



# Chiller Plant Replacement and Hybrid Flexibility

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# Ground Source i.e.

- Geothermal
  - NOT hot rocks
- Earth Source
- Passive Solar
- GeoExchange
- GLHP
- Geo
- Geotherm



# How is it known?

- Housing
  - Multi-family attached
    - DOD, HUD, FmHA
    - Small water to air <3 tons
  - Single family detached
    - DOD, FmHA
    - Small water to air <5 tons
- Small Commercial <10 tons
  - Small retail
  - Small office



# What is missing?

- Commercial
  - Multi-family attached
    - Chilled water (think chiller & tower)
    - Heated water (think boiler or steam)
  - Commercial buildings (large scale)
    - Chilled water
    - Heated water
    - Ice Storage
- Industrial
  - Process water
  - Load sharing, load splitting





# New Chiller Plant Replacement

- Bankable capacity
  - Sizes from 3 tons to 45 tons (ISO 13256 WLHP/GSHP)
  - Existing projects to over 2,500 tons (8 mW)
  - Staging as low as 15 tons for 30 ton modules and 22.5 tons for 45 ton modules
    - (reduced demand for demand side metering)
- Advanced BMS Integration
  - Custom programming
  - BacNET, LON and N2 Open protocols





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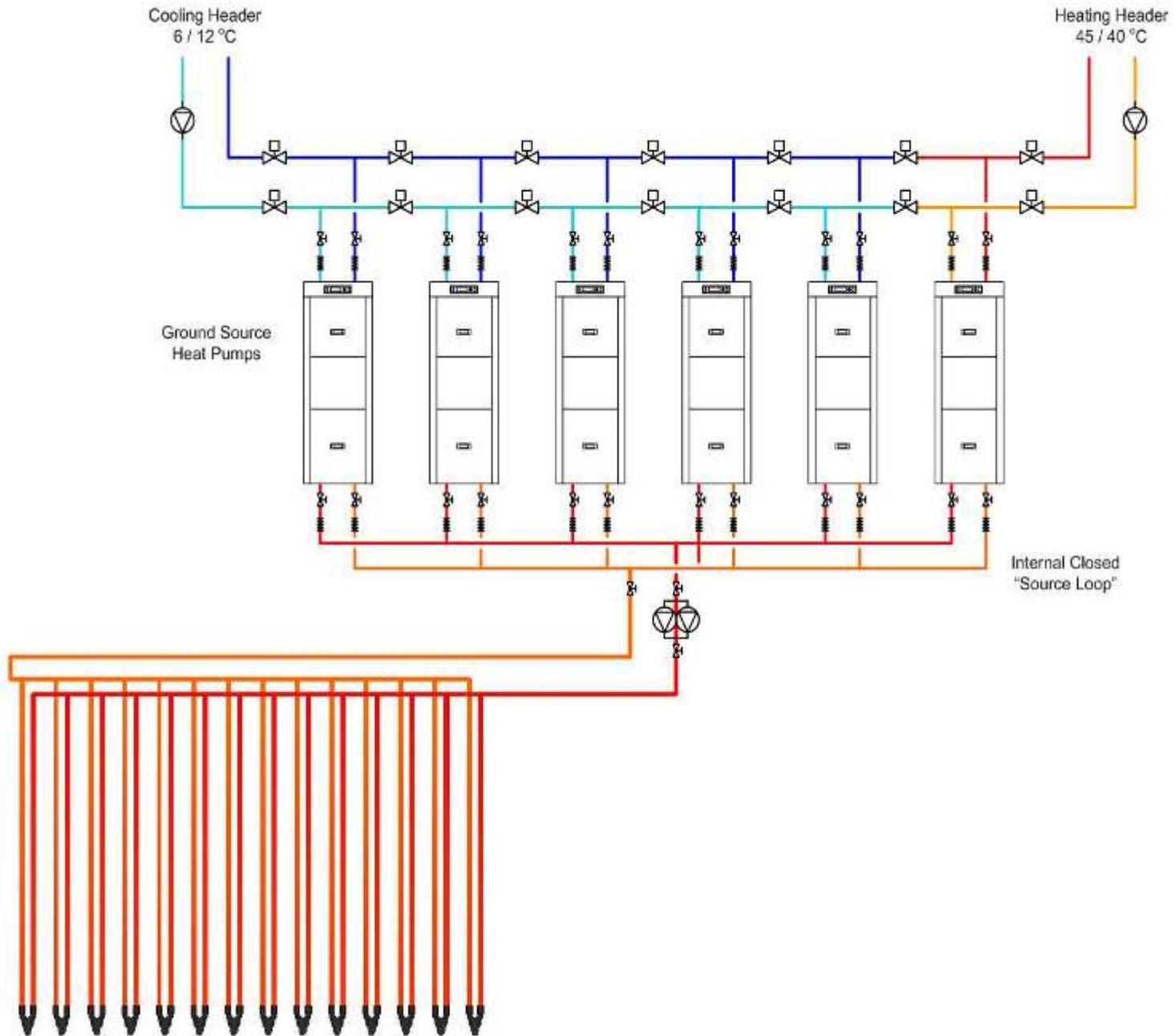
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# Chiller Plant Retrofit

