



## Blake Equipment - East Windsor, CT

## CASE STUDY

### Client Profile

When The Blake Group decided to build a new 17,000 square foot pre-engineered metal, sales and distribution branch; they knew it would be a Net Zero building, in standing with their commitment to sustainable buildings. Blake Equipment is a full service manufacturers representative and distributor of water and thermal energy solutions. The building includes sales offices, a corporate training center, a shop and fabrication center, customer service counter area and a warehouse.

### Challenges

By definition, a zero energy building produces enough renewable energy to meet its own annual energy consumption requirements, thereby reducing the use of nonrenewable energy in the building sector. Buildings are designed and sited to optimize natural lighting, solar gain(winter) and maximize solar energy production. They are well insulated and sealed and employ high efficiency lighting and HVAC systems. The Blake Group will use the building to test multiple geo-exchange borefield strategies under various demand conditions.

### Solutions

The building envelope was designed to be highly efficient with additional insulation. Triple glaze windows were strategically placed throughout the building to maximize natural lighting and passive solar. High performance interior and exterior lighting and controls were used throughout the property.

Thermally enhanced polyethylene radiant tubing was used for the radiant floor in the warehouse, in place of the traditional pex, in a configuration maximizing thermal exchange and reducing circulator pumping. Solar thermal was incorporated into the geo-exchange system to enhance borehole operation for higher wintertime heating efficiency. A fresh air energy recovery ventilator exhausting all air from restrooms spaces was selected to recover both heating and cooling energy, reducing the building loads.

These steps enabled the photo-voltaic system to obtain Net Zero energy in the available roof area.

### Zero Energy Pre-Engineered Metal Multi-Use Building

### Goals and Objectives

1. *Design and Build a Zero Energy Sales, Training and Warehouse Facility.*
2. *Feature technologies marketed by Blake Equipment.*
3. *Build and control borefield such that multiple geo-exchange strategies can be employed and tested under various demand conditions.*



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## Results

Through use of additional insulation and passive solar, the building design heating load was reduced to 12 BTU/SF, in line with other high performance buildings and better than most typical metal buildings.

The radiant heating and cooling of the warehouse floor works well to conserve energy even with frequent opening of large overhead doors for truck shipments. Solar thermal panels were incorporated into the geo-exchange system to enhance borehole operation for higher heating efficiency, reducing the annual KWH demand of the heat pump heating system by about 20%. A fresh air energy recovery ventilator exhausts all air from restrooms spaces, recovering both heating and cooling energy, reducing the building loads.

On an annualized basis, the output of the photo-voltaic system generates twice the KWH used by the building.

The 4 geo-exchange boreholes were installed with a unique manifold to allow side by side testing while the building is in operation. Each borehole is equipped with a utility grade BTU meter for accurate measurements:

500' deep 1-1/4" DR11 HDPE U-Bend

450' deep 3/4" DR13.5 Twister (quad Loop)

900' deep 1-1/2" DR11 GPX2 Twin loop

1,100' deep 4" x2" GPX2 concentric

## THE PROJECT



Rooftop view of The Blake Group campus PV and Solar Thermal arrays. The bottom building is the Blake Equipment site, a Net Zero building and subject of this case study. Top building is The Blake Group Headquarters, an existing building retrofitted to a Near Net Zero Energy building. (*Bing Maps*)

4 different borehole heat exchangers, each with their own BTU meter. Special manifolds allow mixing in total, or various combinations or total separation of loops. All pipe is HDPE.



Horizontal grid and header radiant in-floor use GeoperformX tubing. The wide spacing is for a low heat output warehouse floor, constructed in the same style of arrangement as a hockey rink floor, with the headers buried centrally in the concrete, simplifying piping in the mechanical room with only two pipes for supply and return. The low R value of the GeoperformX tube will allow a 7% to 10% annual savings in radiant heating or a 10% to 15% savings in compressor energy for making ice in a hockey rink.

## PARTNERS IN SUCCESS

**Builder:** Pelletier Builders

**Contractor:** Tuscany Design Build, Inc.

**Engineers:** CES Engineers (PV design)

**Driller:** LaFramboise Well Drilling, Inc

**Technologies:** High performance interior and exterior lighting and controls, High R insulation, High Efficiency Geo-exchange water source heat pumps, solar thermal, passive solar, energy recovery ventilation unit, thermally enhanced HDPE tubing.



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