

Global Ecology Research Center

CARNEGIE INSTITUTION OF WASHINGTON
STANFORD UNIVERSITY, CALIFORNIA

Project Narrative

The Global Ecology Research Center (GERC) at Stanford University is an extremely low-energy 10,900 square-foot laboratory building for the Carnegie Institution of Washington. The mission of the new Department of Global Ecology is to conduct basic research on the interactions between the earth's ecosystems, land, atmosphere, and oceans. Six research groups, using core techniques such as molecular biology, remote sensing with earth-observing satellites, analyses of atmospheric compositions, and computer modeling, conduct interdisciplinary research on site, at times using samples collected during off-site research expeditions. Programmatic requirements for their new research center, including lab, office, warehouse, and greenhouse space, are divided between a two-story main building and an outlying warehouse and greenhouses. A new courtyard unifies several buildings and spaces on a site that the Carnegie Institution has occupied since 1928.

From the Global Ecology researchers' perspective, the most pressing environmental issues are global climate change, biodiversity, and water issues. Rather than follow the more diffuse focus of LEED, the client requested a design that brings attention to these issues to a new level while providing laboratory and research spaces that meet the highest standards of comfort and performance. This focus resulted in a 72% reduction in carbon emissions associated with building operation and a 50% reduction in embodied carbon for building materials.

Design began with critical attention to the fundamentals: orientation, sunshading, daylighting, and building envelope. Daylighting is the GERC's primary task light and provides 100% of the light required for the major part of the day. The narrow building depth (40') and proper orientation coupled with exterior solar shading allows controlled daylight, creating a space that is intimately tied to diurnal cycles with superior visual comfort. Light is admitted from two directions, providing balanced, glare-free diffuse light with direct views to the outside from all workspaces. Careful planning allowed zoning of the program so that lab areas receive high levels of ventilation and cooling, while the remaining non-lab areas are naturally ventilated. These smart planning and building strategies set the stage for innovative mechanical systems, such as:

1. The "Night Sky" radiant cooling system demonstrates the same principles of radiant heat loss to deep space that researchers are investigating. A thin film of water is sprayed on the roof at night. The water is cooled through radiation to cold, deep space and stored. Chilled water is then supplied during the day at 55-60F using only 0.04 kW/ton or 90% less energy than a chiller.
2. A Katabatic Cool Tower serves as an iconic focal point while tempering an indoor/outdoor lobby that serves to anchor the building on the courtyard. Large vertical bi-fold doors open the lobby to the landscape, allowing spaces to merge and the interior space to be passively conditioned. The sunny and dry Palo Alto climate, where the hottest days are clear with low humidity, is ideal for the Katabatic Cool Tower serving the lobby and for Night Sky radiant cooling.
3. Radiant slab cooling uses pumps and pipes to move cool water through the building. Fans are then used solely for ventilation, saving over 70% of fan energy.

Habitat-conservation goals are addressed through a thorough pursuit of salvaged, recycled, and certified materials. Exterior redwood siding was salvaged from decommissioned Sebastiani Vineyards wine vats. Due to the tight-grained quality of this old-growth wood, no sealer or paint was necessary as a preservative, reducing first cost and maintenance over time. Salvaged trees from a nearby municipal yard were used for tables to furnish the conference room and lobby, and workstation tabletops derived from salvaged doors that were donated by the contractor. All wood in the building, including doors, new casework, trim, light shelves, and railings are FSC-certified domestic ash.

Water issues are tackled on multiple levels, resulting in a one-third reduction in use. The Night Sky system use 50% less water than conventional, water-cooled chillers. Dual-flush toilets and waterless urinals reduce potable water use, while no-irrigation, native landscaping saves an estimated 20,000 gallons each year. Bioswales constructed along three sides of the building site slow runoff and encourage infiltration and aquifer recharge.

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Overall occupant satisfaction measured by UC Berkeley's Center for the Built Environment was the second highest in their building database. Occupants are responding well to the unusually high levels of thermal, visual, and acoustic comfort, which are integral to the energy strategies. Their satisfaction with thermal comfort and acoustics is of particular interest, as these are two categories that otherwise received negative marks in the overall database. For the owner and design team, these results are the true measure of the project's success and show that sustainability can improve our quality of life and decrease negative impact on the environment at the same time.

