





**LoopMaster**<sup>®</sup>  
Geothermal Earth Loop Design and Installation

North America's Leading Earth Loop Design and Installation Companies since 1983  
Mike Kapps – Vice President LoopMaster International, Inc.



**Mike Kapps**  
Vice President - LoopMaster, Inc  
August 3-6, 2008



# Types of Loops

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- **Vertical closed loop**
- **Pond/lake closed loop**
- **Horizontal closed loop**
- **Directional bore closed loop**

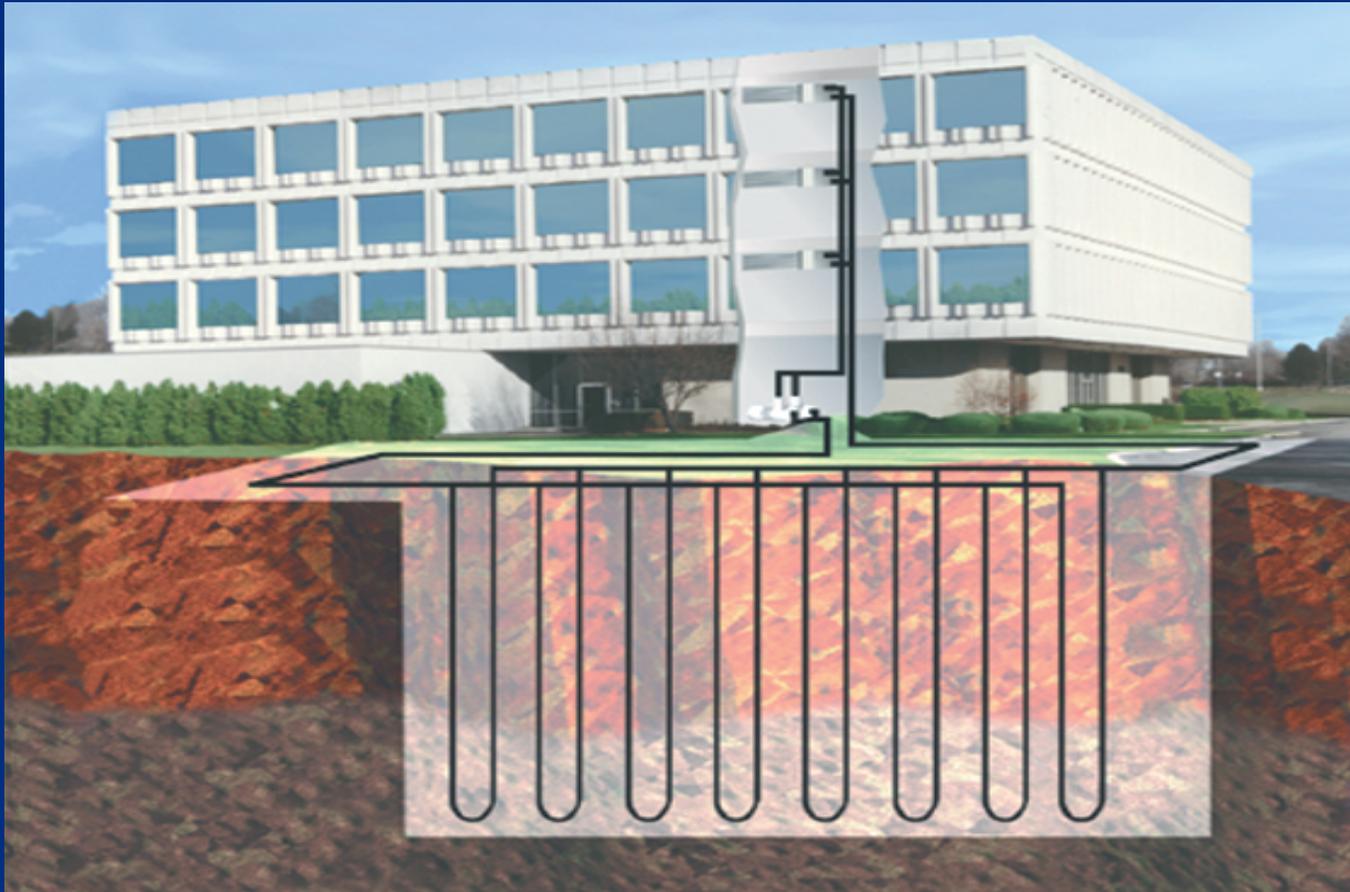


# Loop Design –Materials

- Polyethylene HDPE.
- Polyethylene pipe sizes,
  - \* .75” - 1/1/4” in borehole
  - \* 4” - 12” supply & return
- Pipe 2” and smaller, SDR 11 typical
  - \* 3” and larger SDR 11 or 15.
- Quality HDPE pipe should have a minimum of 50 year manufacturer warranty.
- Only type of connection allowed is heat fusion, (socket fusion, butt fusion, saddle fusion, and electro fusion).
- Total of 20 feet of head recommended.
- Even number of circuits on each header.
- Valve vaults, (polyethylene, concrete).



