Construction Inspection of Geothermal Projects

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Inspection of public and large-scale private construction projects has a long history of ensuring ongoing contract provisions are met. As a young professional engineer, I used to inspect highway construction improvements for the State Department of Transportation, to be sure the proper amount of asphalt and other materials was placed correctly. On tall skyscrapers, I would run cone slump tests and make cylinders to be sure concrete was up to strength, as well as check reinforcing steel to be sure sizing and spacing was adequate.

But for single-family home construction, engineers or construction technicians are not needed to be sure 2 x 4s are nailed up correctly. It would be cost prohibitive to force homeowners to have full-time inspection, and thus building inspectors provide a valuable service by inspecting key locations and milestones as the home takes shape.

In geothermal loop construction, inspection is similarly unusual at the single-family level. Some building inspectors are taking jurisdiction, but lack codes and routine inspection experience to be able to enhance the work performed by an IGSHPA (International Ground Source Heat Pump Association) accredited installer. For larger commercial and industrial geothermal, an owner might budget for, and engage an engineering firm to act as the owner's representative during the drilling and grouting phase. The on-site inspector would be wise to follow the new IGSHPA *Design and Installation Guide* to insist on important priorities only.

Without inspection, the drilling contractor alone would decide if each borehole is the best it can economically be.

Common field situations which might never be otherwise brought to the property owner's attention are:

- Assured depth of drilling as reported.
- Complete loop length installed and covered as designed.
  - Although HDPE (high-density polyethylene) is marked for length, it can be rubbed off easily, or cutting and fusing of a U-bend by an unscrupulous contractor who encountered a problem could disguise this; and, is all pipe diameter buried hundreds of feet* deep, as specified?
- Insertion of the tremie pipe to the very bottom of each borehole.
- Proper amount of, at least the calculated number of bentonite and silica sand bags, plus extra if seams are filled.
  - Inspectors routinely count that there are four or five sand bags in each bentonite bag, and figure batches versus footage grouted.
- High-pressure, very viscous grout connection between adjacent boreholes with possible bridging and deep hollow area results. This is only discovered later when the next tremie pipe is unable to reach the bottom.
- Required separation from water lines, structures, septic systems, etc.
- Properly heat-fused joints that go beyond the pressure test to ensure a 50 plus year loop life.

Good and dedicated drilling professionals rightly insist other drilling contractors who are underbidding them are too often trusted to meet all the specs promised by the bid. And if they are installing for less than their cost, and taking shortcuts the owner cannot discover, it is unfair to the owner and good drilling professionals deprived of the work.

Just as water well drilling contractors are trusted to say there is adequate water yield even at a shallow depth, geothermal drilling contractors and vertical loop installers are also held to a high professional standard. The results of shortcuts or improper installation may not be evident for years - when anticipated heat pump performance is disappointing. And, digging up a finished loop to see what was down deep is rare and risky.

Sometimes having a paid inspector on the job will not mean the outcome could be different, and maybe what's going on with those tricky seams and rock crevices would not be clear, even to a trained eye. Justifying an expensive geothermal inspector on-site full time is usually not in the budget of a homeowner trying to save fuel oil costs, etc. But an educated owner who can watch the work himself or herself, under the guidance of an expert (available by cell phone), would benefit from the time spent.

In this business of drilling, installing, and covering up, the secret condition only the drill operator knows (and maybe not even his or her boss) should be made known to the owner paying the bill, who should ultimately decide if remedy, or even redrilling is required. Increasing the quality of geothermal installations by bringing them out from under cover, can only help our industry.

The statements and comments in this article are my own and are based on information and references believed to be true and factual. If you have any questions or comments, please forward them to me care of WWGR.

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