Additional Information

This project was chosen as an AIA Committee on the Environment Top Ten Green Project for 2007. Please visit www.aiaopten.org and click on the Global Ecology project link for more detailed information and presentation boards.

- 1 pedestrian entry
- 2 new courtyard
- 3 research building
- 4 greenhouses
- 5 warehouse
- 6 existing buildings
- 7 thermal storage tank
- 8 native oak woodland
- 9 irrigated turf removed
- 10 perennial grasses
- 11 chaparral
- 12 bioswale
- 13 agriculture research zone
- 14 new parking

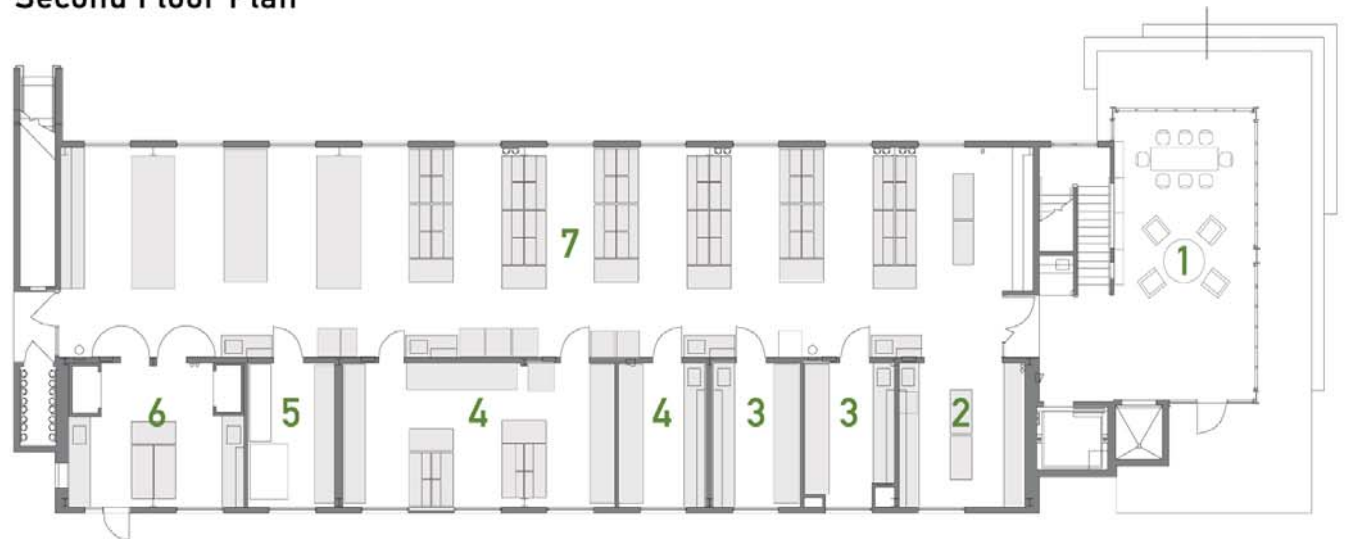
north



1. lobby
2. procedure room
3. clean room
4. equipment room
5. instrument room
6. fume hood room
7. open work area
8. conference room
9. restroom
10. mechanical room
11. meeting room
12. open office
13. private offices
14. server



