

CETCO Products Used to Successfully Install Groundsource Heat Loops



Oakville Hydro Energy Services commissioned Geosource Energy Inc. to install geothermal heat loops for a new condominium complex being constructed by an Ontario developer, Ninco Construction Ltd. The building, called the Roman, will be a 6 story multi-residential building that will be approximately 40,000 square feet.

PROJECT DETAILS

Groundsource Heat Pump Installation
16 boreholes, 630 ft depth

LOCATION

Roman Condominiums
Burlington, Ontario

PRODUCTS USED

GEOTHERMAL GROUT™
CETCO® CRUMBLES
ACCU-VIS®
K&E Silica Sand

The geothermal system will heat the 41 condo building in the winter and provide cooling during the summer months. It was determined that 16 boreholes, drilled to a depth of 630 feet each were required for the building. The holes consisted of 70 feet of overburden, 260 feet of Queenston shale and the remainder being Georgian Bay shale. Geosource Energy drilled the site using 2 rigs; a dual rotary Novomac and a single rotary Schramm. The grout for the holes were specified to meet a geothermal conductivity of 0.9 btu/ft/hr/F. Some of the challenges included getting all the materials to the project site as required, setting the casing properly into the bedrock based on local regulations, and meeting the specified thermal conductivity requirements.

Rice Engineering, a CETCO distributor, supplied the following materials for the project: GEOTHERMAL GROUT, K&E Silica Sand, CETCO CRUMBLES, and ACCU-VIS. Rice Engineering and Geosource Energy worked together to ensure that the products were available on-site or at Geosource Energy's yard so that drilling would not be delayed.

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Geothermal drillers in Ontario are required to properly seal the casing into the bedrock prior to continuing to drill to meet the Ontario MOE regulation 98/12 related to shale gas control. In order to do this Geosource utilizes a two-step grout. CETCO CRUMBLES, a granular bentonite, is added to a water that has been treated by ACCU-VIS. ACCU-VIS is a polymer that works to encapsulate the bentonite to delay it from swelling. This allows sufficient time to pump the mixture before it begins to swell and set. The process to set the casing using the dual rotary rig is to drill casing to rock and seat it into rock approximately 10 feet. The inner casing is completely removed and the surface casing is pulled back by 3 feet. At this point a tremie line is run inside the casing and approximately 15 gallons of the two-step grout is injected in the borehole. A casing plug is put on top of the casing and the casing is pushed back to the bottom. This forces the grout into the bottom of the borehole and up around the casing filling the casing annulus with bentonite. This provides an effective seal that will hold upwards of 200 PSI when the grout is set.

Once the boreholes are completely drilled, the loops are installed, and the boreholes need to be grouted. The efficiency of the system is dependent on the ability of the grout to transfer heat. This project required a mixture of 24 gallons of water, 50 lbs of GEOTHERMAL GROUT and 200 lbs of silica sand. It is essential that the proper sand is chosen. It must be well rounded with a high silica content and must be graded properly to keep in suspension in the grout mixture. CETCO tests the sand in their laboratory to ensure that it has the proper characteristics to meet the specified thermal conductivity. It was determined that K&E body shot, when mixed properly, would meet or exceed the requirements. Geosource Energy prides itself in properly grouting the boreholes. This is required to not only have a properly functioning heat loop, but also to ensure that the borehole is continually sealed by a low permeable grout to protect groundwater resources.

Geosource Energy utilizes a Geoloop Model YP2 positive displacement pump and a 1.25" tremie line, 700 feet, mounted on a Geoloop deep set hose reel. The tremie line is run to the bottom of the borehole with the geothermal heat loop at time of the loop insertion. Two batches of the GEOTHERMAL GROUT and sand mixture are injected into the borehole before pulling back on the tremie line. After this point, the tremie line is pulled 60 feet after each batch until the top of the casing is reached. The casing is washed out with water to prevent loop damage when the casing is retrieved. The GEOTHERMAL GROUT and sand mixture is allowed to set up for a minimum of 3 hours before starting to pull the casing. This ensures that the loop is properly anchored in place. The casing is pulled back 3 feet then filled with the GEOTHERMAL GROUT and sand mixture. The casing is pulled several sections at a time and the borehole is topped off with GEOTHERMAL GROUT and sand mixture the entire time. This process is continued until all the casing is removed and the grout mixture is at the surface. For this project the grout remained visible at the top of the boreholes as no settlement occurred.

The project was completed in 8 days and the grout met or exceeded the specified requirements.

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