- Ease of replacement versus conventional chillers
  - No need to remove a wall or excavate the street
  - 45 ton module is compact and transportable
    - Footprint – 24” x 52” (608mm x 1330mm)
    - Height – 71” (1803mm)
    - Installed weight – 1842 lbs (836 kG)
    - Can be moved in a standard commercial elevator
    - Dimensional and weight data based upon a reversible chiller with the optional sound reducing enclosure



# Hybrid Applications

- What is a Hybrid?
  - A combination of more than one source
- How does it work?
  - It takes advantage of multiple sources to maximize the operating efficiency of the system
- Why do it?
  - Improve system efficiency while lowering overall installed cost



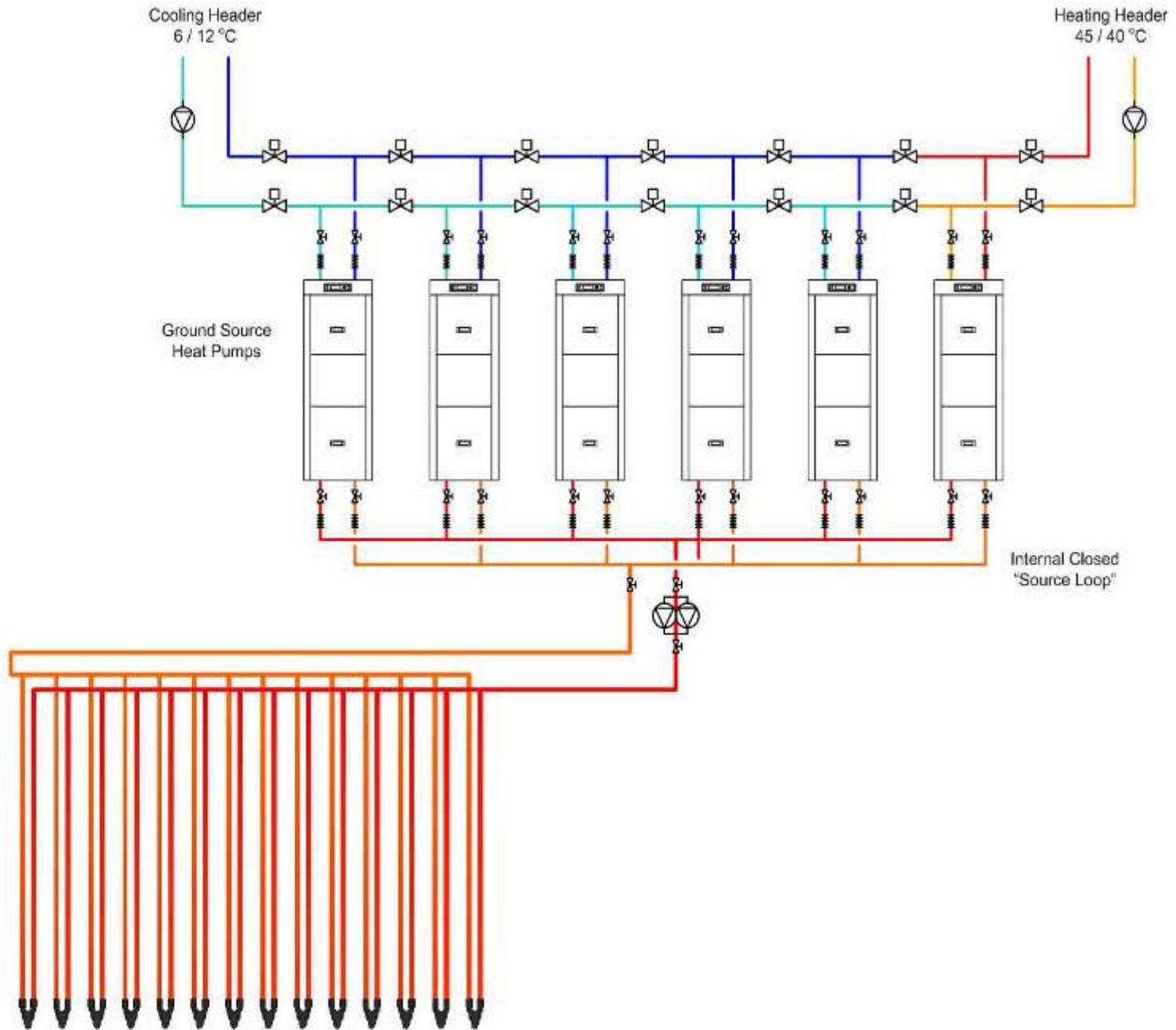
# Standard Commercial Source

- Vertical
- Pond/Lake
- Open
- Pile



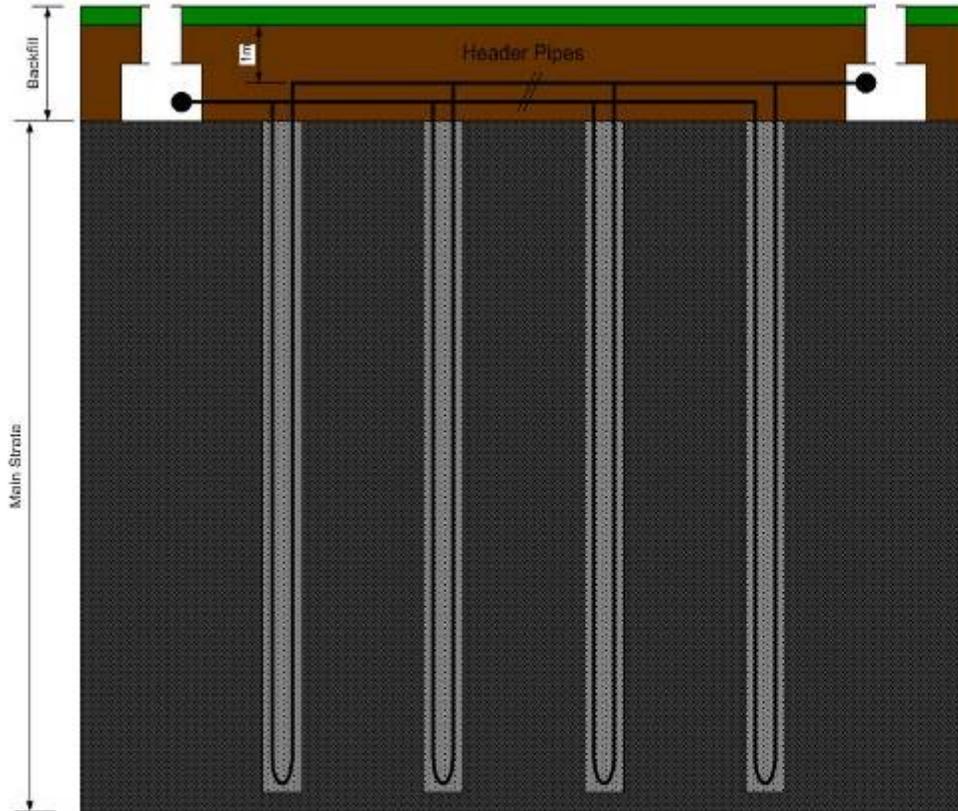
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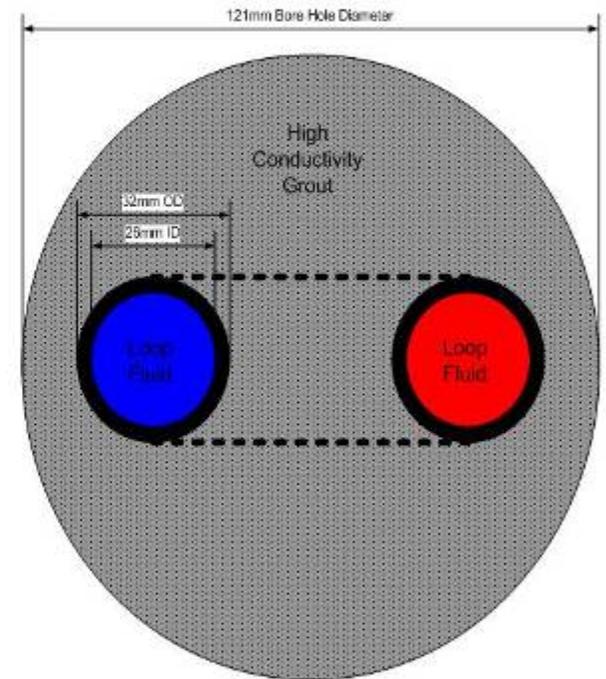
## Loop Field Cross Section