Second Floor Plan

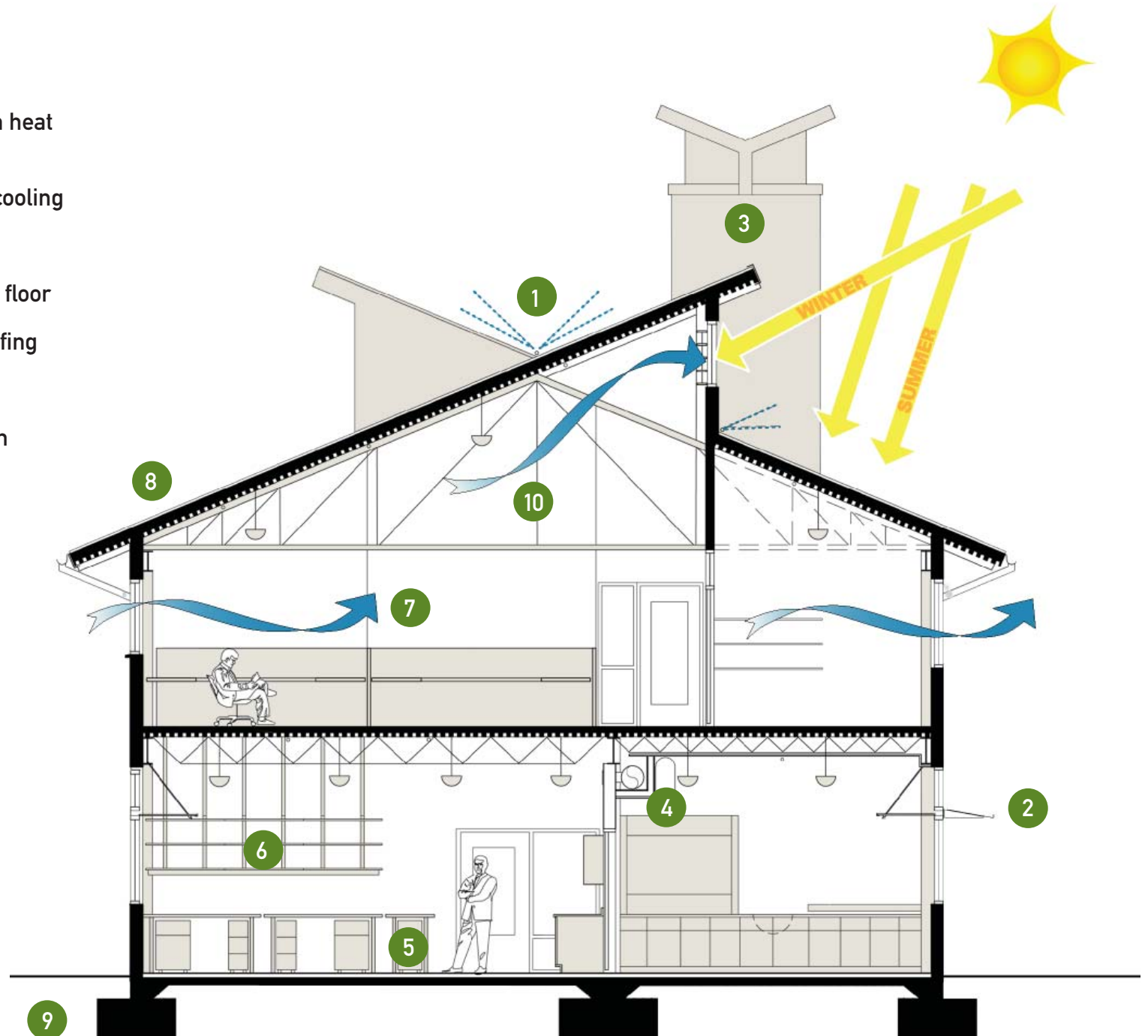


First Floor Plan

north



- 1 night sky radiant cooling
- 2 sunshades
- 3 katabatic cool tower
- 4 efficient ventilation with heat recovery
- 5 radiant slab heating + cooling
- 6 light shelves
- 7 naturally-ventilated top floor
- 8 spectrally-selective roofing
- 9 on-site water detention
- 10 fully daylit interiors with lighting controls









