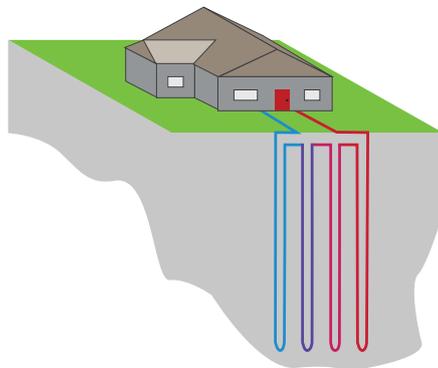


ENGINEERS AND POLICY-MAKERS ADDRESS SAFETY IN GEOTHERMAL DRILLING

By Brian Beatty, P.Eng., and Muktha Tumkur, P.Eng.

GEOTHERMAL SYSTEMS provide a source of “green” heating and cooling in a variety of applications, including residential, commercial, agricultural and industrial, and support the provincial government’s long-term plan to use more renewable energy and eventually close coal plants. Geothermal heating and cooling leverages underground temperatures to heat and cool buildings.



Geothermal systems extract natural heat from the ground to heat or cool domestic or commercial buildings.

As of May 18, 2012, the Ministry of the Environment (MOE) introduced Ontario Regulation 98/12 under the *Environmental Protection Act* to improve public safety and protect the environment by strengthening regulation of vertical closed-loop drilling for geothermal energy systems. The regulation requires geothermal installers to obtain an environmental compliance approval (ECA) for vertical closed-loop geothermal systems. Applicants are required to submit a work plan, prepared by a licensed engineering practitioner or a professional geoscientist, that must include measures to prevent an adverse effect if hazardous gas is encountered while constructing, altering, extending or replacing a system.

The intent of the new regulation and instructions is to protect against the release of hazardous gases, such as natural gas and hydrogen sulphide, while drilling boreholes and installing the grout and U-loop components of geothermal systems.

Key requirements of O. Reg. 98/12 include:

- a work plan prepared by a licensed professional engineer or geoscientist;
- equipment and procedures for monitoring hazardous gases during geothermal drilling;
- a preliminary site assessment and a step-by-step description of all drilling activities;
- that measures and procedures be taken to control the release of hazardous gases during drilling and, if required, to kill the borehole (i.e. prevent release of the gases);
- crews trained in the safe management of hazardous gases during drilling;
- notification to specified individuals if hazardous gas is encountered in a geothermal borehole; and
- a mitigation completion report prepared by a licensed professional engineer or geoscientist if hazardous gas is encountered in a geothermal borehole.

The ministry is also requiring installers to notify landowners, occupants of a building, the municipality, the local fire department and the ministry’s Spills Action Centre if they encounter hazardous natural gas during installation of a vertical closed-loop geothermal system.

The ministry has published a guideline to assist installers, entitled *Instructions for Completing an Application for an Environmental Compliance Approval (ECA): Vertical Closed Loop Ground Source Heat Pumps* (www.ene.gov.on.ca/stdprodconsume/groups/lr/@ene/@subject/@renewable/documents/nativedocs/stdprod_097798.pdf).

Geothermal industry stakeholders Brian Beatty, P.Eng., Stan Reitsma, P.Eng., geothermal drilling contractor, and Ron Schertzer, geothermal equipment supplier, met with senior MOE staff to review the overall parameters for compliant geothermal drilling. Several concerns were raised by the MOE technical reviewers, leading to field tests, observed by MOE personnel, that formed the basis for acceptable procedures.

These procedures led to guidance and requirements that are now contained within the CSA Group standard *CSA-C448-13 Design and Installation of Earth Energy Systems*, which provides more guidance for drillers. The C448 standard applies to new and retrofit installations and also led to a sample work plan template that is available on the Ontario Geothermal Association website (www.ontariogeothermal.ca) for reference by other geothermal drillers in Ontario. However, each drilling company is responsible for preparing and submitting their own ECA application, including a work plan that is suitable for their equipment and procedures.

The C448 standard was developed and approved by technical committees and subcommittees that represent a multi-stakeholder forum representing the geothermal industry across Canada. Σ

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