



# CITY OF CAMBRIDGE

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## Union of Concerned Scientists National Headquarters

**Architect:** Brett Donham

**Building Developer:** Prospectus, Inc

**Solar Contractor:** Solar Design Associates

**Size:** 10,000 square feet

**Total Cost:** \$500,000 [note: this is the cost of renovating and outfitting the office space, not of overall construction]

**LEED Rating:** Did not pursue LEED certification

### General Information

In 1994, the Union of Concerned Scientists agreed to purchase the top two floors of a six-story design, with the acquisition contingent on the developer granting UCS permission to redesign the building envelope and fenestration (for the whole building) for greater comfort and energy efficiency, and the roof and upper floors for daylight penetration. They have since purchased the fourth floor as well, and retrofitted it for enhanced energy efficiency and daylighting.

### Sustainable Sites

- Easy access to busses and subway
- Available bike racks and shower stalls
- White membrane reflective roof surface, which reduces heating bills, in addition to offsetting the urban heat island effect

### Energy & Atmosphere

- Extensive daylighting. The windows lining the building's exterior have efficient argon-filled low-e-coated double glazing. Inside walls made partially of glass pass light through to hallways and interior offices. Highly reflective acoustical tiles help transmit reflected daylight to the interior. A central atrium/stairwell connects the two floors of the office.
- High-efficiency ceiling lights, daylight-controlled for energy savings. All perimeter lighting is proportionately daylight dimmed with ballasts. Recent estimates place the averaged lighting power density in the area of 0.1-0.15 watts per square foot. (For reference, the Massachusetts minimum lighting power density standard is 1.3 watts per square foot for all office buildings, and the Portland, Oregon *G-Rated Tenant Improvement Guide* lists a lighting power density of between 0.3-0.5 watts per square as "state of the art").
- Exterior wall insulation:  $r = 30$ . Roof insulation:  $r = 40$ .
- Two-speed ultra-high efficiency Florida Heat Pumps, four on each floor, with separate thermostatic control for each. Because the building itself is highly energy efficient, they were able to use residential-sized heat pumps, which are much smaller than more conventional options.
- 2.1 kW rooftop solar array, which provides one third of the energy for UCS's lighting needs during peak summer hours. Partially funded by a grant from the Electric Power Research Institute and installed by Solar Design Associates.
- The remainder of the office's energy (about 60,000 kW-hr per year), though supplied by conventional electricity, is offset by the ReGen renewable power upgrade service (available through Sun Power

Electric), which supplies the grid with enough renewable energy to equal 100% of UCS's remaining energy use.

- Heating energy provided by an energy-saving gas-fired boiler (which also preheats the outside air portion of the fan-forced ventilation air).

### **The Bottom Line**

- Thermal and lighting systems use less than 40,000 Btu per square foot per year, 30% lower than recommended standards for efficient office buildings, and significantly lower than in conventional buildings in the Cambridge area.
- The total cost for renovating the office space was \$50 per square foot, well below the costs for outfitting the other floors of the same building, which followed more conventional plans.
- Solar array has a payback time of twenty-four years, though this figure could be decreased to five years if it were to be used for energy management and uninterrupted power supply purposes in addition to its current function as a source of energy output.
- Recent estimates place the averaged lighting power density in the area of 0.1-0.15 watts per square foot.
- ReGen blocks of 2,000 kW-hrs cost \$72, or \$.036/kW-hr.
- The net additional cost for the building envelope in comparison with the original design was only about \$30,000, or about \$1 per square foot.
- Skylighting costs added \$41,700 to the costs of the cost of the two floors, or \$4.17 per square foot (about \$45 per square meter). These features were considered well worth the extra cost, due to the increased usefulness and pleasantness of the two floors, as well as operational savings due to decreased lighting needs.
- Lighting dimmers are zoned by perimeter façade rather than providing them for each of the 20 individual offices, saving about \$20,000 in up-front costs.
- Total cost for all lighting fixtures, ballasts, dimming and light level control systems was \$54,000, or \$5.40 per square foot

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