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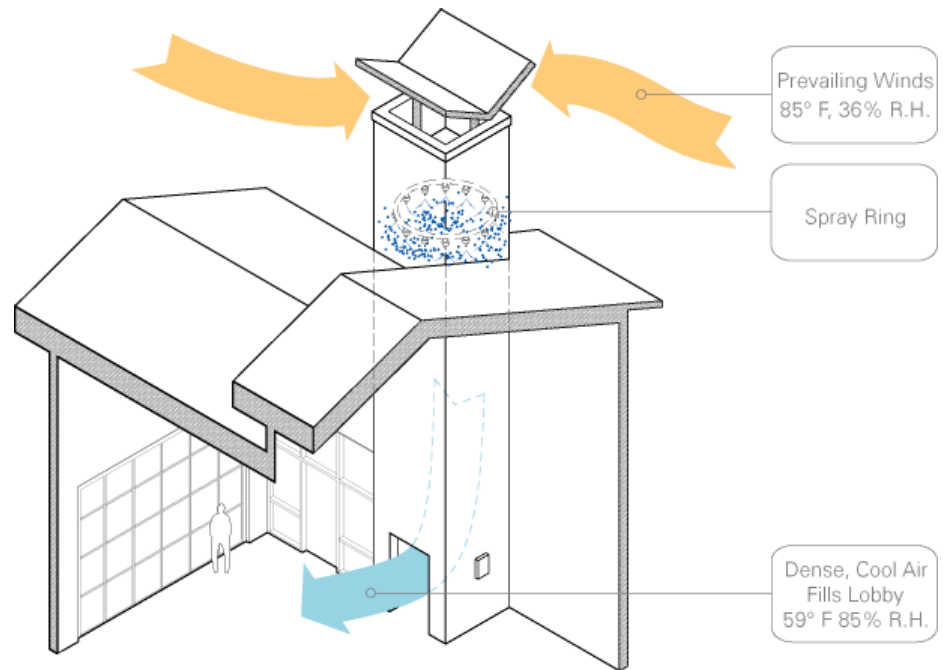
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Katabatic Cool Tower



