

EARTHLINKED
TECHNOLOGIES

Infinite Energy for Heating and Cooling

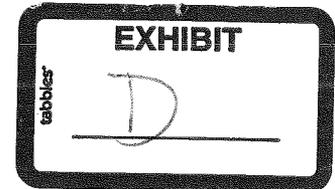
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DEPT OF CONSUMER PROTECTION
OFFICE OF THE COMMISSIONER

April 16, 2008

Honorable Jerry Farrell, Jr.
Commissioner of Consumer Protection
State Office Building
165 Capitol Avenue, Room 103
Hartford, CT 06106



RE: Proposed Regulation of the Department of Consumer Protection Concerning Well Drilling

Dear Commissioner Farrell:

I am writing to address issues raised by the proposed Regulations in regard to the installation of EarthLinked® direct geexchange heat pump systems.

We do not oppose the promulgation of appropriate and reasonable regulations, but do contest the adoption of the Proposed Regulations because of the:

- Lack of legislative authority (see attachment #1).
- Absence of any reasonable connection between many of the proposed regulations and what is necessary to protect groundwater in the installation of bore holes for direct exchange geothermal heat pumps.
- Exclusion of geothermal bore hole drillers from the Connecticut marketplace by creating a monopoly for water well drillers who can only drill holes that are larger and much more expensive than necessary, and whose equipment can not access many of the retrofit installation sites that direct geexchange systems now serve.

Connecticut has a substantial heating load, is one of the states that EPA had determined “contributed substantially to nonattainment . . . of national ambient air quality standards . . .,”¹ the need to improve air quality, the highest residential and commercial electric rates in the 48 contiguous states as of December 2007, and large luxury homes are being added to the system at a time when electric generating and distribution facilities are constrained. To reduce the cost of heating and cooling, the emission of pollution and greenhouse gases, and the need for additional generation, it is desirable to use every available clean energy technology. The U.S. EPA and DOE have determined that

¹ Federal Register, Vol. 73, No. 16, January 24, 2008.

geothermal heat pumps are the most energy efficient heating systems and the most environmentally clean in most applications.

The EarthLinked® geexchange heat pump system (attachments #2 and #3) is a direct geexchange system that circulates refrigerant in small copper tubes buried in the upper 100 feet of the earth's surface for heat exchange. The system is used to heat and cool residential and small commercial buildings and to heat water. We now have 28 years of experience in the field using the system. It is saving energy and the environment in 41 states and 14 countries, from Australia to Estonia. What we do to assure good heat transfer in the earth (small diameter, shallow bore that only displaces a minimal amount of earth; grout the entire hole with thermally enhanced grout; and prohibit the use of sand as backfill) also serves to protect groundwater.

The development of this technology has led to 1) the issuance of nine U.S. patents for heat pump innovations and two more are pending 2) small bore drilling equipment and 3) specialized small bore drillers who install shallow earth loops. The proposed regulations would effectively restrain trade in the product in Connecticut and create a monopoly for geexchange heat pump installations in a single segment of the drilling industry that only operates large well drilling equipment that is designed to obtain water from wells.

Background Facts

- Water wells are typically at least 6" in diameter, and are drilled to a depth that connects them with the underground water supply. Water-based closed loop geothermal wells are typically 6" in diameter and are drilled to depths of 200 to 500 feet. Direct geexchange heat pump bore holes are typically 3" to 4" in diameter and are drilled to a maximum depth of 100 feet. They do not need to connect to underground water. The majority of EarthLinked bore holes are 35 to 71 feet in depth and they displace only 11% of the soil displaced by a typical water-based geothermal bore hole (of 6" x 250'), thus the potential for impact on groundwater is minimal by comparison.
- After a 1984 Florida Solar Energy Center test and electric utility monitoring in Delaware and Florida demonstrated the high energy efficiency of the EarthLinked system, EarthLinked Technologies (ETI), formerly known as ECR Technologies, applied to the State of Florida for a blanket drilling permit for installations in Florida. As a condition for action on that request, the Department of Environmental Regulation required an environmental study.

