

Design of a Geothermal Cooling System

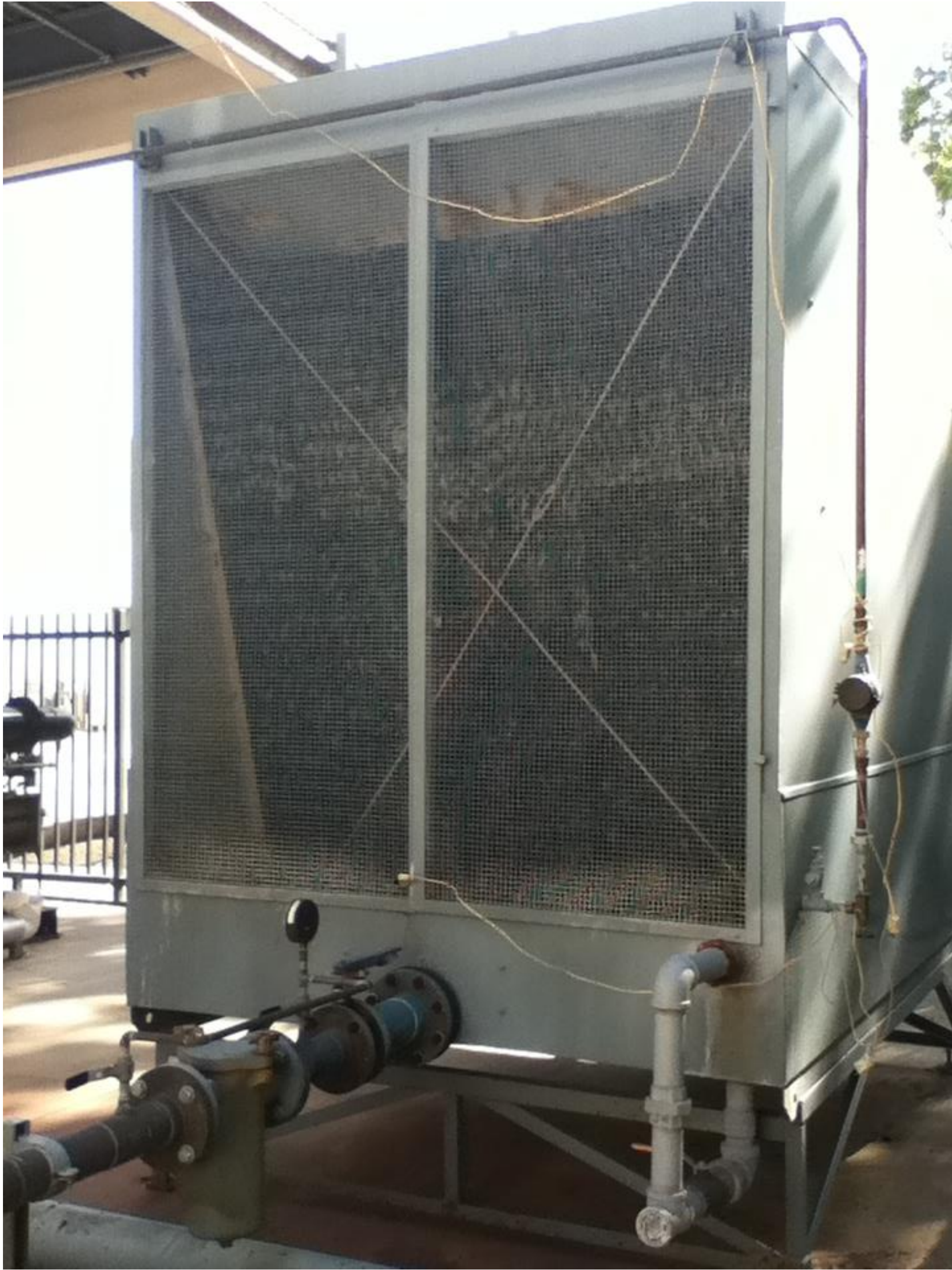
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The Goal

Replace a cooling tower with underground pipes



1,000,000 Btu/hr
Cool from 100 °F to 85°F
Limit velocity to 3 ft/s

The Pipe

4-inch Ductile Iron
Velocity of 1.33 ft/s
Thermal Conductivity
240 Btu in/(hr ft² °F)

The Ground

Geysers Geothermal Field
Middletown, CA
61.5 °F, 10 feet deep
Thermal Conductivity
21.2 Btu in/(hr ft² °F)

Why Choose Geothermal?

Eco-friendly

The ground is the heat sink

Not the environment

Aesthetically Pleasing

Can be easily hidden

The Results

Pipe length

248,738 feet

47.11 miles

Placement

Two feet apart

Total Area

17 acres

15.5 football fields

Disadvantages of Geothermal

Expensive

Over \$2 million for pipe alone

Installation—Buried 10 feet

Design Difficulty

Accurate ground temperature

Space Consuming

Impractical for repairs

Limited dual use of land