Night Sky Radiant Cooling

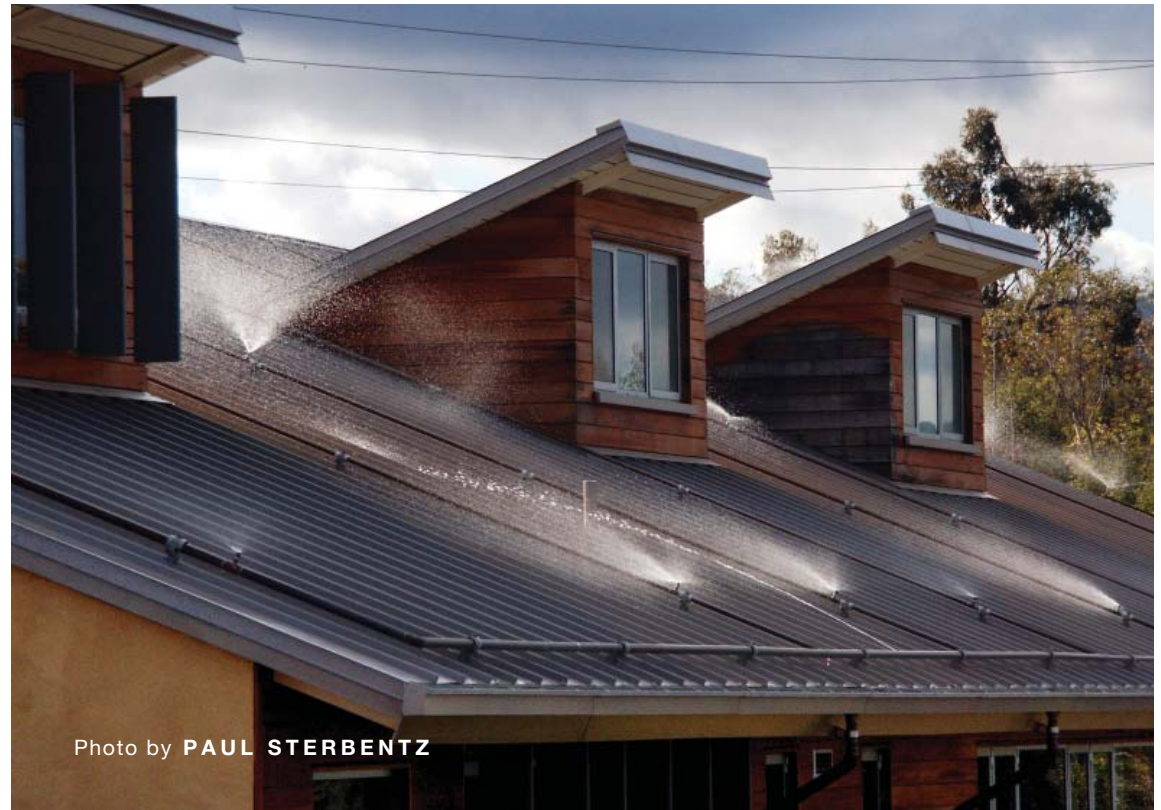
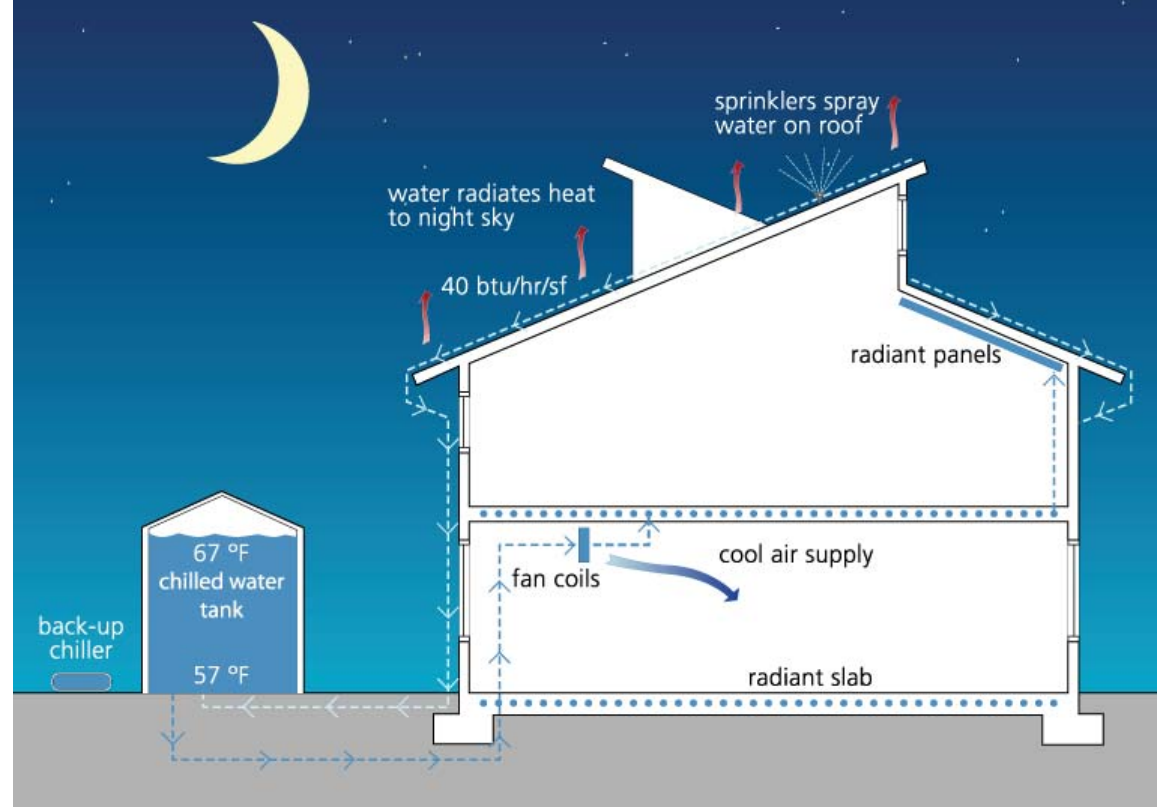