# Vertical Loop



# Drilling



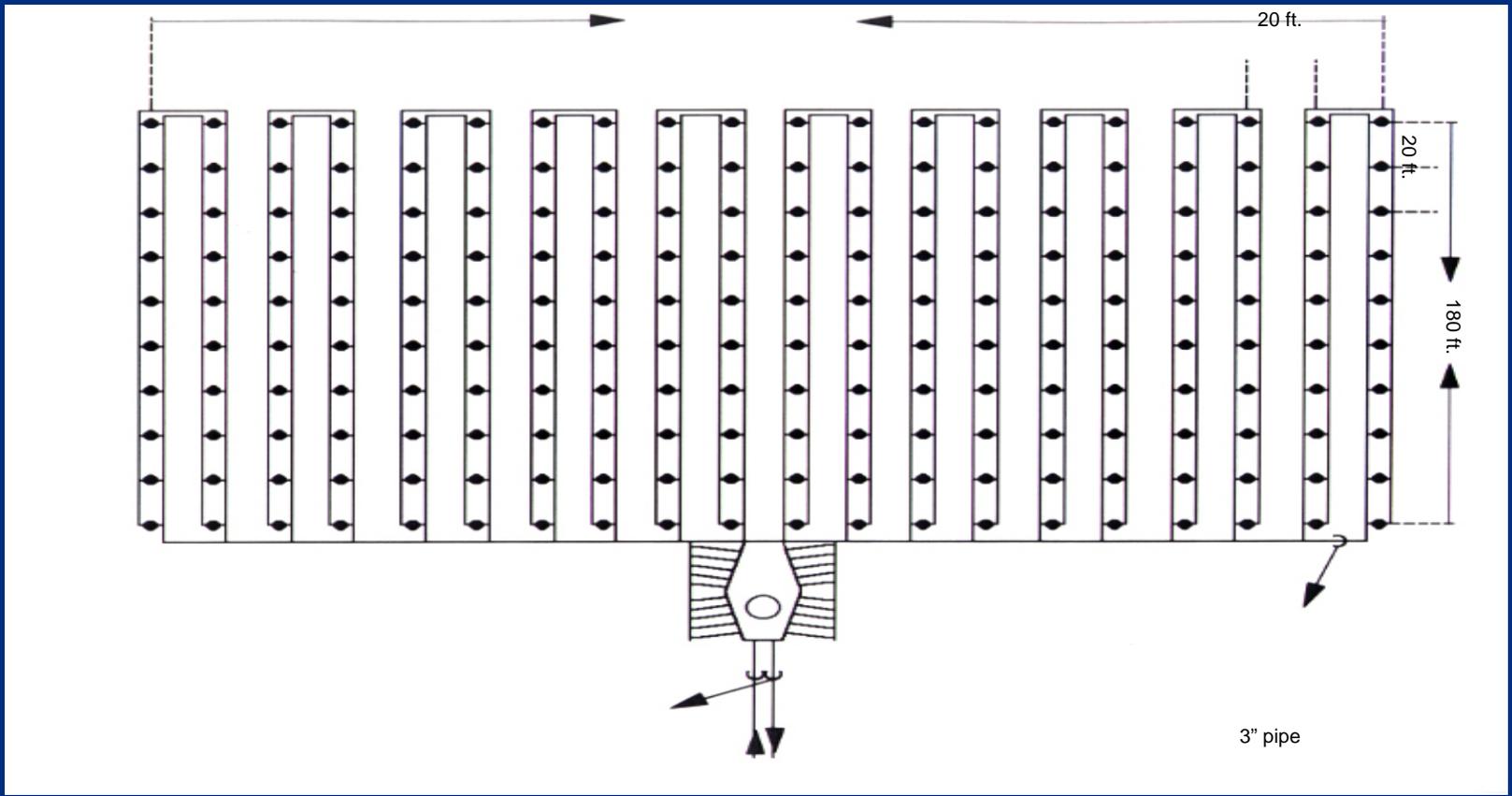