Header  
Vaults



Boreholes Containing Loop Pipe Sealed In  
High Conductivity Grout

## Bore Hole Detail (Plan)



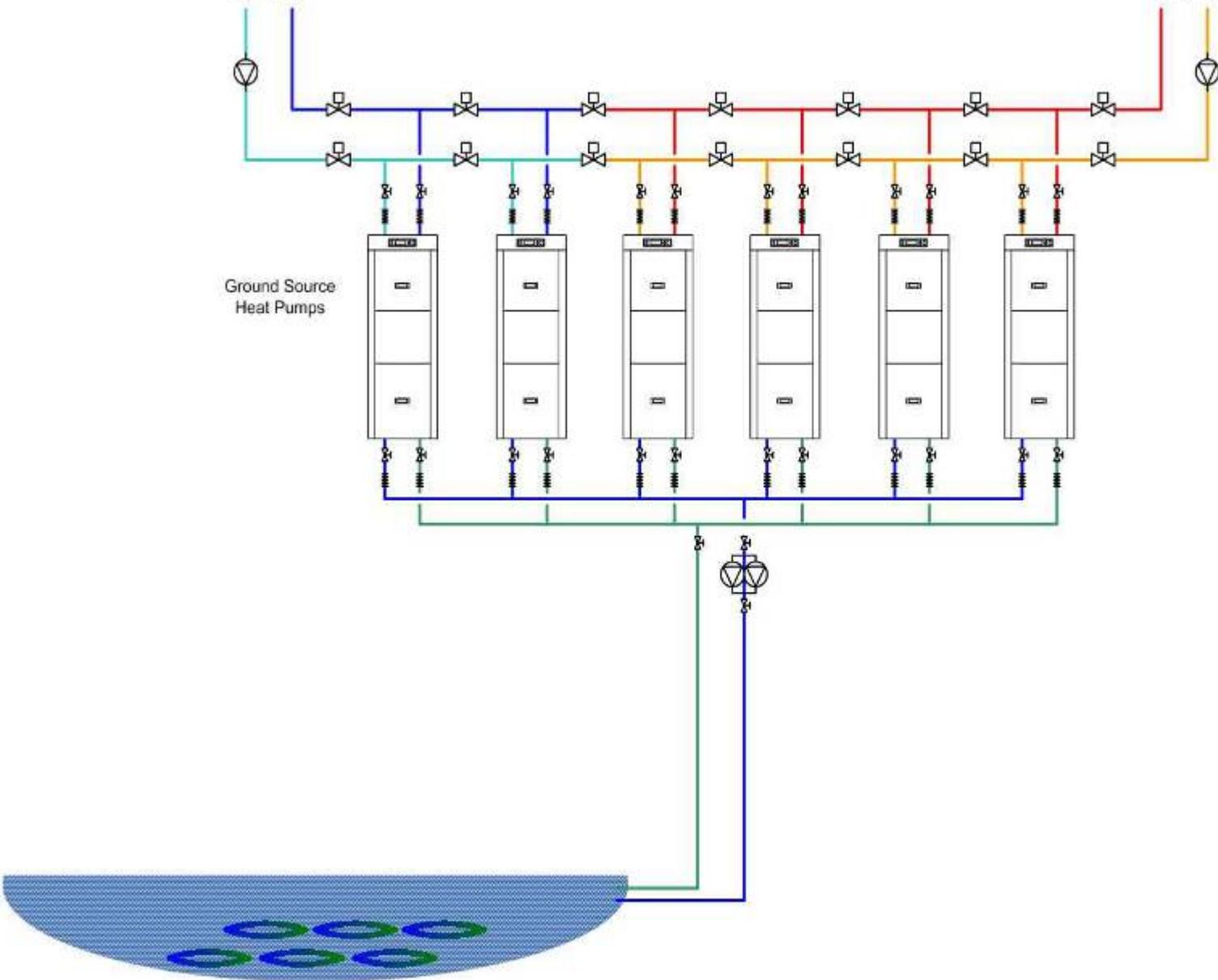
Typical Geothermal Loop Field Layouts