Photo by PAUL STERBENTZ

Salvaged Redwood Siding

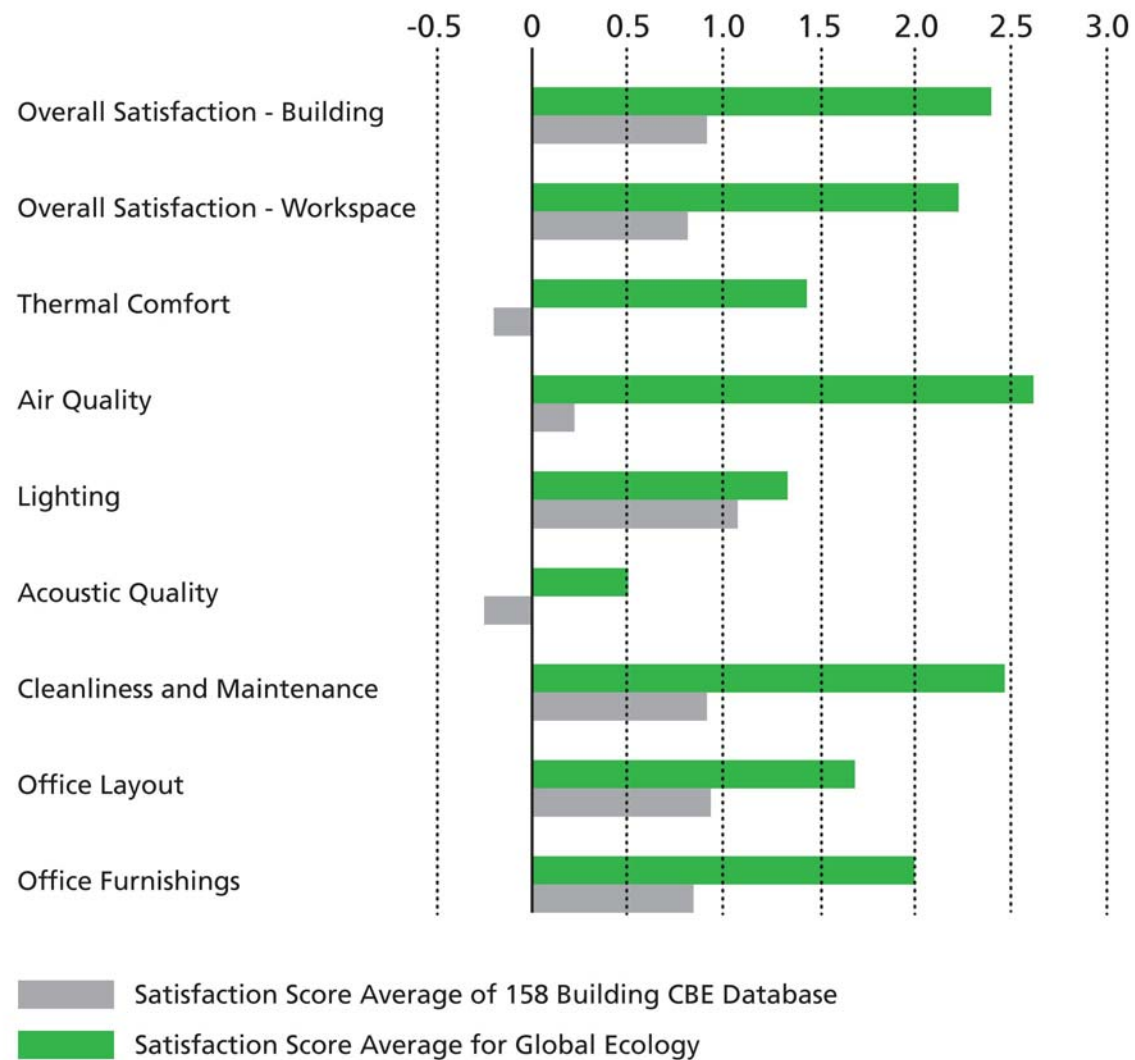


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Post-Occupancy Evaluation Survey (prepared by Center for the Built Environment)

