

# GEOHERMAL 101

## Approaching your Geothermal Project for Success

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# What is Geo Thermal ?

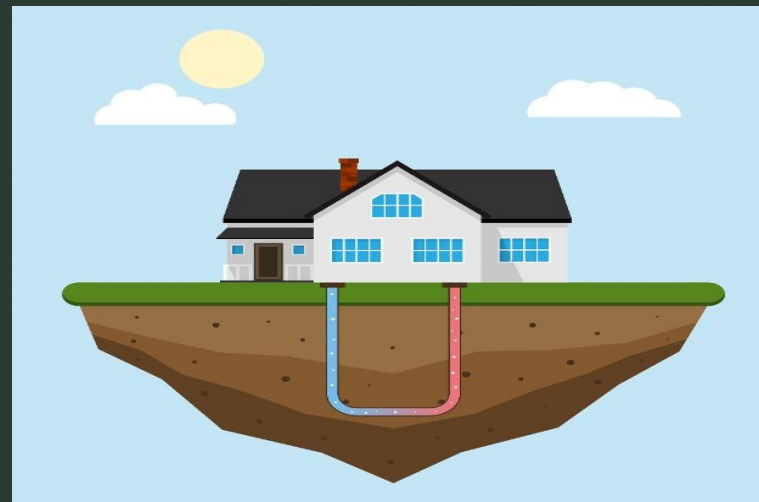
## Renewable Energy

### Geo Definition:

- Geothermal is defined as heat from the earth; The difference in temperature between the core of the planet and its surface, a continuous conduction of Thermal Energy in the form of heat from the core to the surface.

### Closed Loop Geo Thermal:

- Utilizes a continuous loop of buried polyethylene pipe. The pipe is connected to an indoor heat pump forming a sealed underground loop that an environmentally friendly antifreeze and water solution is circulated through repeatedly.



# Common Questions

1. How should I approach the construction of the Geothermal?
2. How can I reduce the amount of space required for the bore field?
3. Can I provide Value Engineering to my client and reduce the size of the field?



# ▶ Test Work & Heat Load

*Valuable Information*

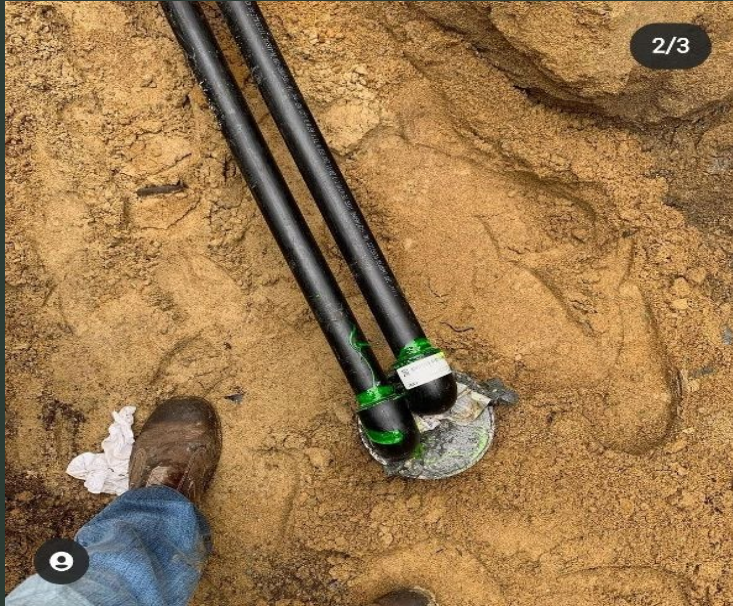


1. Geology
2. Water Production
3. Thermal Performance with heat exchanger
4. Total # of bores required to achieve demand
5. Means & Methods



# Traditional Heat Exchangers

Single U-bend & Horizontal "Slinky"



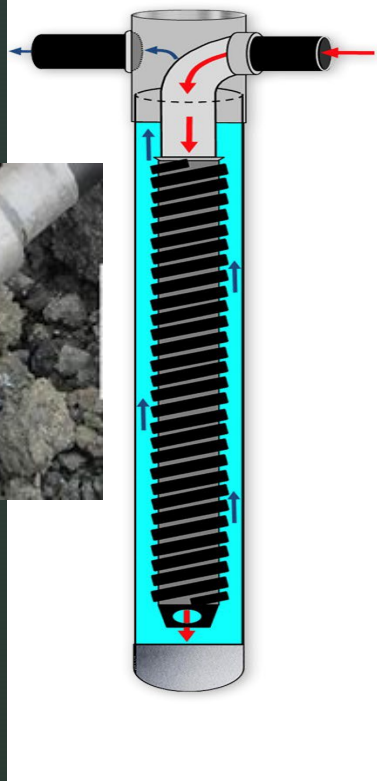
- Most Popular-easiest to install.
- Requires more real-estate when compared to High performing heat exchangers.
- More qualified installers

