West Valley Mission Community College District
Mission College Campus

FACILITIES MAINTENANCE BUILDING
40-ton “SLINKY” Ground Coupled Heat Exchanger

JOHN GEYER, CGD
International Ground Source Heat Pump Association
2014 Annual Meeting
Baltimore, MD  October, 2014
Location: Maintenance Building and Slinky Loop field

126,00 Sq Ft Geothermal
Campus Center

Loop Field
Simple Design/Operating Concept

- Four equal quadrants; all mirror images
- No vault as “junction box”; Four circuits manifold, valve and port (individually) inside mechanical room
- Any circuit can be accessed, worked on and re-purged without interrupting or affecting use of others
- Easy to purge: ~47 gpm @ <12 feet of head loss; Reynolds 2,850 (turbulent), 165 gallons per circuit.
- No antifreeze: Pure water content; heating load will not drive water temperatures near freezing
- Ground water wets most -8’ loops; optional “Soaker” system at -5’ wets sand around upper loops, when used
Top View of 4 Quadrants and Central Supply/Return Piping

Field dimensions are ~70 x 140 Feet
10’+ corridor in center for lighting access

Styrofoam Channel at -3 Feet
(4 x 12 feet)

Similar patterns at -5 and -8’ levels.
Only -5’ connects to Christy Box.

Quad A SUPPLY, -5’ and -8’
Quad A RETURN, -5’ and -8’
Quad C
Quad D combined SUPPLY, -5’ and -8’ levels
Quad D Combined RETURN, -5’ and -08’ levels

8x8’ Styrofoam protective panel at -3 Feet

Corridor for parking lot lighting towers and cables

7,000’ SF Building

Christy Box

GRC 2014
John Geyer & Associates, Inc.
“Slinky” Circuit Layout and Piping Scheme;
5 identical loops at -5 Ft and -8 Ft levels

Supply Header: 1.25” SDR-11 HDPE necking to 1” for two end loops

Loops average 3’ wide with 3’ to 4’ lateral spacing

All Slinky loops are ¾”, SDR-11 HDPE. Headers are 1.25 and 0.75” pipe. “4710” resin rated 200 psi @ 73.5°F

Slinky Coil length = 500 Ft, including 70 Ft return to Header

Approx. 30 loops in each Slinky, with 18” overlap or “Pitch”

Five loops at each level in each Quad, connected as a 10-loop Circuit
Quadrant Cross Section
(All four quadrants are similar)

Add 2’ soil to final grade; 18” of which is lime-treated

Grade after Loop Field Construction

24” compacted native soil

Irrigation “SOAKER” System – “Drip Line” near upper loops in sand layer

SAND 12”

24” compacted native soil

Groundwater Saturation Zone

SAND 12”

- 5 Ft level

- 8 Ft level

Soaker to Municipal Water Source; main in Christy Box
Quad A and B Supply Lines

Christy Box

B Supply
A Supply
Soaker Main
Soaker Laterals
B -5' Supply
A -5' Supply
B -8' Supply
A -8' Supply

Quad A
Quad B

4' x 12' x 6" Styrofoam zone
Return Piping Tees

2” Metallic “Geothermal” locator tape at perimeter and center line of each Quad

Quad C Return (both levels)

Quad D Return (both levels)

Silver Duct Tape ID label

Quad A Returns

Quad B Returns

Soaker Main and Laterals
5-loop Header Assembly

1.25” Supply Header (On 1st Slinky Coil)

1.25” Return Header (Parallel, Reverse; On 70’ return leg)

0.75” HDPE Circuit Pipe (SDR-11, 200 psi rated)
Above-Ground Transition to Building
Christy Box layout

Building

SUPPLY
A B C D

RETURN
SOAKER
A B C D

Loop Field

GRC 2014
Site Overview
A,B at -3’ level; C,D at -8’
Quads B and A at -5’ Level
(Christy Box between 1st loop pair, near generator and compressor)
One half of 70 x 140’ pit excavated at a time (no rock, groundwater at 7 feet)

8 Ft Silt-Clay wall; NO rocks

Groundwater at -7 feet in driest time of year

Excavating Quads C and D

Lighting Corridor
24/7 Sump Pump clears groundwater from -8’ level (paint marks -5’ level)
500’ Slinky Coils are placed 5-wide in each Quad, hydro tested individually, and headered

A, B’s 4-foot setback from lighting corridor

C, D’s 4-foot setback from lighting corridor
Quads A and B Loop Layout, -5’ Level
(curved SOAKER line between loops)
12” Sand Cover over both loop layers
24” of compacted soil over each sand lift
5-loop levels are heat-fused into “headers”; -8’ and -5’ circuits are joined together, uniting 10 loops
Supply and Return Headers are Flushed, Purged of air and pressure tested at 40 and 100 psi
Pressure Testing occurs in 4 stages
(3 are for contractor assurance; “Final” is for College)

• Individual 500-foot loops are filled with water and pressure tested at 100 psi

• Groups of 5 loops are headered and pressure tested

• -8’ and -5’ groups of 5 loops in each Quad are joined into 10-loop circuits and pressure tested

• Mains in Christy Box are flushed and purged of air
  (Circuit flow takes 5 minutes; flushing lasts 75 minutes)

• Christy Box Pairs are pressured and sealed near 100 psi
Four pair of Supply/Return headers meet in Christy Box (Pressure gauges are here for building connection)
Final grade, -2 Feet: As-left on Dec 31, 2013

Highest loop pipe is 5 feet below Christy Box lid.

Pipes to building will be 24” to 30” below lid level.

Pipe path is pre-formed with 6” Styrofoam panel.
Christy Box Interior, Jan 2, 2014, with 4 “Supply” gauges holding at 103 psi after 48 hours
Irrigation Main inside Christy Box
Completed Loop Field, 2 feet below final grade, with groundwater at -7 feet wetting lower loops

Technical Contact: John Geyer, CGD, for questions or more photos
(360) 882 5050 or jgeyer@jgainc.com
Thank you for your attention!

John Geyer
John Geyer & Associates, Inc.
Vancouver, WA

360 882 5050
jgeyer@jgainc.com