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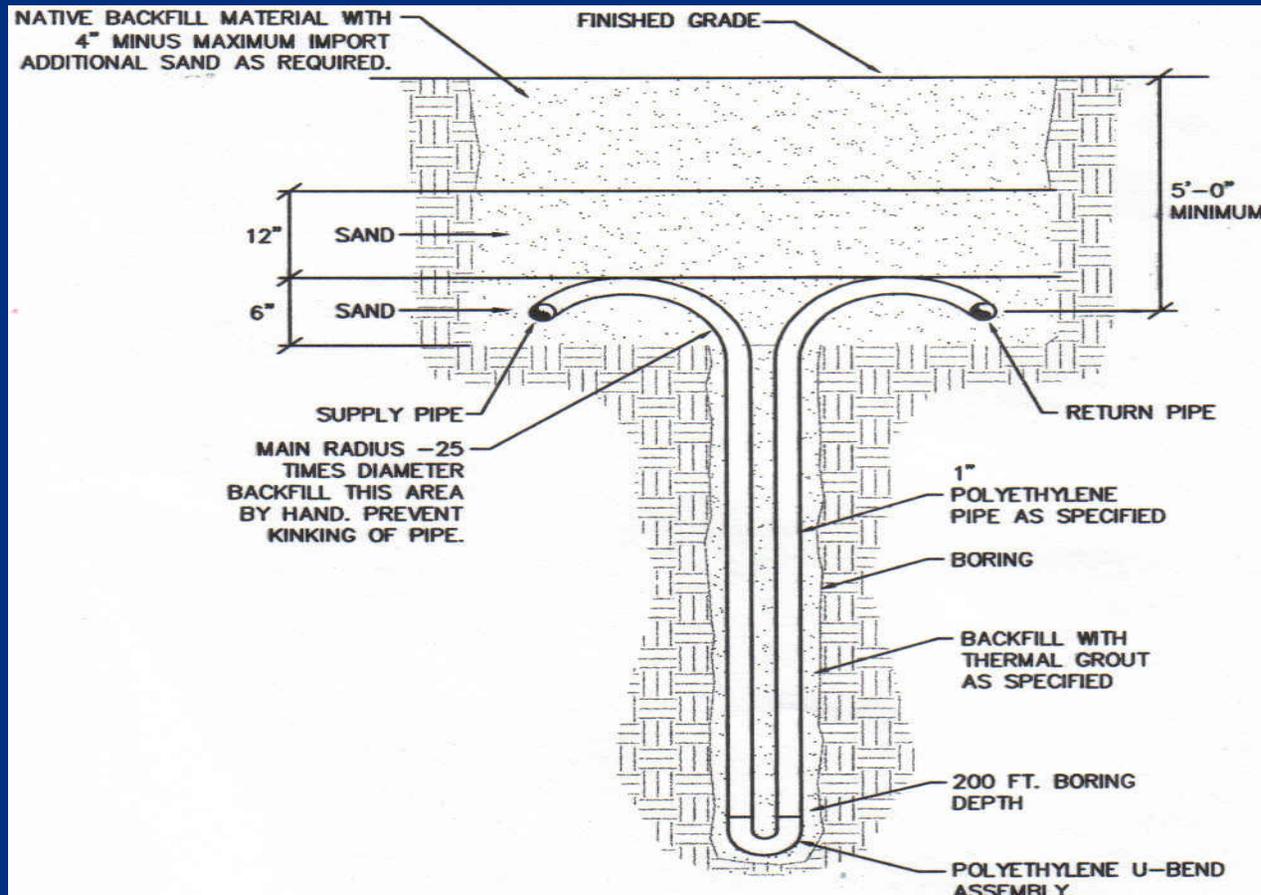
# 200 Hole Loop Design

380 ft.