**NOT COMMON** in New-England

- Requires the most real-estate when compared to all the heat exchangers.
- Land above the bore field has limited use

# High Performing Heat Exchangers

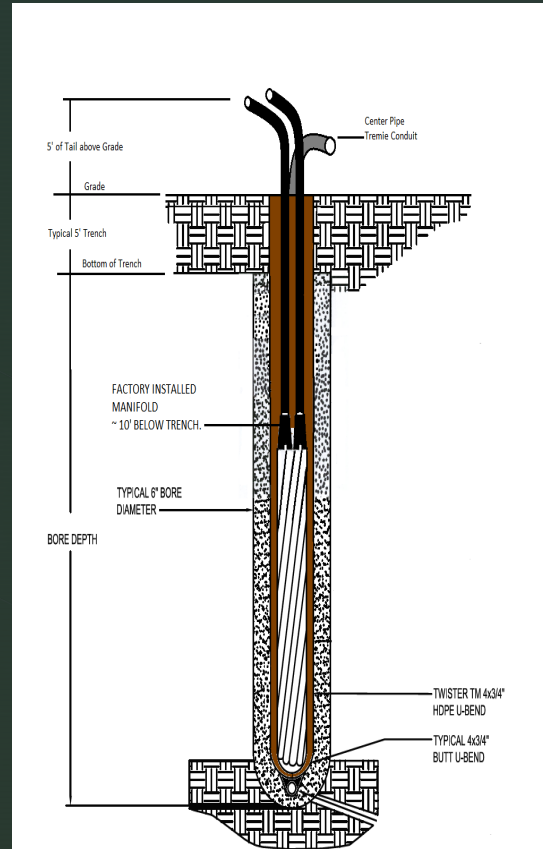
## Coaxial *Rygan*



### Pro:

- Deploy Heat-exchanger to deeper depths
- Reduces The number of bores, grout & foot print of the field- less excavation.

## Twister



## Quad Loop U-bend *Versa Profiles*



### Cons:

- Heat-exchanger are more costly
- May increase bore diameter, thus-Increase drilling costs.
- Deeper Bores may become difficult to grout.
- Limited Number of qualified installers

# Heat exchanger selection while maintaining Budget

Increasing bore diameter = \$\$\$



# Bidding & Geo Thermal Contractor Selection

★ **De-scoping & Coordination A MUST !** ★

Drilling Contractor

Water Management

Lateral Contractor

Excavation

Oversight

Interfacing with HVAC



# Drilling Contractor

- **Bores:**

- Discuss the Diameter of the hole
  - Does the contract Include extra stability measures that may be required to achieve depth. (*air, cement, sleeves*)
  - Discuss the number of rigs needed to achieve the projects projected time line.

- **Casing:**

- Will the casing be permanent or removed? Credit for removal?



## Heat-exchanger & Integrity testing:

- Discuss optional Measures to achieve full bore depth during install.

- **Grouting (Thermal Grout)**

- Tremie grout to the bottom
- Quality control samples



# WATER MANAGEMENT

Definitely Needed & Often Overlooked !



Wells can produce 100 gpm+



Weirs tanks and filtration

# Water Management & Tank Clean-outs

Vac Trucks required



Debris from Weirs tank

Where will it go?



# Site Management is Important

1.



2.

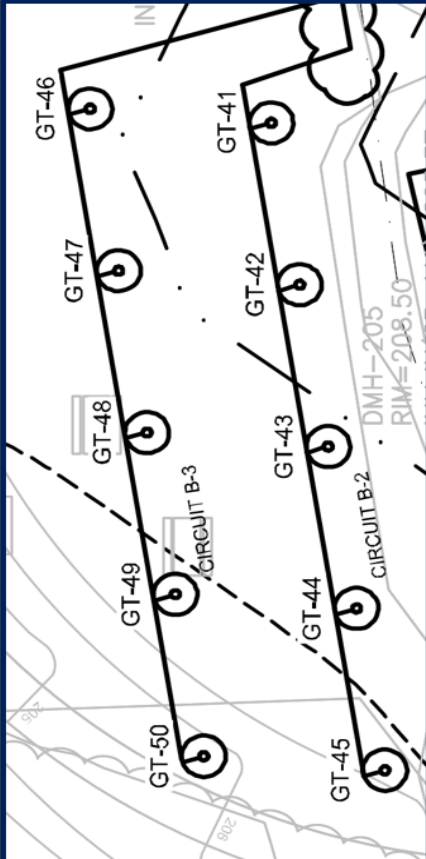


3.