GLOBAL ECOLOGY RESEARCH CENTER

January 2005



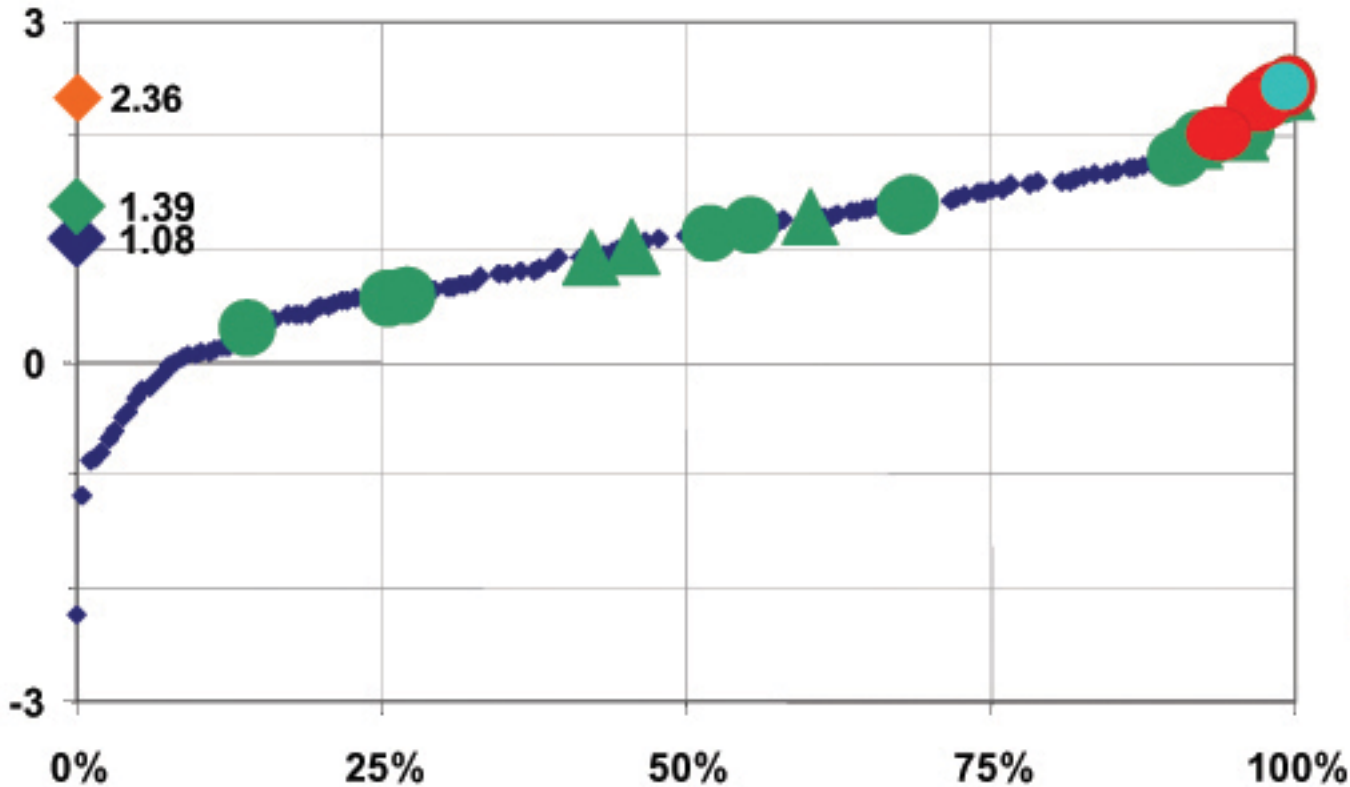
Overall Satisfaction - Building

LEED & GREEN (n=20) Compared to CBE Database (n=161)

Very
satisfied



Mean Satisfaction Score



Very
dissatisfied

● General database

● LEED/green

● Mixed-mode

Mixed mode
buildings

BH (2.42)
CIGE (2.39)
CBF (2.36)
HF (2.30)
CCGT (2.00)

BH – Bren Hall

CBF – Chesapeake
Bay Foundation

CCGT – Chicago
Center for Green
Technology

● CIGE – Carnegie
Institute for Global
Ecology

HF – Hewlett
Foundation