

Permafrost Technologies

Thermosyphons

Thermosyphons transfer heat

No moving parts, zero power consumption.

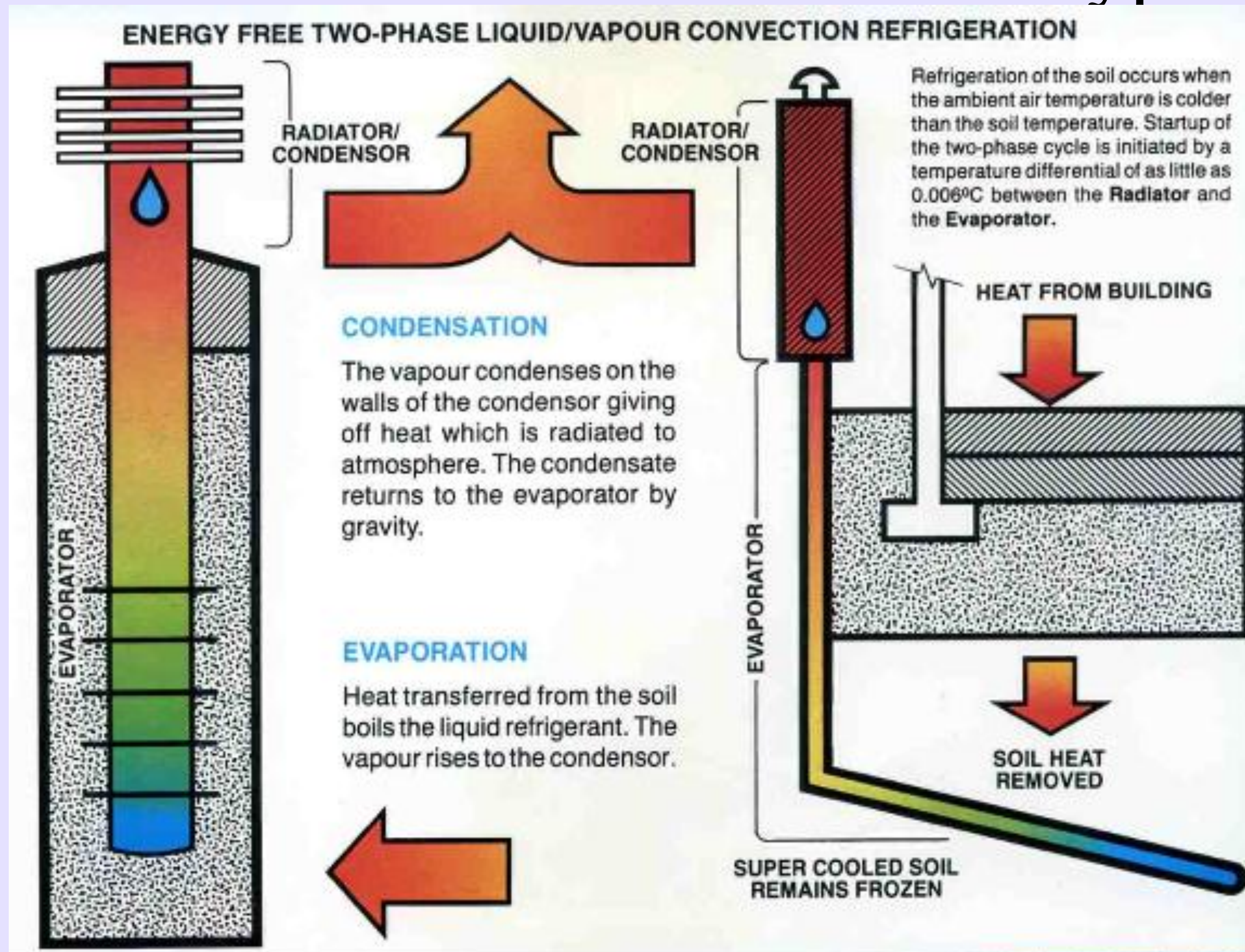
Climate Change considered during design.