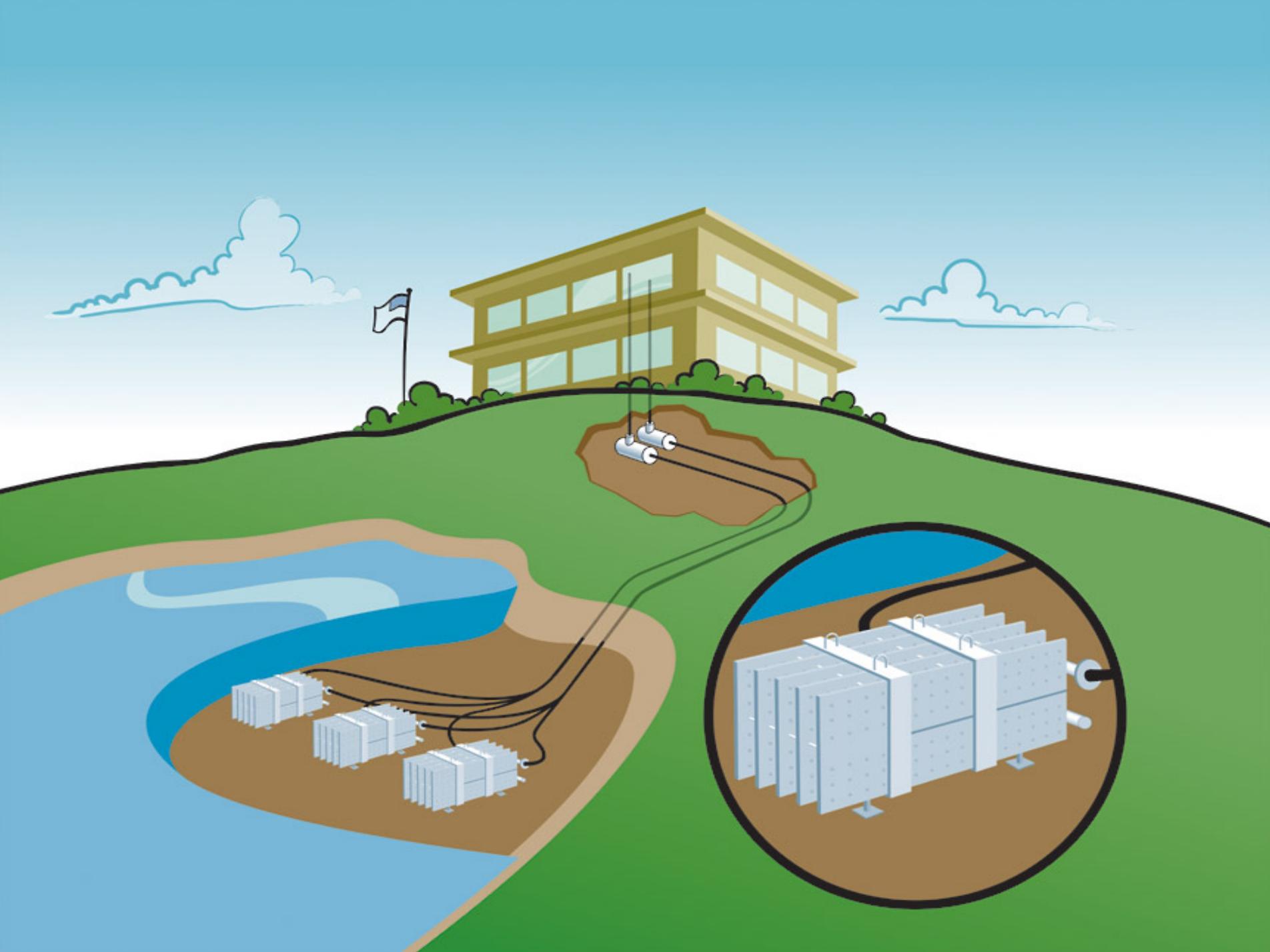
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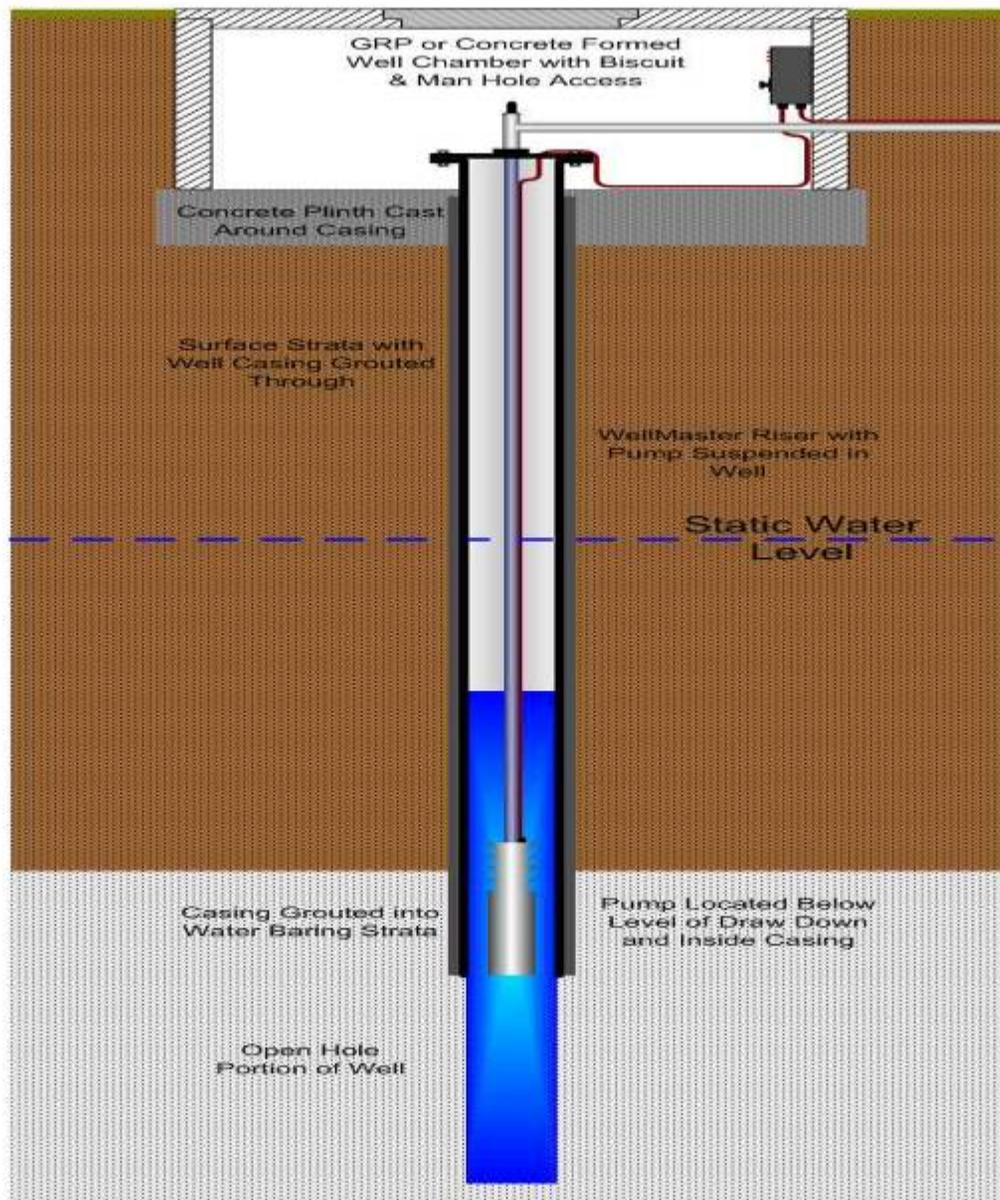
Cooling Header  
6 / 12 °C

