Workshop Description

Designing a ground heat exchanger (GHX) is not like designing a conventional HVAC system. A GeoExchange designer is responsible for the energy source of the system much like the utility is responsible for designing the gas wells and pipelines delivering gas to the furnace or boiler, or designing a cooling tower rather than simply selecting one from a catalogue.

The workshop describes a design process that demonstrates the importance of accurate energy modeling on the configuration, size and cost of a GHX and geothermal system. It shows the influence a designer can have on the feasibility of constructing a geothermal system using an iterative design process and working closely with the entire building design team in an integrated design process.

The process illustrates the site specific nature of geothermal system design and helps the designer optimize the building to work over the long term with a GHX designed to provide energy for the entire system. It also shows the impact of various types of hybrid options.

The workshop shows the designer how to generate information needed by a client to develop financial models needed to determine the economic feasibility of constructing a geothermal system for their project compared to a conventional HVAC system based on the utility rates applicable to their project.

The workshop describes methods of testing the capacity of the soil / rock to transfer energy and shows examples of when a thermal conductivity test is warranted in a vertical GHX, methods of determining the capacity of the soil for a horizontal GHX and discussion about pump testing for an open well system.

There are many factors that influence the design of a GHX, including the heat transfer fluid, temperature range it is expected to operate at, pipe size and specifications, methods of placing pipe in the ground, the number of circuits of pipe, considerations for flushing and filling the system, pumping strategies, pumping cost, borehole diameter, grouting, etc. These details are discussed during the workshop.

The mechanical system and GHX must be considered as a system. The workshop discusses the impact of different design strategies such as distributed heat pump systems, distribution operating temperatures, simultaneous heating and cooling opportunities, energy storage, control strategies, etc.

Quality control during construction of the any mechanical system is critical if the system is to operate as expected. This is especially true of the GHX since it is buried, and is, for all practical purposes, inaccessible. The workshop outlines many typical things to review during a pre-construction site meeting and during construction site inspections.

Commissioning and system review with the building operator can make or break a project. What do you look for during commissioning? What does the building operator need to know? There are numerous potential issues that can be dealt with if a complete commissioning procedure is followed.

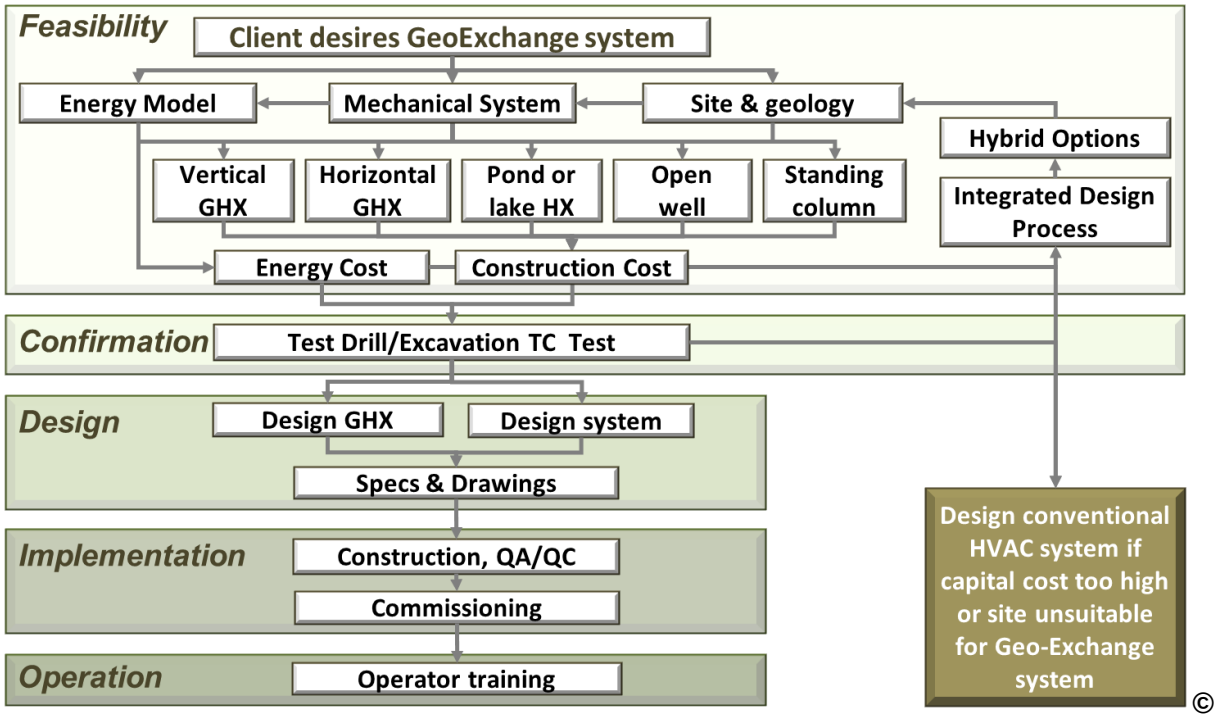
It is beneficial for participants in the course to have access to software needed to design ground heat exchangers. Ground Loop Design (GLD) has agreed to provide temporary licences for the duration of the course. Temporary USB activation keys will be provided in the classroom and will be couriered to online participants. GLD also provides a discount of 10% to all course participants.

A trial version of the software can be downloaded at www.groundloopdesign.com




Developing a Design Process for Cost-effective GeoExchange™ Systems

This flowchart illustrates the design process that will help optimize the design of a cost-effective and sustainable geothermal heating and cooling system. The workshop is designed to help a geothermal system designer understand and develop their own approach that is suitable for their clients and the projects in the areas they work.



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This design process has been well accepted by clients who want to know if they will they receive a reasonable return on their investment. This can only be accomplished by developing an accurate energy model that can be used to estimate energy cost and determine the energy transfer to and from the ground heat exchanger. This information allows the owner to make an informed decision to proceed or not proceed with the design of a geothermal system.

Consulting with a geologist, driller or excavation contractor before drilling test holes or test excavations provides the designer with information needed to develop a preliminary ground heat exchanger design for the land area and geological conditions on the site and is used to determine if a test borehole is needed, what the test borehole depth should be and the size of pipe that should be used.

If a test borehole confirms assumptions made during the preliminary ground heat exchanger modeling were accurate, the owner can again make a decision to proceed with a geothermal system design or not, and feel comfortable that the system will work as expected.

Developing a good drawing set and well written specifications raises fewer questions for the mechanical and ground heat exchanger contractors, resulting in more accurate bids with fewer “contingencies”. Appropriate site inspections during construction and good commissioning specifications help ensure the project is installed and operates as intended.