California Energy Commission
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All of the investments Areas provide both a foundation and a bridge to advance energy savings. Through **Technology Demonstration and Deployment investments** our impact would be on **demand-side management**. **Direct use geothermal** is already a proven green technology that saves as much as 75% on energy costs, it's has no training facilities with in the state, and remains unknown by most Architects. **Terra Structural inc** has developed new hybrid ground loop system designed for Southern California's desert environment. We see these investments as way to elevate our testing standards while reinforcing our products credibility in the market place.

As structural drillers Terra Structural starting looking for ways to adopt geothermal into our existing work. In doing so we were also red flagged by number of Local jurisdictions and the **State Contractors license Board.** As a result Terra structural Inc started working with **Piers,** discussing ways in which the state should regulate of Licensing Direct use Geothermal installation, under **Joe Loyer** of the **California State Energy Commission.** It was time when the company was just studying the Basic's of integrating Geothermal loops into structural caissons. Knowing Terra structural was working with State and **Craig Hoellwarth** also from the **California Energy Commission** helped us to resolve problems with the Local jurisdictions and we finished our work.

We came up with a geothermal loop system that is machined woven into the non structural voids around the structural rebar inside caissons. Caissons or deep drilled foundations are part of the standard building codes in California. They are utilized in unstable areas or in areas with high water tables. Our Geothermal caissons are well suited for Southern California's desert environment. As structural caissons use high Density grout which increases the Thermal Conductivity, our loops follow the **International Ground Source Heat Pump Association** or **IGSHPA** equations for what is called a Slinky loop. They have been structurally approved, and inspected.

The Geothermal point of sale is with the Architect. Architects are the ones who calculate the title 24 requirements on projects, they are ones who layout products for the clients. As for Terra Structural our marketing was geared towards local contractors. We sent out one hundred and twenty five letters and E-mails to Architects telling them we wanted to discuss our new Geothermal system with them. We got back almost ninety responses wanting to meet. The most surprising responses came from the larger more notable architect's who wanted to meet with us immediately just learn about direct use geothermal. In the eyes of HVAC companies who make geothermal heat pumps, like Daikin AC, Unknowingly our biggest success with geothermal was finding direct access to so many Architects who wanted hear about our work. AC companies typically market to HVAC installers.

One of the major setbacks of Direct Use Geothermal is the fact that most of manufacturers are from out of state, I had to go to school in Portland Oregon for installation of geothermal loops and Oklahoma for the design of ground loops. Most manufacturers Limit training to only a few installers per area and want Architects and contractors to use unknown HVAC installers for products they don't understand. Terra Structural found itself building a ½ ton geothermal unit on a dolly with a 5 gallon reservoir just to demonstrate visually to Architects a working geothermal unit with a Desuperheater used to make household hot water during cooling modes. Southern California has 15,000 AIA Architects. This is when we ran into Daikin AC.

In 2012 **Daikin USA** Located in Irvine Ca, purchased **McQuay heat pumps** of Ohio. Dakin Asked to see our new **geothermal caisson** then introduced us to **DMG HVAC distribution**; Daikin's west coast distributer; we came up with a soft marketing campaign for Architects so Terra structural could conduct field testing on the geothermal caisson in different soils. At this time we also brought in **Magco drilling** and representatives from McQuay outlined how to conduct the Scientific field testing of our product. The cost of testing is very expensive but it's also in line with what it would take a company Like Daikin Ac and DMC HVAC to comfortably launch a marking campaign for geothermal in California while opening up **Daikin's Irvine Ca Technical school** to any licensed HVAC installer for training in geothermal systems currently this schooling is Ohio. Best of all Daikin Ac is trusted name with the Architectural community.

The test equipment called a Geocube it tests and documents thermal Conductivity in the different soil types, it's used to meet the manufacturer's specifications. The Geocube needs to be purchased and to be calibrated to our product, by drilling three holes in on one Jobsite in 8 different locations. The first borehole is a typical 5inch geothermal hole drilled to a 150ft the next two holes are large diameter caisson holes with 30inch diameter openings and are between 30 and 40 ft deep. Testing will cost two hundred and twenty five thousand dollars. We need eighty three thousand.

Terra Structural is a small company asking a large corporation to spend large sums of money on product registration for title 24 compliance, marketing and technical training. Through Technology Demonstration and Deployment Investments once again we see this type of funding as way to elevate our testing standards while reinforcing our products credibility in the market place at a time when needed the most.

Sincerely,

John P. Kreber

Owner Terra Structural Inc.