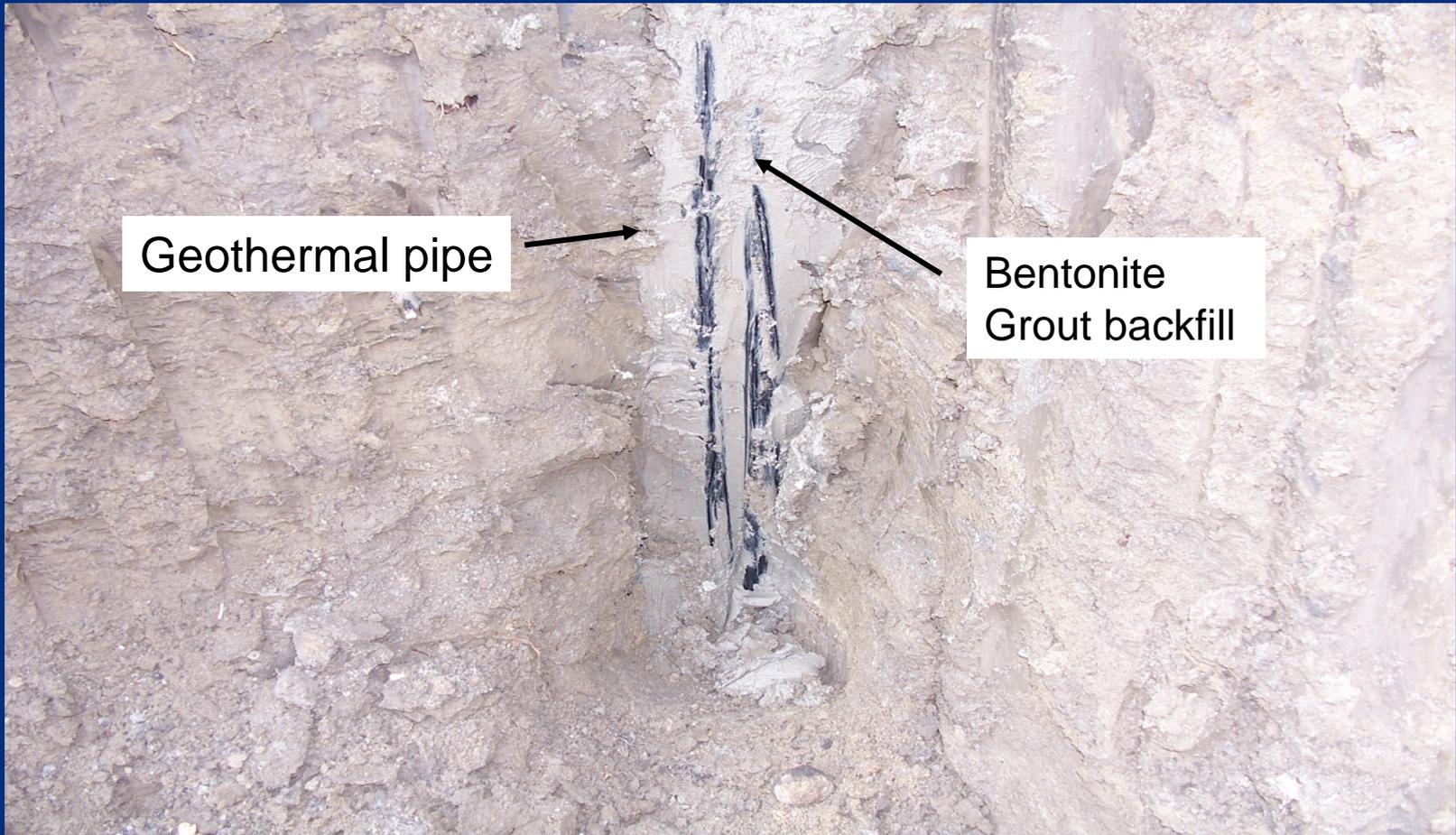


10" pipe

# Typical vertical bore detail



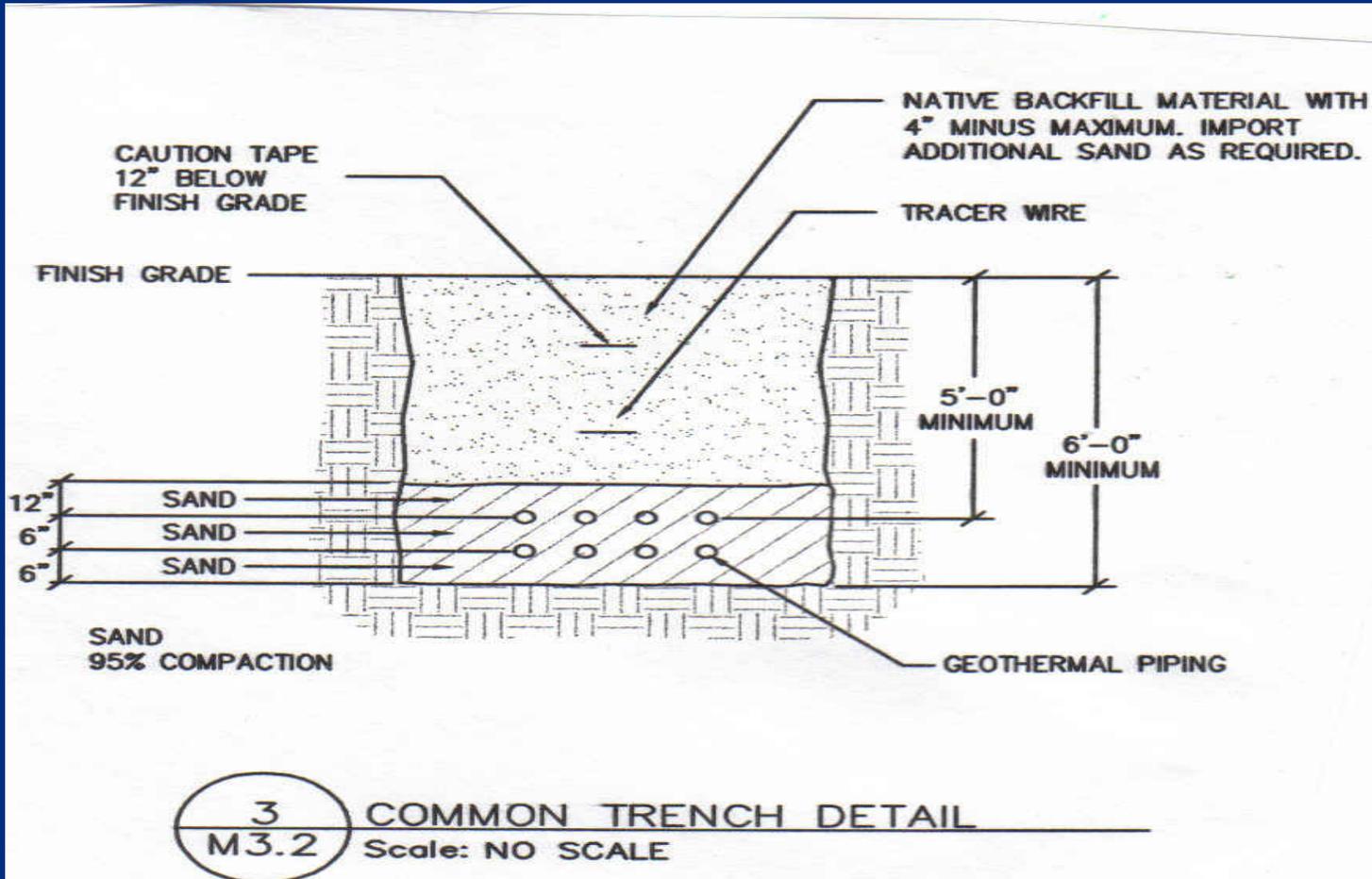
