Our project is to design a geothermal heating and cooling system for a new house in Grand Rapids, MI. This includes:

- Performing load calculations on the house
- Sizing the geothermal wells
- Designing the HVAC system
- Providing a financial analysis to the client

The load, or energy required to adequately heat the home, was determined based on:

- Square footage
- Wall and roof insulation
- Window construction
- Typical weather
- Heat generated by people & appliances

In order to meet the heating and cooling load of the house, several wells will be drilled for the geothermal piping. The well depth was determined by calculations based on a modified heat exchanger model.

To distribute the conditioned air throughout the house, an HVAC system was designed that allows for different temperatures in different areas of the home. The ducts, grilles, and registers were positioned and sized to optimize efficiency and comfort.

Geothermal heating is more environmentally and financially responsible than traditional heating because heat is drawn from the warm earth instead of being created by burning fossil fuels. This increases start-up costs but drastically reduces annual energy costs.

Financial Results

<table>
<thead>
<tr>
<th>Capital Cost</th>
<th>Annual Energy Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Geothermal</td>
<td>$40,000</td>
</tr>
<tr>
<td>Geothermal After Tax Credit</td>
<td>$35,000</td>
</tr>
<tr>
<td>Conventional</td>
<td>$20,000</td>
</tr>
</tbody>
</table>

- Six Year Payback • $7,000 More Upfront • $800 (52%) Yearly Energy Savings

Lynette Hromada  Joel Love  Laura Price  Rachel Jelgerhuis

(ME)                   (ME)                (CE)               (ME)