WHAT IS A GROUND SOURCE HEAT PUMP SYSTEM?

- A geothermal exchange system that uses the earth’s natural, relatively constant thermal temperature to “condition” water used to heat, cool and provide hot water for a facility.

- A geothermal system consists of three parts:
  - A ground heat exchanger (a series of pipes buried in the ground that transfers the warmth from the earth into the building.)
  - A heat pump (connects the ground portion to the inside of the building), and
  - A delivery system (the ductwork or hydronic system that transfers the conditioned air or water throughout the building.)

Image from Arizona Geology Magazine
GSHP ADVANTAGES AND DISADVANTAGES FOR HVAC SYSTEMS

ADVANTAGES

• No outside equipment to conceal / place
• Mechanical rooms can be smaller (no chillers, smaller boilers)
• Less simultaneous heating and cooling
• Typically more efficient, ≈ 33% for RCC
• Lowered cost when paired with an existing water source heat pump system

DISADVANTAGES

• May be more expensive installation
• Need area for ground field
• Lots of equipment to maintain (instead of a few large pieces of equipment)
• Typically no economizer ‘free’ cooling
## DCAMM’S GSHP SYSTEMS (Partial List)

<table>
<thead>
<tr>
<th>Project Name</th>
<th>System Type</th>
<th>Wells / Depth / Building Load</th>
<th>Building Type</th>
<th>DCAMM Process / Background</th>
<th>Completion Date</th>
<th>Heating/Cooling Load</th>
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<tbody>
<tr>
<td>MA Maritime Academy (Bourne)</td>
<td>Closed loop (CL)</td>
<td>48, 400 foot wells 6 well field circuits Provides full heating/cooling load</td>
<td>New Library (approx. 15,000 sq. feet)</td>
<td>New construction project (Gensler) Retained GSHP experienced firm to oversee construction</td>
<td>August, 2011</td>
<td></td>
</tr>
<tr>
<td>North Shore Community College (Danvers)</td>
<td>Closed Loop (CL)</td>
<td>60, 4-500 foot deep wells 5 well field circuits</td>
<td>Allied Health Building (58,700 sq. feet)</td>
<td>GSHP was one component of a Zero Net Energy Building project Required Legal Office mediation</td>
<td>September, 2011</td>
<td></td>
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<tr>
<td>Greenfield Community College (Greenfield)</td>
<td>Standing Column well (SCW)</td>
<td>6, 1,500 foot wells GSHP supplements existing water-cooled chiller plant</td>
<td>Core Building (96,000 sq. feet)</td>
<td>New construction project US DOE grant Two design phases</td>
<td>March, 2011</td>
<td>150 tons</td>
</tr>
<tr>
<td>Springfield Tech CC (Springfield)</td>
<td>Standing Column well (SCW)</td>
<td>2, 1,000 foot wells Has steam back-up for winter load</td>
<td>Building #11 (20,000 sq. feet)</td>
<td>Gut renovation of historic building GSHP chosen by designer and facility</td>
<td>July, 2011</td>
<td></td>
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<tr>
<td>Middlesex Community College (Bedford)</td>
<td>Closed Loop (CL)</td>
<td>7, 500 foot wells Provides full heating/cooling most of year. Existing gas boilers kept for winter load back-up</td>
<td>Trustee's House, office space (9,800 sq. feet)</td>
<td>Replace existing gas-fired HVAC with GSHP. Feasibility study and performance specification Two designs</td>
<td>October, 2012</td>
<td>17.5 tons</td>
</tr>
</tbody>
</table>
PARAMETERS OF THE RCC INSTALLATION

- 115 Well, closed loop system (A closed loop system consists of underground continuous piping loops that are filled with an anti-freeze-like liquid that helps transfer the ground temperature, \(\approx 50-54\) degrees, to the geothermal heat pump.)
- Well depth – 500 feet
- Buildings Served (4) – Media Center, Administration, Academic, and Student Center
- Heating/Cooling Load – Estimated 400 tons
- Estimated yearly savings - $136,000

Parking Lot #1 Today with 1MW PV Canopy & 115 - Well GSHP Field
QUESTIONS

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