

# Birmingham Foundation Solutions Put Piles to Work

**Geothermal Piles Provide Heating and Cooling**



We all know that piles are used to support buildings on soft ground. Many developers see the cost of foundations as at best necessary; rarely do they see any benefit coming from them. **Birmingham Foundation Solutions** from Hamilton, Ontario is changing all that. Utilizing European technology, the Canadian foundation specialist is capturing the thermal energy in the ground that surrounds the piles to heat and cool the building above. Ground source heating and cooling are not new, but installing the polyethylene loops in the piling is new to North America.

The idea was developed by Austrian company Nagele Energie-und Haustechnik in 1980. Since that time they have supplied over 400 major projects including 20-story bank buildings, and 800,000 square foot factories. They have partners across Europe, recently completing a project in Oxford University in England and are even looking at work in China. Analysing the seasonal heating and cooling flow under a building using irregularly spaced piles, in a variety of depths and soil types is something too complex for a person to accurately calculate. The company uses a very complex three-dimensional computer analysis to plot the temperature variation at depth, by pile, by month. Almost 25 years of experience have gone into perfecting the model for all types of soil.

Birmingham has recently completed the first installation of the system in North America, installing it in 70 piles for a new marine heritage museum located on Lake Ontario. The owner of the museum is the Canadian Government, and they wanted make the new facility as green as possible.

Utilizing the cube of soil under the building to heat and cool the museum will reduce those costs by up to 80%. The project designers were the Zeidler Partnership Architects of Toronto. Their estimate indicated that the thermally active pile solution saved about \$100,000 over the cost of conventional drilled holes. The museum is supported by 51 No. 10-inch (254 mm) diameter closed-end pipe piles, and is supplemented with 20 thermal piles in front of the building. Together these will provide the necessary loop lengths needed to supply the heat pumps.



**Preparing to Hook-Up Polyethylene Pipes  
from Piles to Manifold**

Birmingham's Project Manager Todd Barlow, P. Eng. explains the construction sequence ".....we used a Birmingham B3505 diesel hammer to drive the one-piece piles approximately 100 feet (30 m) to rock. The piles then had twin polyethylene loops lowered into them and then the grout was pumped in. Special thermal additives are available for the concrete in this application, and Birmingham personnel devised special spacers that kept the plastic pipes as close as possible to the wall of the steel pile. These two factors maximize the heat transfer from the saturated ground to the heating cooling loop. Each pile contains two heating/cooling loops that are kept on separate circuits that can be shut off if it develops leaks. That is very unlikely as we kept the loop charged with 85-psi pressure during the entire installation process. The piping material is made especially for this application and comes with a 50-year warranty.