Arctic Foundations Of Canada

Elie, Manitoba



Two-Phase Thermosyphons



In the Evaporator, the working fluid absorbs heat and turns from a liquid into a gas.

The gas rises to the radiator and condenses into a liquid.

The liquid falls down, because it is heavier than the gas, and enters the evaporator to start the process again.

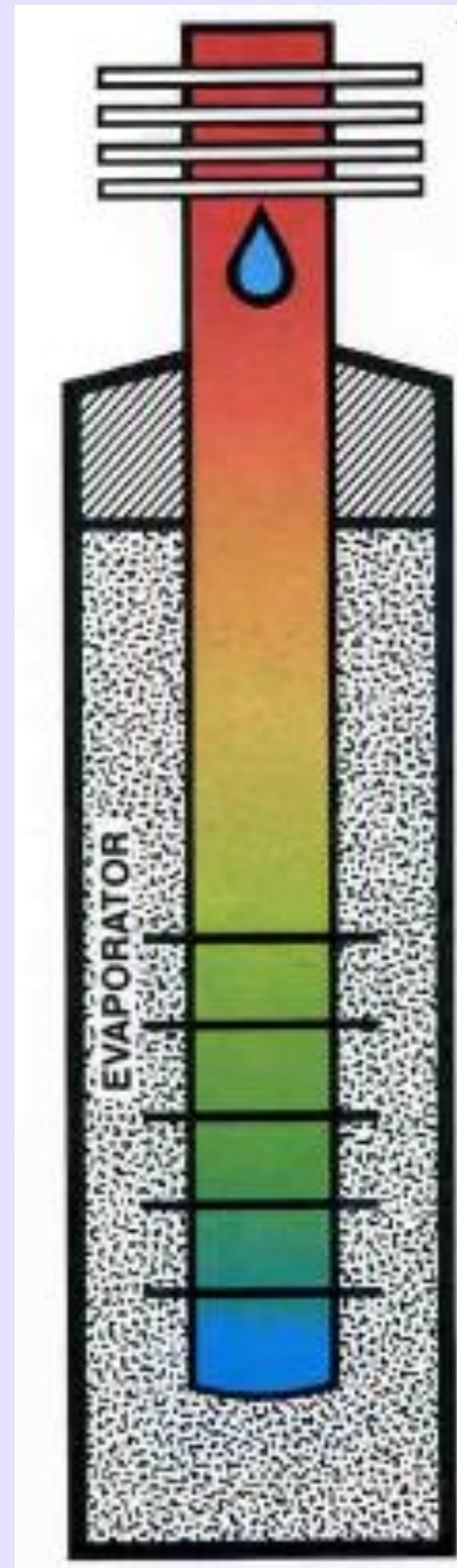


Typical Thermosyphon Applications

- To allow heated structures to be constructed at-grade on permafrost soils.
- To permit building construction in ice rich soil
- To passively or actively refrigerate the soil around buried heat sources
- Create below grade frozen barriers for contamination containment
- Create frozen dams for water control
- Maintain or create permafrost worldwide.
- Hockey rinks
- Thermosyphons can be used ANYWHERE
- Anywhere heat must be movedany thoughts????