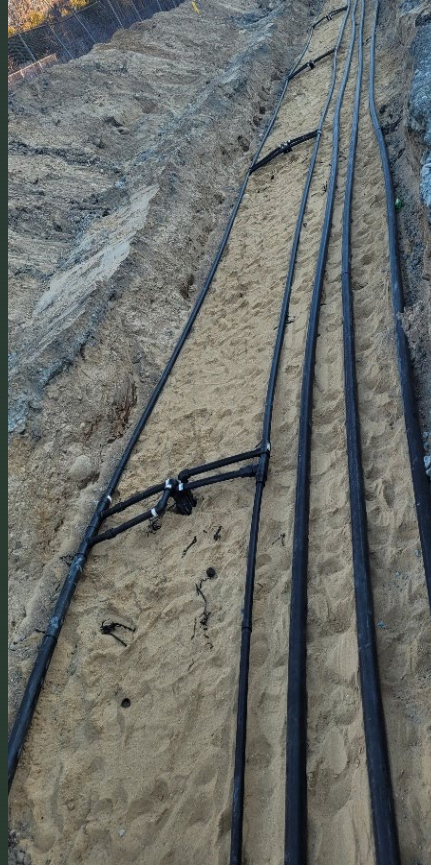
# Lateral Piping & Vaults

1.



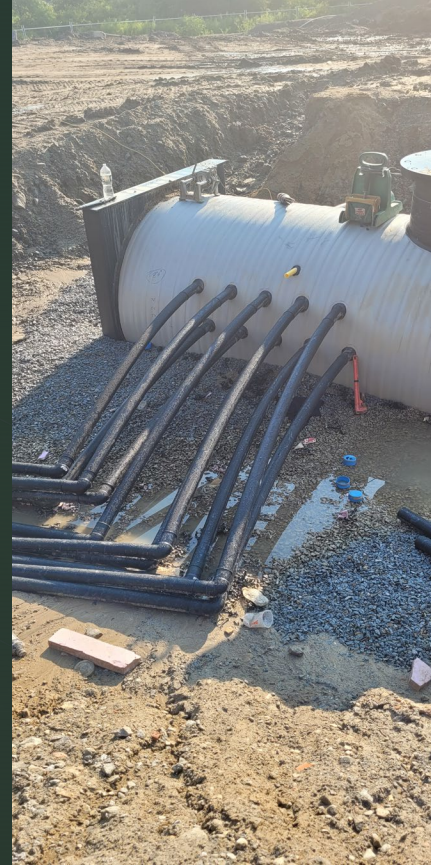
Drawing

2.



Circuit piping

3.



Vault connections

4.



