Harvard Green Campus Initiative
High Performance Building Resource

Zero Arrow Street Case Study
LEED-NC Certified
October 2004

Summary

Zero Arrow Street is a 36,080 square foot building containing offices and the American Reparatory Theatre. Office space consists of 3,000 square feet and 4,800 square feet is auxiliary and theatre space. Parking and utilities are located in the basement. The building was completed in October 2004, and it achieved LEED certification in 2005. There are approximately 276 building occupants.

Building Highlights

- A 2000 cubic foot cistern collects storm water to provide 100% of irrigation for the site.
- Reduction in energy use of 35% over code
- Recycled content materials, local materials, and Forest Stewardship Council certified wood
- Low-emitting paints, sealants, paints, and carpet
- Construction Indoor Air Quality management plan implemented

Sustainable Initiatives

Site

Alternative Transportation
Alternatives to driving are provided for building occupants. The building is in close proximity to public transportation, with two bus lines, the Harvard Shuttle, and the MBTA Harvard Square T stop all within a short walk. Bicycle storage and showers are provided. An electric car charging station is provided in the basement garage.

Sustainable Landscape
The small landscape includes native/drought-tolerant plants.

Location

Zero Arrow Street is located at the intersection of Massachusetts Avenue and Arrow Street, east of Harvard Square.
Google map location of Zero Arrow Street

Energy

Ground Source Heat Pumps
The office area on the fourth floor of the building is served by earth-coupled water to air heat pumps. A central air handler with hydronic coil serves the theatre. The coil is fed by a pair of water-to-water earth-coupled heat pumps. All of the heat pumps are served by a common building loop. The loop is passed through a heat exchanger to maintain separation of contaminants. The heat exchanger is connected to three SCWs, each with a dedicated pump. The building uses ClimateMaster Genesis GR/GS Series pumps. This heat exchanger transfers heat into the building in winter and removes it in the summer. The Owner expects a 5-7 year payback on the system. This contributes to a **35% reduction in energy use over ASHRAE 90.1-1999** requirements. The energy model was created using the HVAC Loads Calculation Program, Version 3.08. The building was modeled by Allied Engineering Services.

Ventilation is provided with two **Energy Recovery Ventilators**, which are desiccant wheel type units with auxiliary electric heat. One is used for the office space and one is used for the theatre space.

To reduce the cooling load and the heat island effect, 79.37% of the roof is a Ultra-Ply TPO **high-albedo roof.**

A commissioning agent (SEi) ensures that systems are designed and installed to optimum performance.

Water

A 2000 cubic foot storm water cistern collects water in the basement to provide 100% of the water used for irrigation on the site Water is collected from the roof and area drains located on impervious areas. The tank has the capacity to accommodate at least 25% of the 100-year storm level.

Materials and Waste

• 81.51% of construction waste was diverted from landfills.
• 13% of materials (by cost) include recycled content and 56% were manufactured regionally.
• 51% of all the wood (by cost) is certified by the Forest Stewardship Council.

Indoor Environmental Quality

Indoor Air Quality: A construction IAQ Management plan was implemented during construction. After construction, the filters in the water source heat pumps were replaced with new MERV 13 rated media. The building underwent a 2-week flush out period, exchanging the energy from the building exhaust air volume with the same volume of 100% outdoor air. After the flush-out, the heat pump filters were again replaced.

Low-emitting adhesives, sealants, paints, coatings, and carpet were used.

Extensive **day lighting** throughout the building