The study (attachment #4) was conducted by a professor at the University of South Florida. As a result of that study and their own analysis, the Department issued its Declaratory Statement granting the request (attachment #5). That favorable determination was affirmed and updated in 2007 (attachment #6).

- The Manufacturer's Safety Data Sheets (MSDS) on Refrigerant-22 (attachment #7) and R-407C (attachment #8) are appended.

They state that 1) the loops do not inject and are not reasonably expected to inject any fluid into the soil, 2) are not expected to contaminate the soil because the refrigerant has very low toxicity, is largely insoluble in water, and 3) any released refrigerant would immediately vaporize. The MSDS's state that the refrigerants are low in toxicity to animals, ingestion is unlikely because of



the physical properties (evaporates above -40.8°F) and are not expected to be hazardous. They have very low solubility in water (0.3 wt% at 25C), that they not a hazardous waste; and 5) the MSDS on the mineral oil lubricant, SUNISCO 3GS REFRIGERANT OIL, states that it is not soluble in water and describes the Health Hazards as possible irritation to the eyes and gastrointestinal tract, if ingested.

- The system has been the subject of 10 electric utility monitoring projects from southern to northern climates, including CT, where their efficiency was proved with R-407C. That project led to the development of the commercial water heating application that is mentioned later. Consumers Power Company of Jackson, Michigan conducted an 18 month field test and reported that the system is 25% more efficient than water based geothermal heat pump systems (attachment #9). Energy efficiency reduces the use of electric power and the resulting emission of greenhouse gasses and pollutants in the generation of electricity or on-site burning of fossil fuels.
- There is regulatory precedent in the states of Florida, Michigan, Wisconsin, North Carolina and Colorado for the use of direct geexchange systems. In many other states and countries, they are permitted under general drilling regulations without specific regulation. As the number of installed units increases, there is growing proof of the benefits and the absence of risks.
- In 2006, the US EPA completed 15 months of monitoring the performance of an EarthLinked® Commercial Water Heating unit in a nursing home. The EPA report states that the system saved 75% of the electrical energy that would otherwise be required to heat water. It resulted in avoiding the emission of 7,100 lbs of CO₂ and 15 lbs of NO_x per ton of capacity per year. That equates to 42,600 lbs of carbon dioxide and 90 pounds of nitrous oxides annually by a 6 ton system, which is equal to not burning 3,642 lbs of gasoline or 74 barrels of oil each year. More detail is provided in a summary attached (attachment #10).
- An EPA position letter concerning direct geexchange heat pumps is attached (attachment #11).
- ETI has never experienced the loss of a loop due to corrosion. For harsh soil conditions, ETI offers its Cathodic Protection System that emits a small amount of milliamps of impressed electrical current that precludes corrosion by establishing a protective electron field. More detail is provided in attachment #12.

We have the following comments on specific sections of the proposed Regulations:

Section 8:

25-128-39a: Would require bore holes to be at least four times the inside diameter of the largest loop in the system. The greatest protection of groundwater would be to require the smallest hole possible for the system being installed, which would also reduce the amount of excavated material and the energy required to excavate it.

25-128-39b: Would recognize water based geothermal heat pump systems and permit the use of water/glycol solution, but would require direct geexchange systems to seek the approval of two Departments for the use of heat transfer fluids. We request approval for Refrigerants R-22, R-407C and R-410A, and delegation of authority to the named Departments to approve other heat transfer fluids.



25-18-39c: Would recognize water based geothermal systems that use polyethylene pipe, but would require direct geexchange systems to seek the approval of three Departments for the use of copper heat exchange loops. (Subsection "c" thereof would require loop pressure testing at 150% of operating pressure for 30 minutes. The EarthLinked® Installation and Start-Up Manual requires 24-hour testing at 400 psi, which is 200% of operating pressure.)