# Vertical Loop/Grouted



Geothermal pipe

Bentonite  
Grout backfill

# Typical supply & return piping trench detail





# Loop Design (pond)

**Surface area of pond/lake.**

**Accessibility to waters edge.**

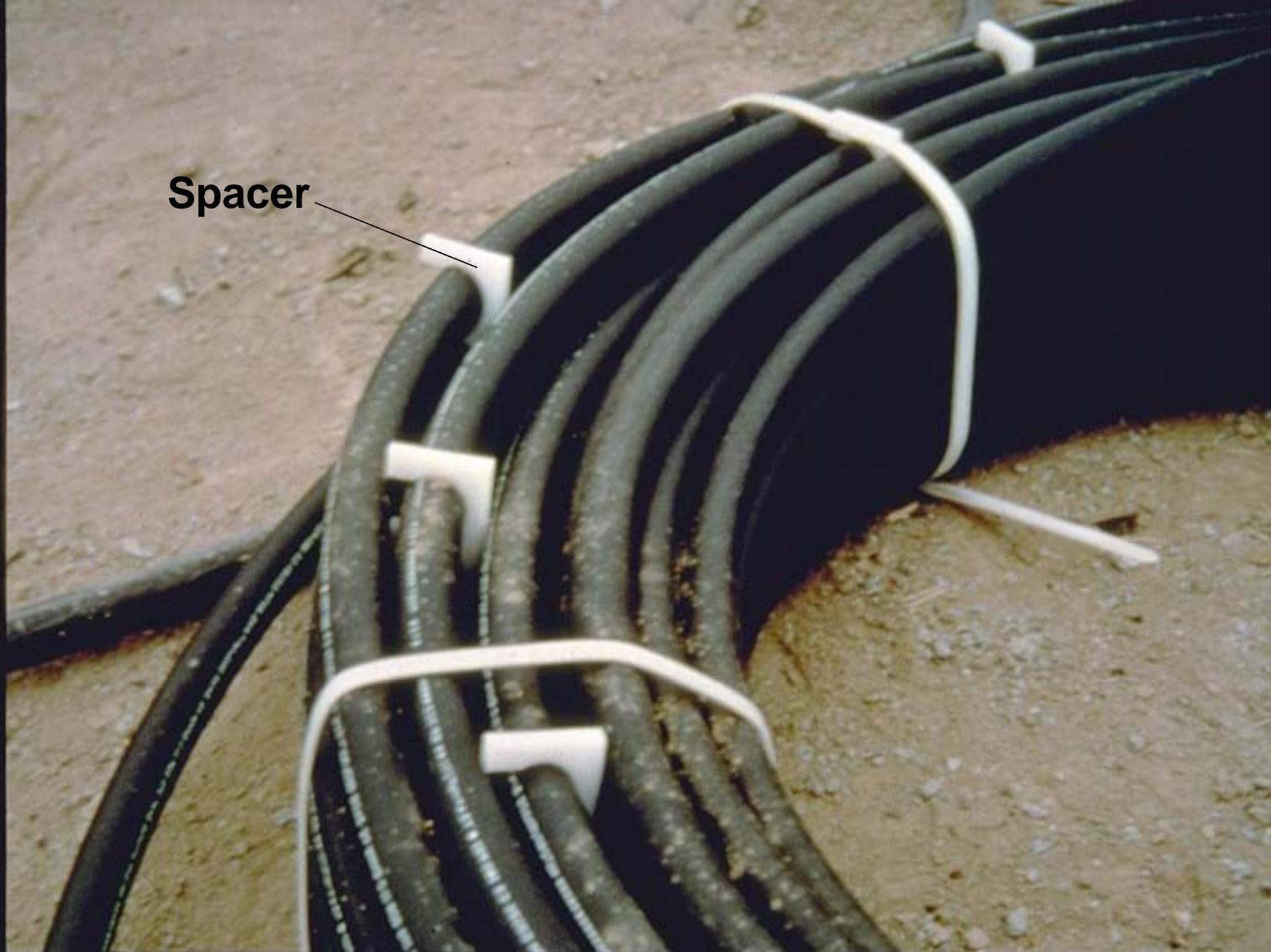
- **Depth of pond should be at least 10ft at lowest levels.**

