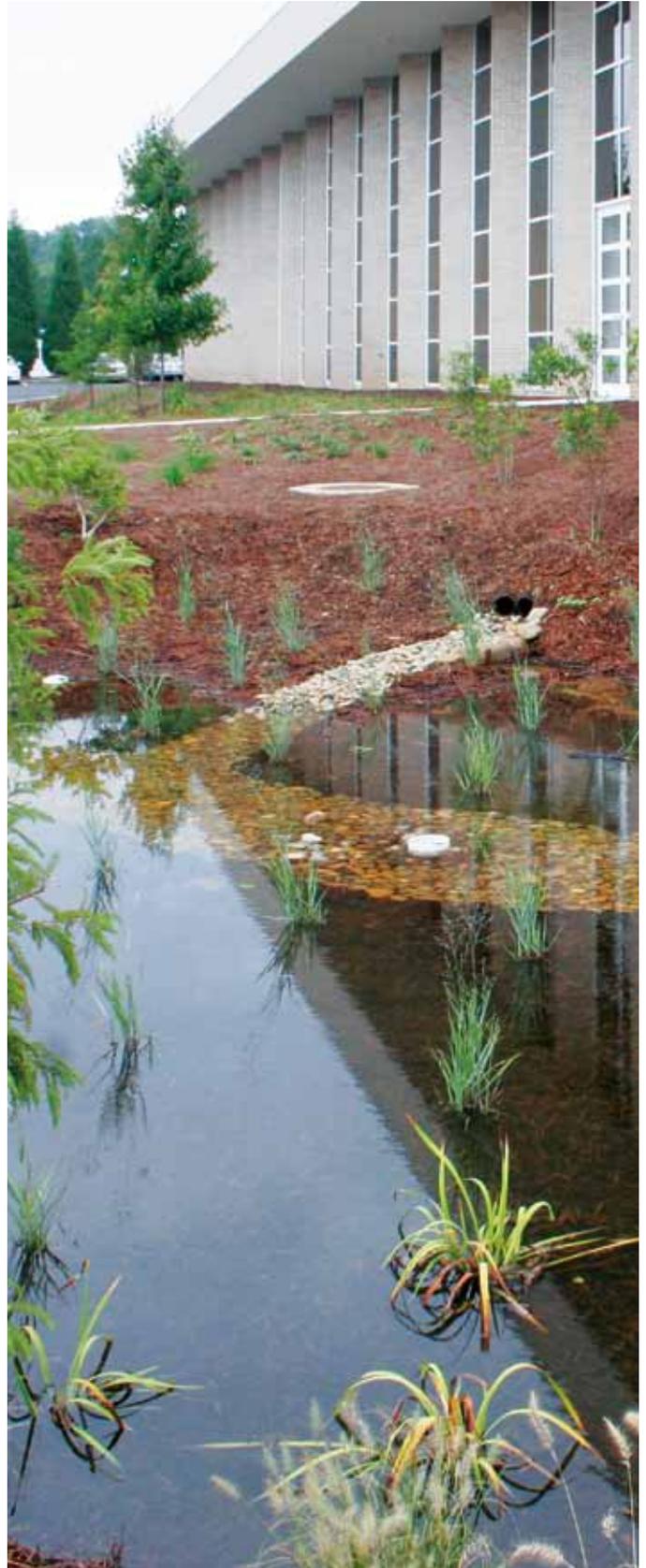
“Using the data collected by ASHRAE, we determined that the VRF system used 57 percent more energy than the geothermal heat pump system in 2010, 84 percent more energy in 2011, and 61 percent more energy in 2012” said Tony Landers, director of marketing, commercial



products for ClimateMaster. The performance data collected from 2012 showed an annual energy usage of 1.5 kWh/sq. ft. for the geothermal heat pump system, while the VRF system operated at 2.5 kWh/sq. ft.

“Needless to say, we are very pleased with the performance of the geothermal system and look forward to more in-depth comparative studies of the two systems,” said Landers.

“ASHRAE thanks ClimateMaster for its donation of the geothermal heat pump system that provides high-efficiency heating and cooling for 14 individual zones on the second level of the building,” said ASHRAE president Tom Watson. “The system is of great interest to visitors as they tour our facility.”





ClimateMaster is the world's largest and most progressive manufacturer of geothermal heat pumps. The company is committed to innovation and dedicated to environmentally clean, economically sound and superbly comfortable home and business environments.

Each ClimateMaster product is produced in the company's state-of-the-art facility utilizing quality management systems that are ISO 9001:2008 certified. An LSB Industries, Inc. company (NYSE: LXU), ClimateMaster has been designing and building equipment that enhances the environments we live and work in every day for more than 50 years. In addition to geothermal heat pumps, ClimateMaster offers the most extensive product line of water-source heat pumps for use in a wide variety of applications. ClimateMaster products are proudly built in the U.S.A.



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