Section 12:

25-128-42: "Drilling, general" relates to water well drilling and geothermal bore holes, but it is not clear which provisions apply only to water wells.

25-128-48a: "Annular space" relates to water well drilling (use of casing, sloping the surface away from the casing, etc.) but it is not clear which provisions apply only to water wells.

(c): Requires the use of bentonite grout or a thermally enhanced bentonite grout containing a minimum of 20% bentonite with a maximum coefficient of permeability of 10⁻⁷ cm/s, or other grout approved by DCP and DPH.

(f): Requires all bore holes and wells to be covered with a 2' thick by 3' diameter layer of grout, which is "overkill" for a 3" diameter closed loop direct geexchange bore hole.

25-128-49: "Well head completion" includes the following that are not appropriate to require for direct geexchange bore holes:

(a) requires casing, which is not needed in every instance where bentonite is injected into shallow bore, small diameter holes that we require to be filled with an earth loop and completely grouted with thermally enhanced grout.

(b) requires draining the well head, which is inapplicable to closed loop geexchange bore holes.

(c) requires protecting water piping from freezing, which is inapplicable.

(d) requires the use of a "vent cap or sanitary seal with an access port for ventilation." (Venting is not applicable to a closed loop system and it is not clear if any other provision of this Section, if any, is intended to apply to geothermal bore holes.)

Section 17: Requires the disinfection of all wells. This is inappropriate for bore holes for closed loop geexchange systems.

Section 19: Requires that all well and geexchange bore hole development be done by a registered well driller, which is onerous and prohibitively expensive. "Well driller" is defined by Chapter 482 of Connecticut General Statutes to mean one who drills holes to obtain water.

Section 21:

25-128-57a: Decommissioned closed loop geothermal system fluid shall be displaced with bentonite grout (ie: at least 2 lbs. of bentonite per gallon of water) or other substance approved by DCP, DPH and DEP and the bore hole capped with grout at least 12" thick.

This precludes the use of neat cement unless specific approval is obtained from the Departments.



Section 24:

25-128-58d: Geoexchange bore hole contractor W-7 registration requires documentation “that the applicant has been actively engaged in the well drilling trade as a well driller for a period of thirty-six (36) months prior to the date of application and/or has held a valid W-8 registration for at least two years,” (*emphasis added*) and letters of reference from a Connecticut registered well contractor, etc. This is onerous and prohibitively expensive; and the use of the conjunctive and disjunctive “and” and “or” are mutually exclusive in that one requires both (36 months plus two years) and the other permits either.

Section 27: Geoexchange borehole contractor W-8 requires three years experience as an apprentice driller or equivalent experience and training, and passing a written exam on well drilling. The three-year apprenticeship is onerous and prohibitively expensive.

Section 29:

25-128-61: Requires a permit application *by a registered well contractor for geoexchange systems*. This is onerous and prohibitively expensive.

Section 31: 25-128-62a and Section 32: 25-128-62b: Requires a geothermal system completion report *by a registered well contractor* (defined as “A well drilling contractor is any person . . . in the industry of obtaining water from a well . . .” Section 4: 25-128-36). This is onerous and prohibitively expensive.

The mission of the Department is to ensure a fair and equitable marketplace, safe products and services for consumers. We respectfully suggest that the major environmental and energy saving benefits of the EarthLinked system eclipses the extremely remote risk of a cross-connection of surface water and groundwater being created by the installation of an EarthLinked system; or refrigerant or a few ounces of mineral oil being released in the soil if an earth loop were breached.

To simplify and clarify the Regulations for the benefit of government officials, the industry and consumers, we would request that the Regulations be separated into different sections that address water wells, water-based geothermal bore holes and direct geoexchange bore holes; and separate licensing requirements for each.

Very truly yours,



HAL ROBERTS, CEO

/ph
enclosures (12)