**Ownership of pond or lake.**



Commercial Lake Loop

**Spacer**







# Thermal Conductivity Testing

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- Vertical bore hole drilled and tested
- Testing- heat energy applied for 40-48 hours
- Reporting Data to engineers
- Provides critical geological data
- Allows for accurate ground loop sizing
- Grout selection data

# Grout selections and thermal conductivity value



Standard bentonite grout = .43TC

Select grout = .85TC

Thermal select grout = 1.2TC

the higher the solids the higher the TC  
-- add silica sands to increase TC

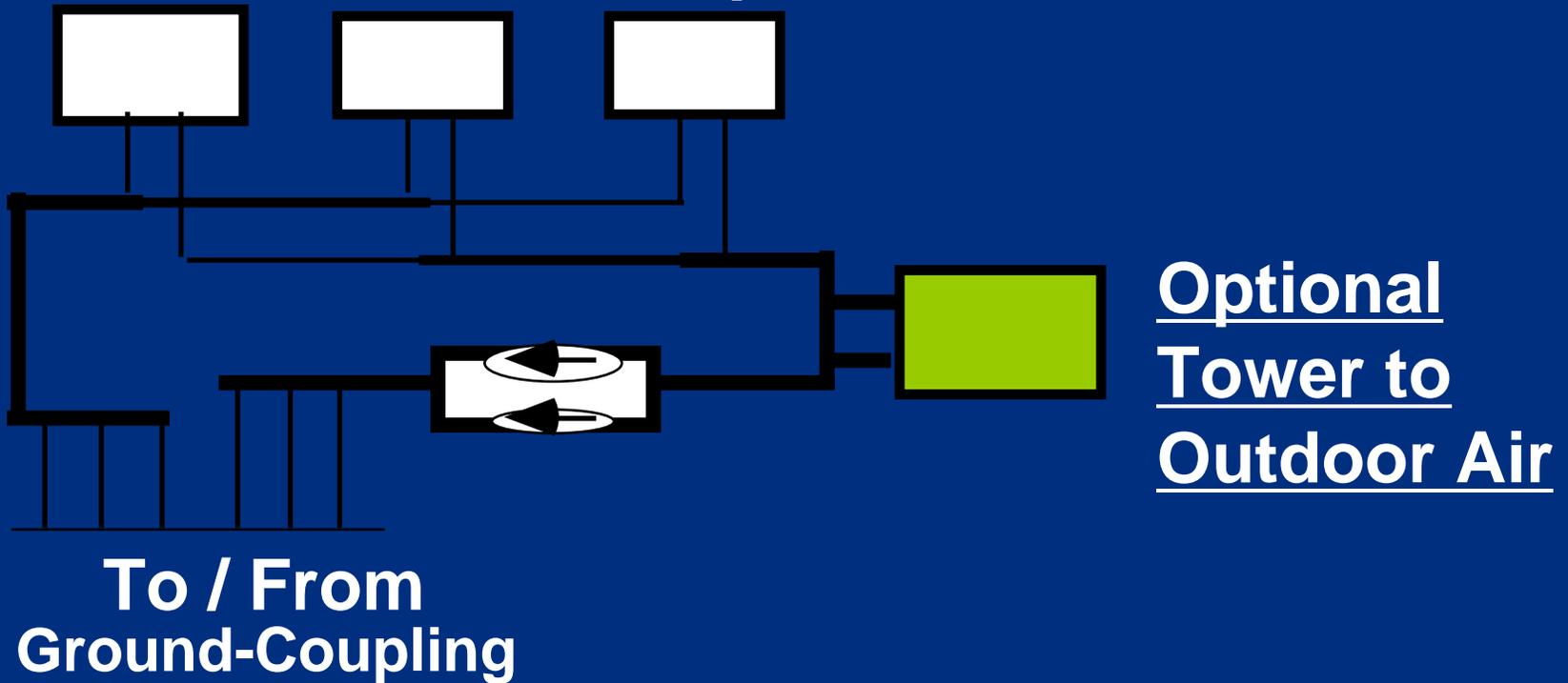


# Basic Heat Sink Designs

- Hybrids
  - Multi Closed Loop Layouts
    - Lake
    - Vertical
    - Horizontal
  - Closed Loop with Tower Options
  - Closed Loop with Boiler Options
  - Closed Loop with add on Open Loop Heat Exchanger

# Typical Hybrid Layout

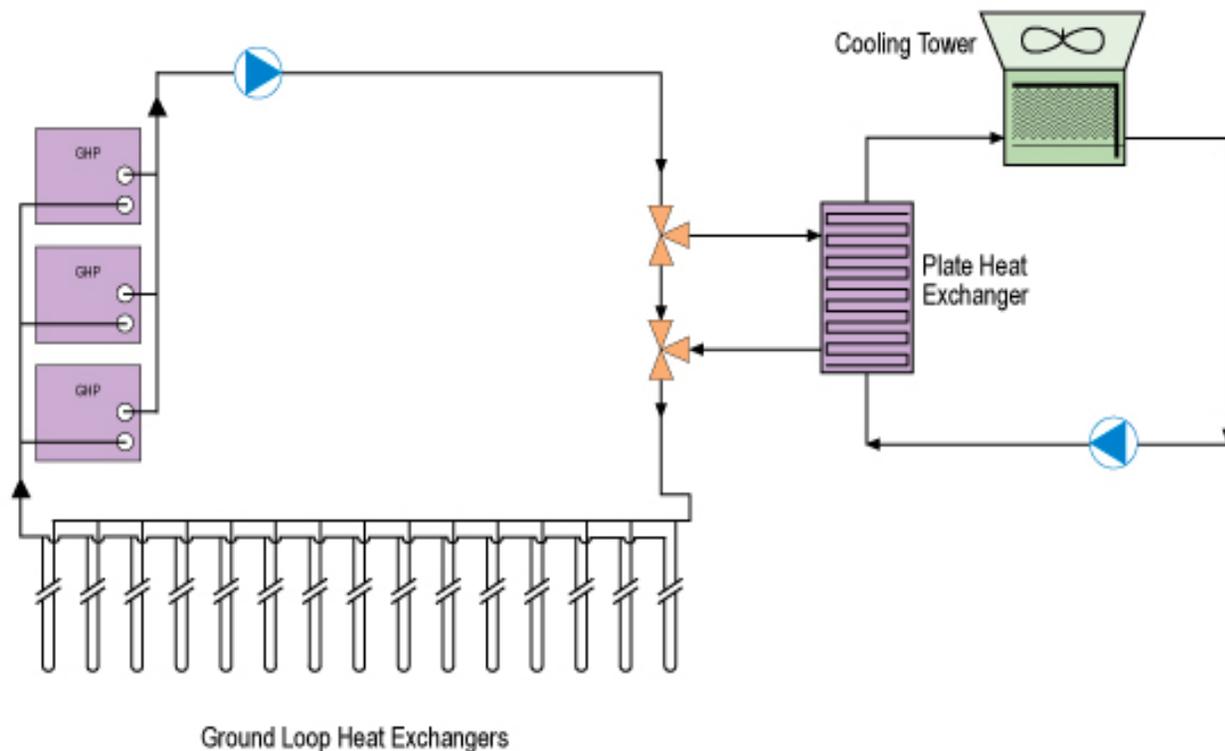
## Zone Heat Pumps



Optional  
Tower to  
Outdoor Air

# Hybrid System with cooling tower

## Hybrid Ground Source Heat Pump System with Cooling Tower



# Closed circuit fluid cooler



# Multi Unit Hybrid with Boiler