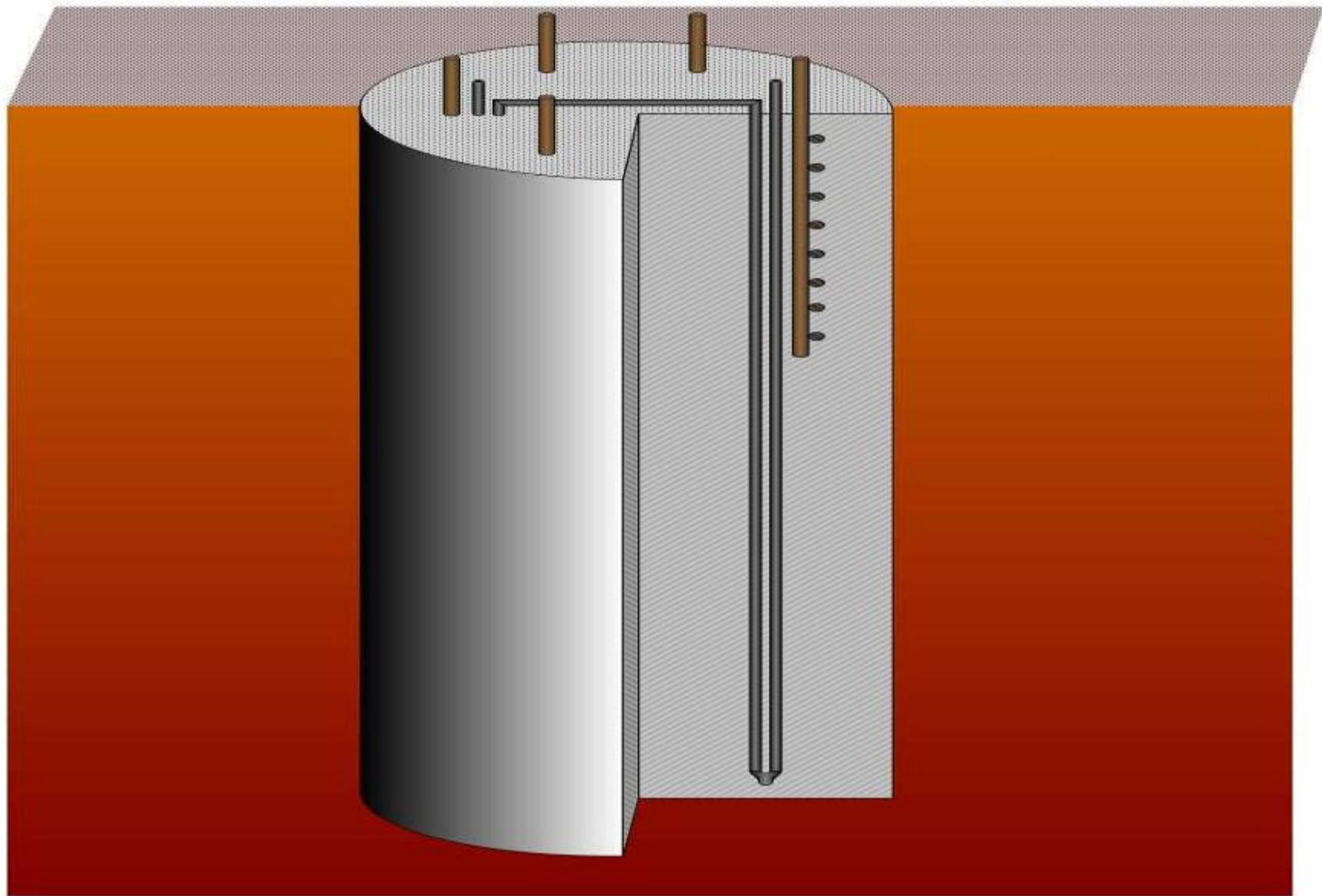
Heating Header  
45 / 40 °C

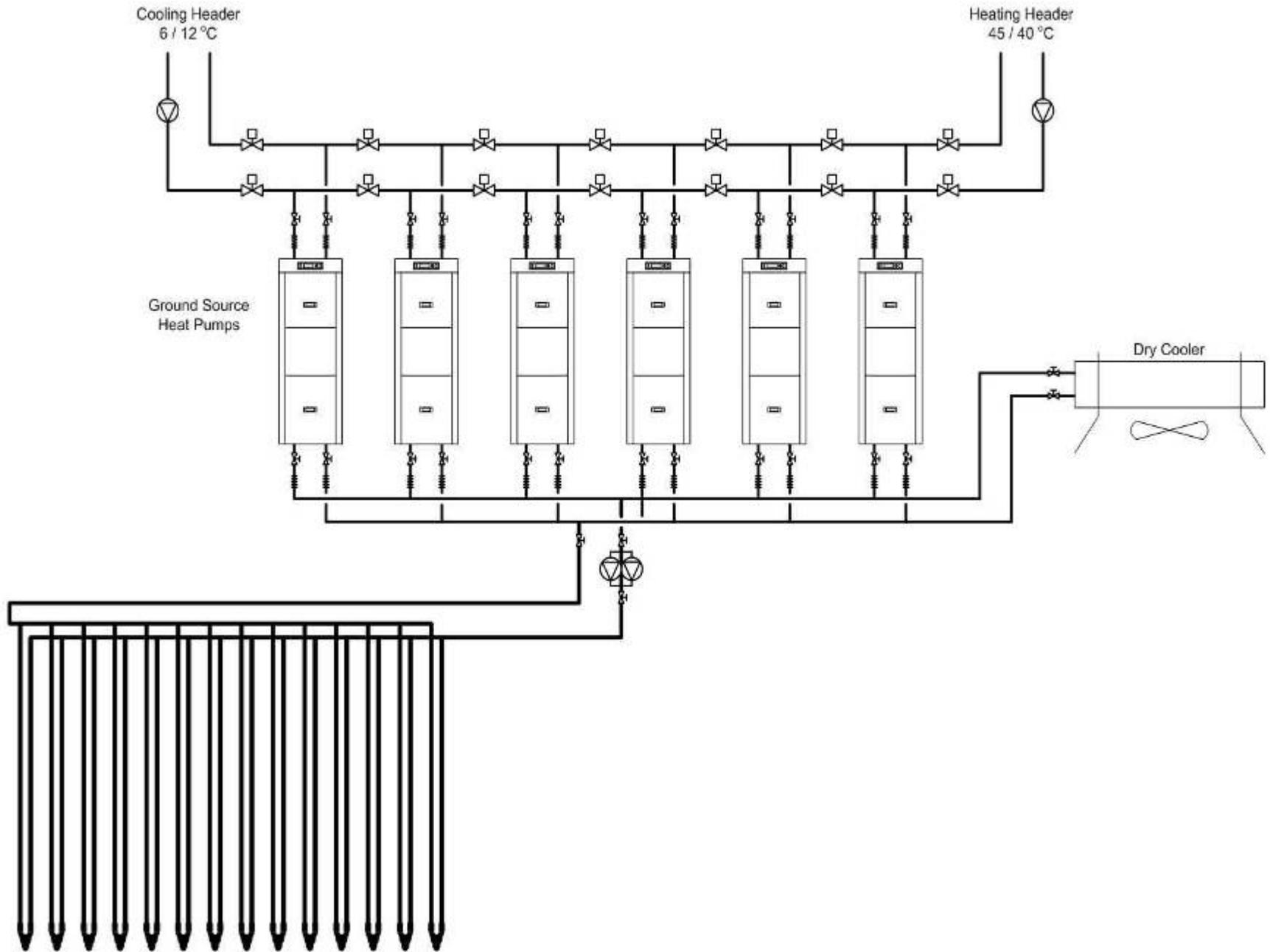