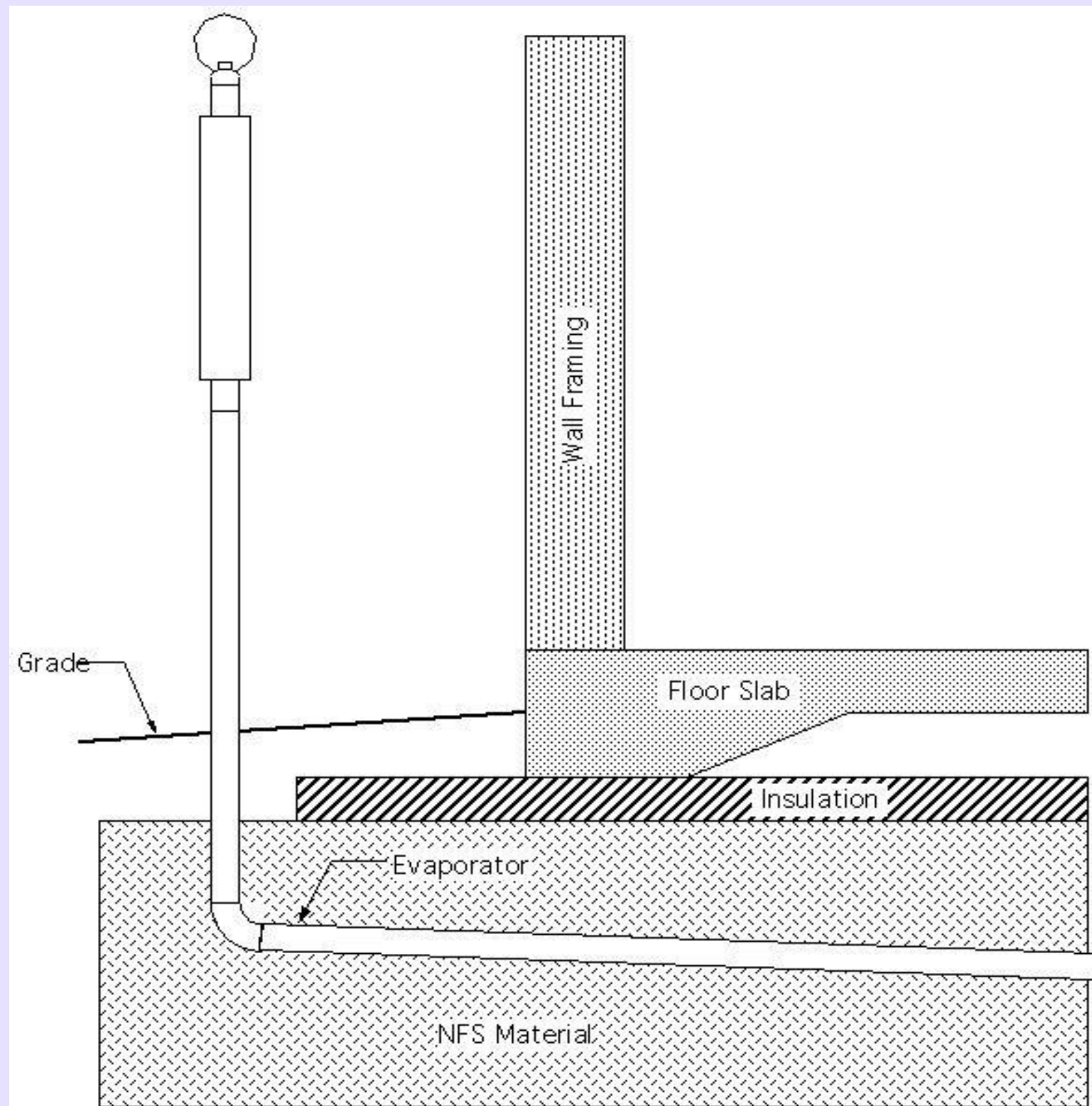
Vertical Thermosyphons



Thermosyphons are used to provide passive refrigeration to maintain or create permafrost.