Closed cell Insulation

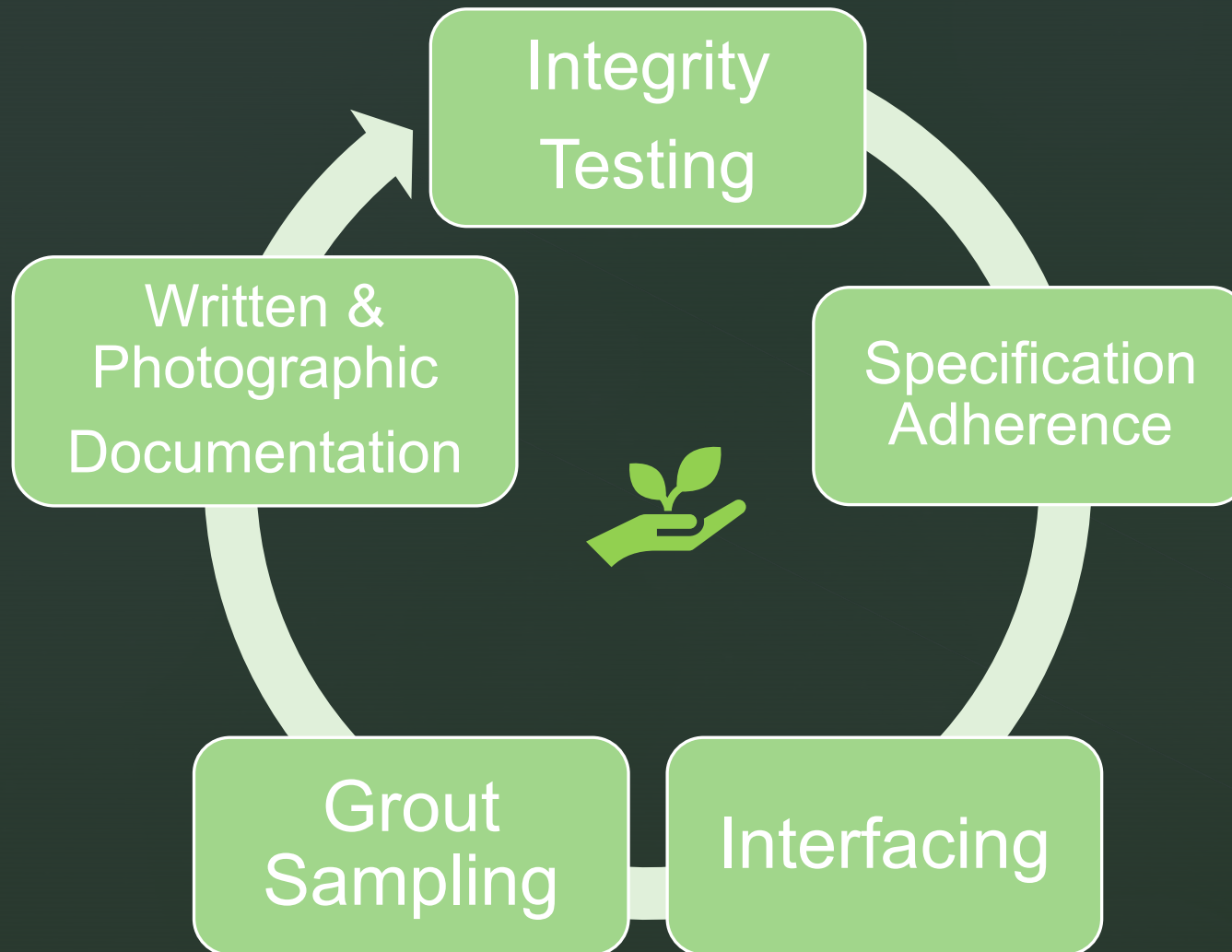
# Excavations

## Lateral Trenching In the Northeast



- A minimum trench depth of 5'
- A minimum trench width of 1.5 (x) the size of the lateral pipe line.
- Sand bedding minimum 6" above and below the lateral piping.
- Insulation if required, above sand bedding. Geothermal Marking tape is placed above the first "lift" in the excavation.
- **Minimum of ¼" pitch every 10' up towards the building**

# ▶ Oversight/Third Party Management



- Certified Geothermal Inspector
- Knowledge of Drilling Practices
- Knowledge of design Practices
- **Independent Party-should NOT an employee of the contractor installing system**

# Integrity Testing

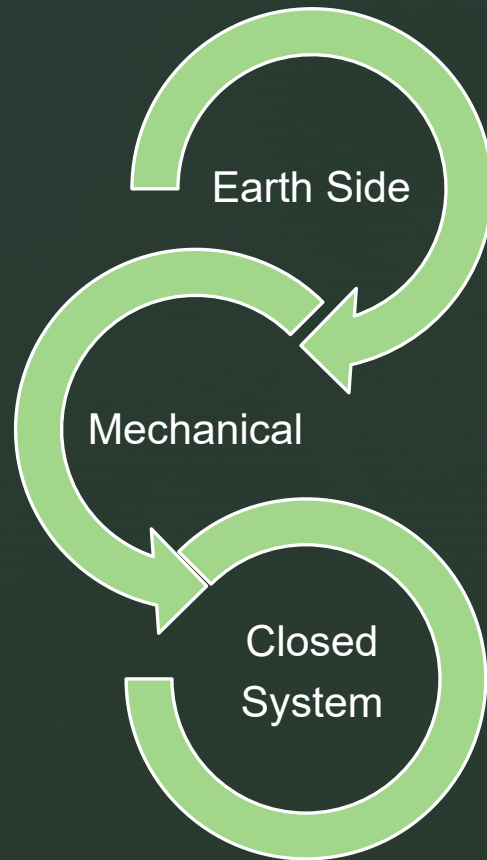
1. Heat Exchanger Deploy & Test
2. Proper Fusion techniques
3. Piping configuration
4. Flush, Purge & Velocity Testing,
5. Air & Debris removal
6. Pressure Drop testing
7. Grouting conformance
8. Pressure hold testing
9. Connection to the manifold
10. Water quality
11. Glycol
12. Connection to the Interior





# Interfacing the Earth & Mechanical system

The Earth & Mechanical contractor MUST Coordinate early in the construction process



- Flushing of Mechanical
- Do fluids co-mingle?
- Loop Fluid
- Water quality
- Glycol
- Procurement & Filling system
- Follow-up testing annually



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