Ground Source  
Heat Pumps

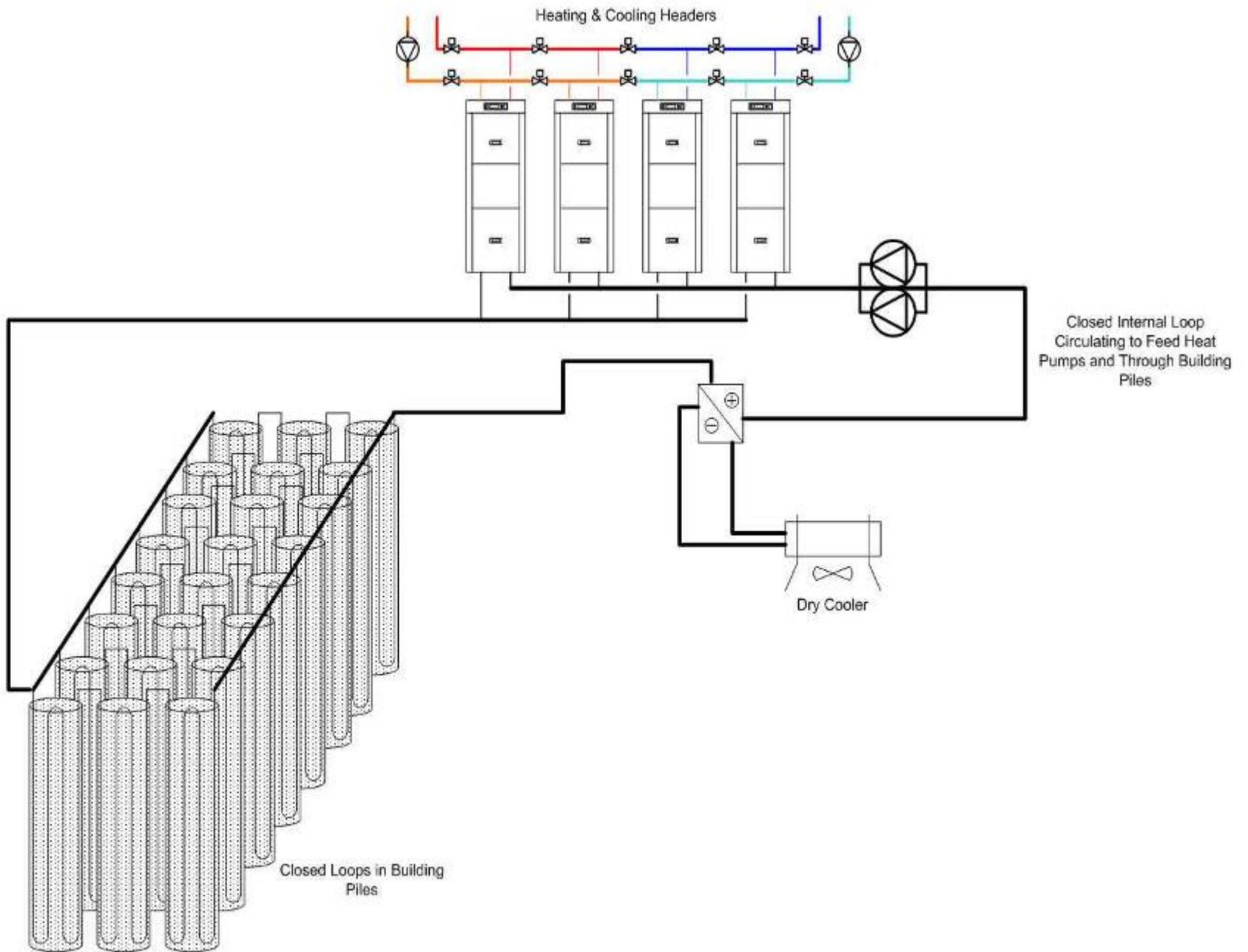


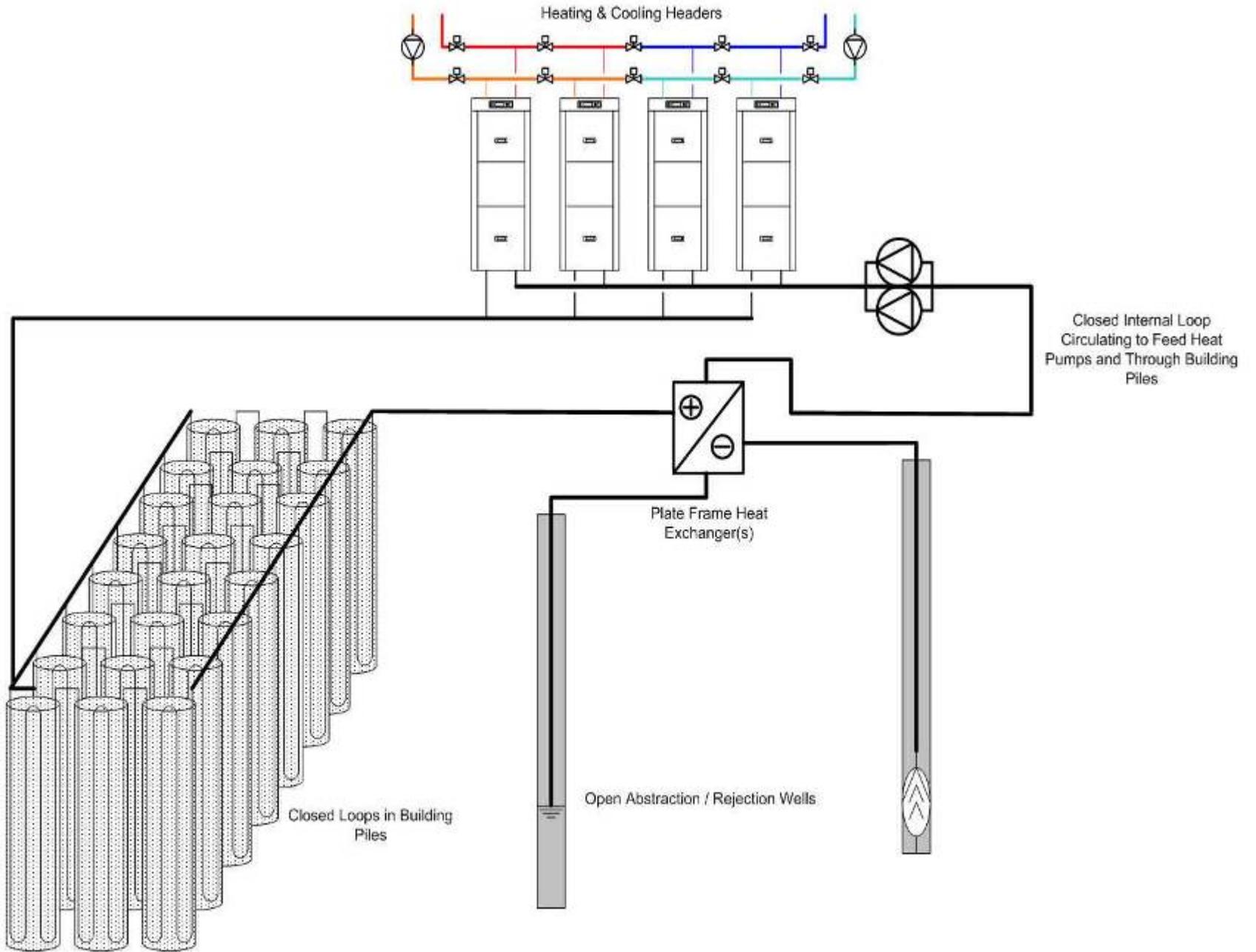














# We're Done

- Thanks for your time, attendance and patience.
- The floor is now open for questions.

