

## **Commercial Geothermal (Ground Source Heat Pump) Systems Design & Construction Considerations**

*A list of items is provided below to help you prepare to work with a mechanical contractor, mechanical engineer or other construction professional to design and install a commercial scope GSHP system. Depending upon the specifics of the installation, additional information may be required.*

Possible discussion items for review with your GSHP professional:

- Do you require only a rough cost estimate, feasibility study, or detailed installation proposal for a GSHP system?
  - Rough cost estimates or ranges may be possible from general description items (type of facility and use, conditioned space, location, etc.)
  - Feasibility studies and detailed installation proposals will require cooling and heating load calculations, ground loop design, etc.
- Your role: Are you the owner, architect, engineer, general contractor, or other, seeking design or construction assistance?
- Do you require just the design of the ground loop, or complete mechanical design?
- New construction or retrofit?
- If this is a retrofit, what is the vintage of original construction?
- Regardless if new construction or a retrofit, can a site visit be scheduled?
- What is the configuration of the facility – physical configuration, orientation, multiple levels, etc.?
- What is the total conditioned floor space?
- Do you have a set of architectural plans available for review?
- Do you have a mechanical engineer engaged to design the mechanical system? What is the ME's experience level with GSHP systems?
- For cooling and heating load calculations, required for equipment sizing and design of the ground loop, insulation values, door and window schedules, lighting schedules, outside air requirements, etc., will be required.
- What is the address or physical location? This is required to factor in climate conditions for load calculations.
- How much land is available? This will influence what type of ground loop options can be considered.
- Do you have a geotechnical report or well logs available for the site? For most commercial scope projects, a thermal conductivity test is advised with the test parameters determined by the asset responsible for design of the ground loop.
- If there is a pond or lake accessible, a surface water heat exchanger may be feasible,

- Is your preference for radiant in-floor or forced air space conditioning? For some applications, a combination of delivery options may be preferred.
- Be prepared to discuss your preferences for zoning.
- For some commercial applications, control of the system may only require a simple thermostat for each zone. For larger residences, varying levels of automated controls may be an asset. Your GSHP professional can discuss options with you.
- Your GSHP professional may have additional questions or suggestions depending on the specifics of your situation.

## **Summary Design Process - Commercial**

1. Cooling and heating loads are calculated to determine sizing of ground source heat pump equipment. Other considerations for loads are factored in, such as outside air requirements and how outside air is managed, how the system is controlled, occupancy durations, etc. For commercial applications this usually requires a detailed hourly load calculation which is necessary for the design of a commercial scope closed loop ground heat exchanger.
2. For forced air systems, the cooling and heating load calculations, minimum air flow requirements are also considered for GSHP equipment sizing.
3. For radiant floor systems, water flow rate and other factors are used to aid in GSHP sizing.
4. Ducting and/or radiant floor requirements are designed to be compatible with the new GSHP system.
5. If the facility is a retrofit installation, an assessment of the existing ducting and/or radiant floor is made and any adjustments are accounted for.
6. Appropriate ground heat exchanger or surface water heat exchanger options are determined depending on site variables.
7. Once load calculations and GSHP equipment selections are confirmed, and appropriate GHX/SWHX options are shortlisted, final design of the system is completed.
8. For either vertical (drilled) or horizontal (excavated) ground heat exchangers, a thermal conductivity test is typically required after a preliminary design is completed to select test parameters. Note: A TC test should not be programmed until the building loads and equipment variables are determined, and preliminary GHX simulations are completed to determine placement, etc. See [Thermal Conductivity Testing](#).
9. Most variables will require coordination with other design assets including the architect, civil engineer, general contractor, etc.
10. Other considerations may factor into the final design, such as local regulations or codes that must be considered, surface infrastructure that must be accounted for, scheduling, etc.