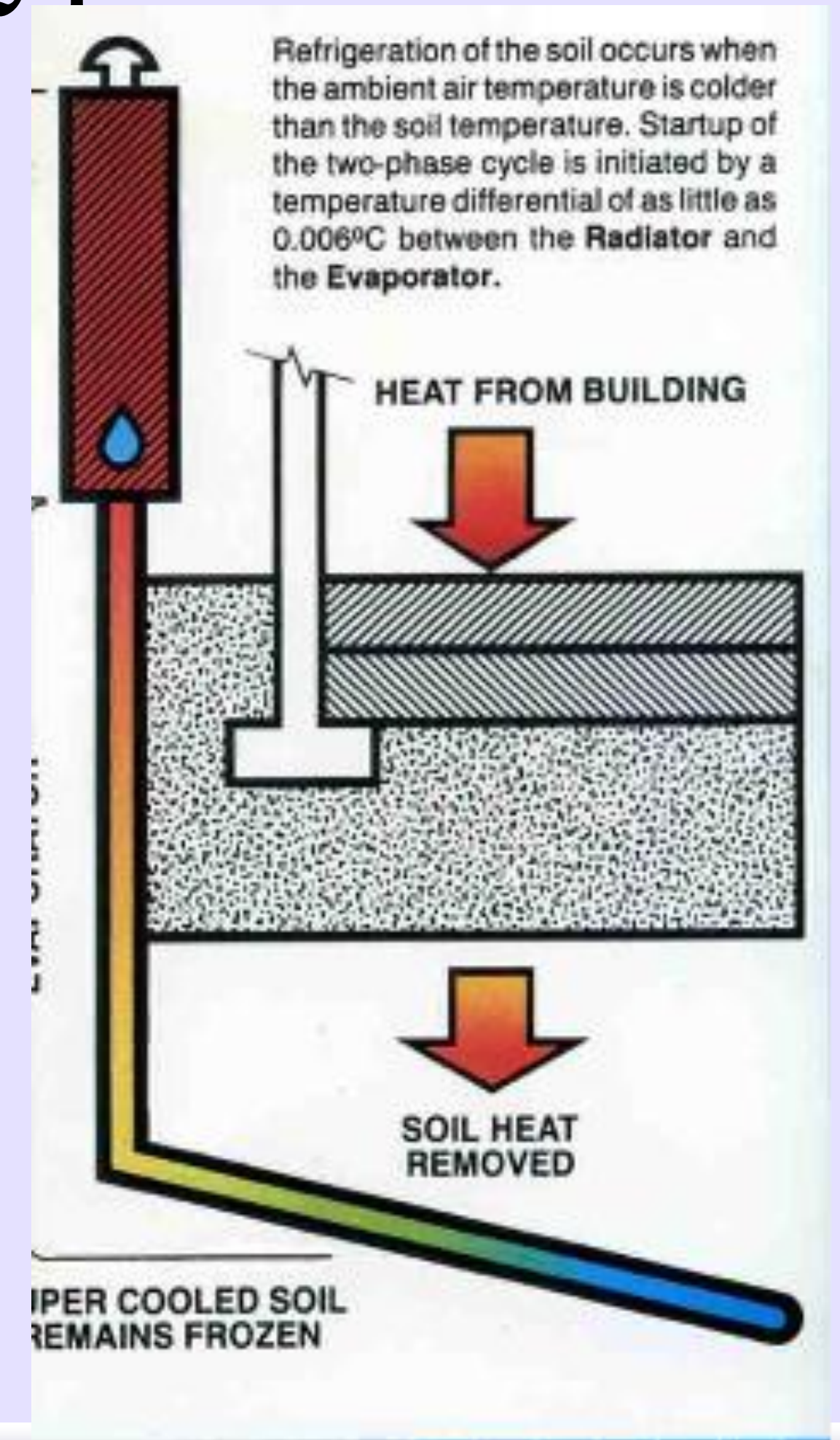
Sloping Evaporator Thermosyphons



Sloping evaporator Thermoprobe in typical subgrade cooling installation beneath slab on grade structure.

Excellent opportunity for retrofit applications.

Typically used below heated structure.



Flat-Loop Thermosyphons



Typically used on new installation with full access under the building.



Hybrid Thermosyphons



Hybrid thermosyphons are designed so that they can be cooled actively as well as passively.



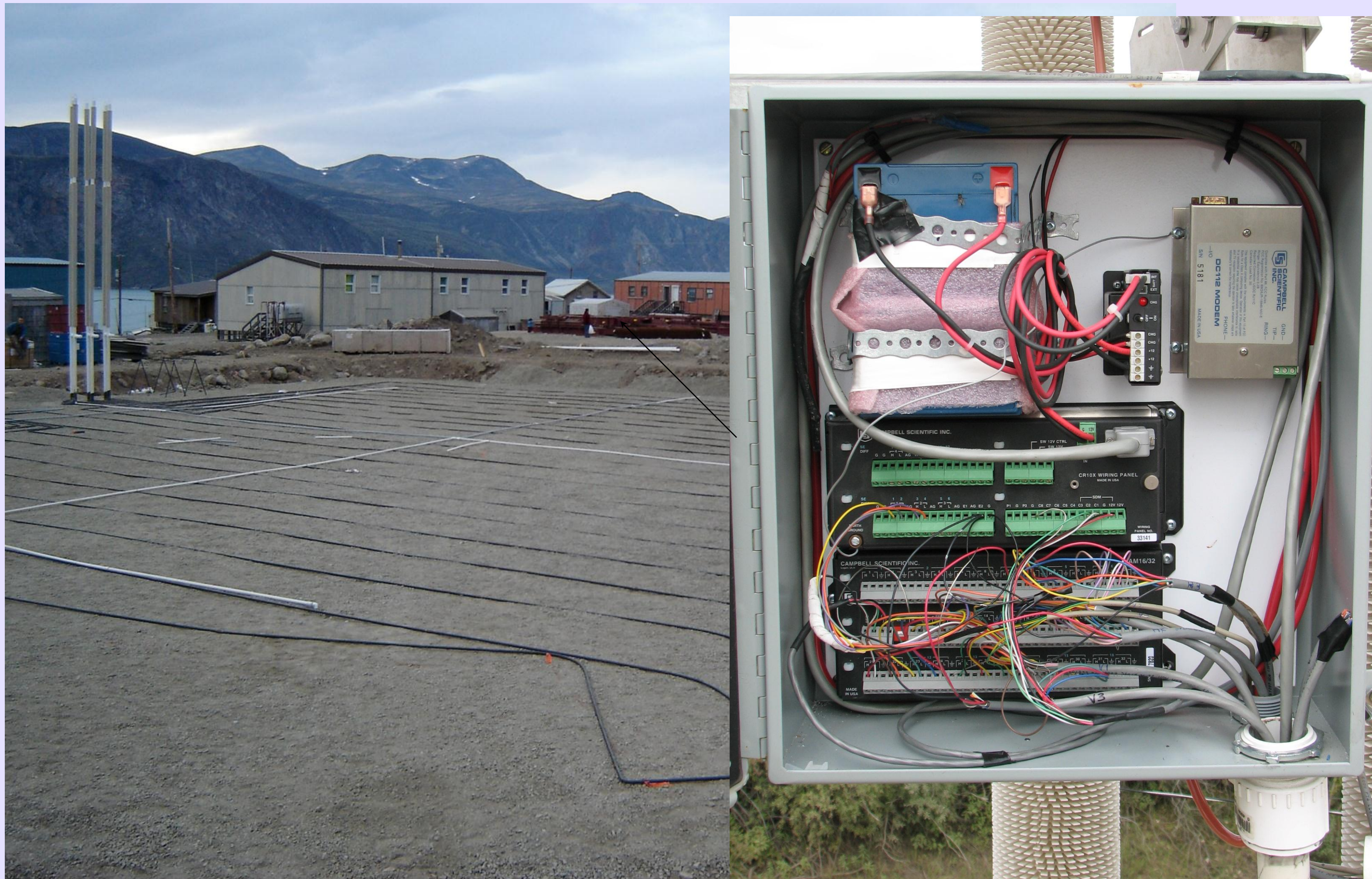
Hybrid Thermosyphons



Hybrid system may be used to maintain permafrost during the first summer.

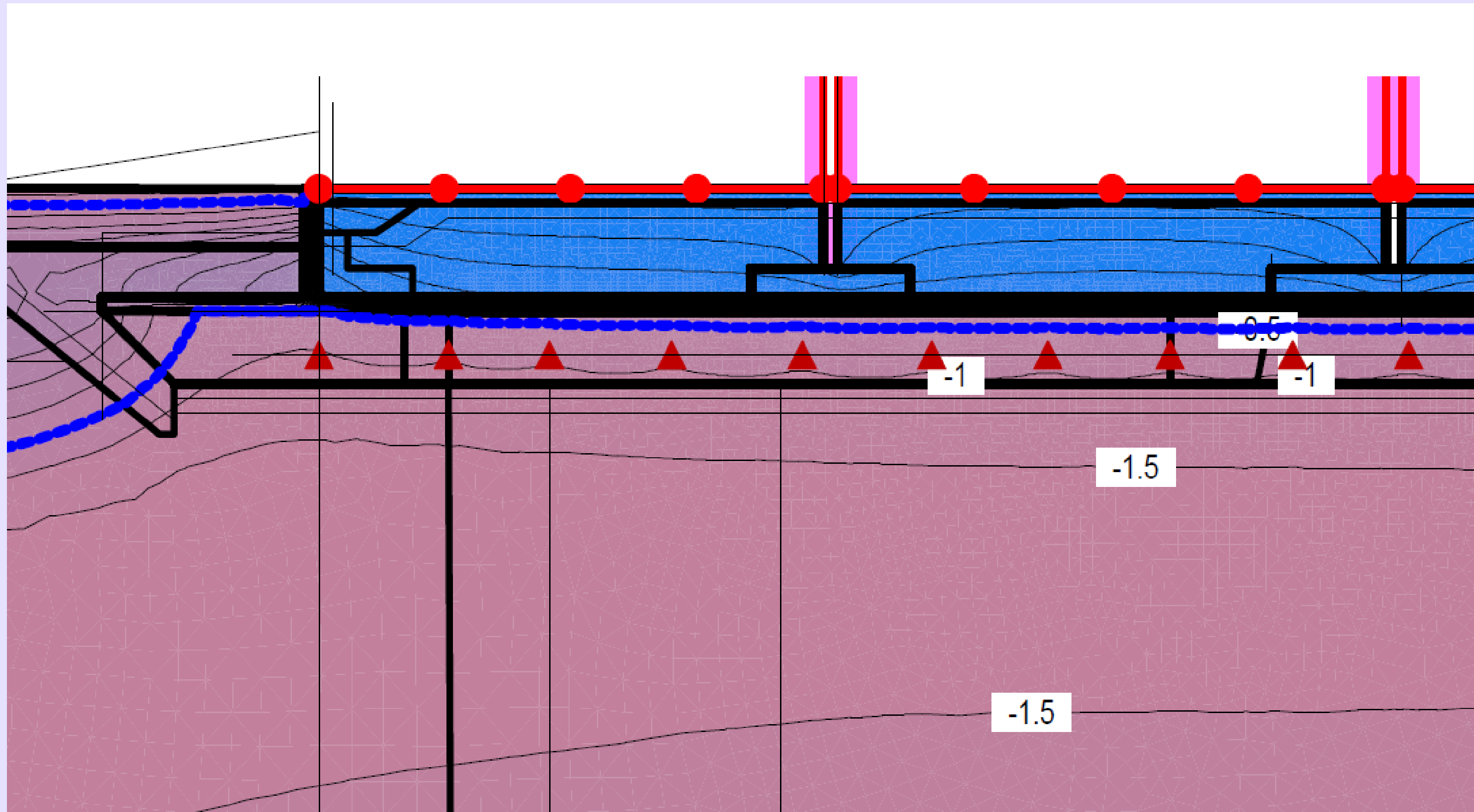


Ground Temperature Data



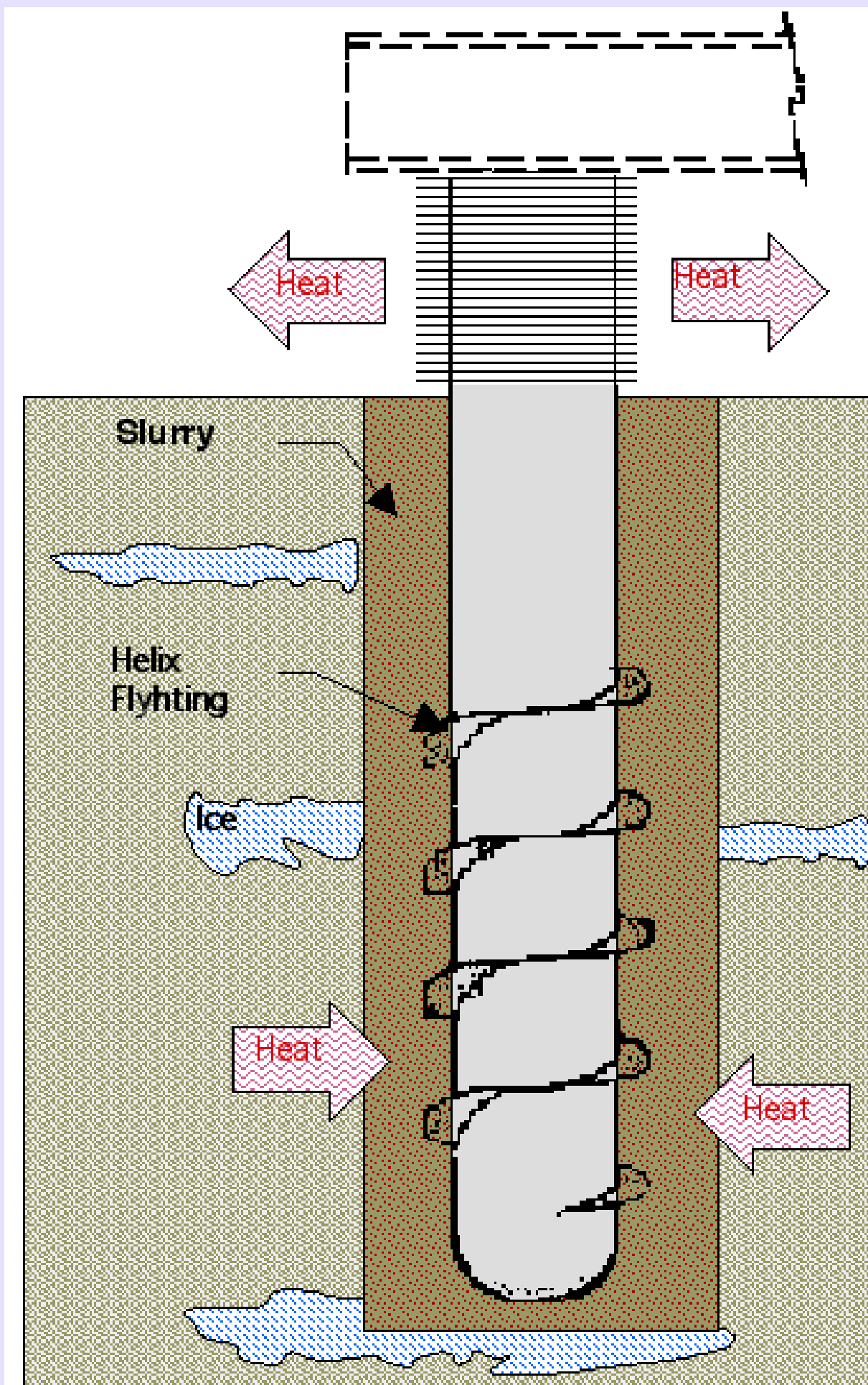
Modeling

Use Finite Element Models
to predict performance



Thermopiles

Thermopiles are load bearing thermosyphons.





Permafrost Adaptation

Thermosyphon Considerations

- Each system is designed to suit the application.
- Global Climate Change and site specific conditions are considered during design.
- Thermosyphons are proven technology through Canada and USA
- CSA Standard on Thermosyphons is currently being prepared.

Global Climate Change Adaptation Consideration

- Installation of thermosyphons at existing buildings is possible.
- Hybrid refrigeration units can be retrofit onto existing thermosyphons



Thank you

