

UC Berkeley

Envelope Systems

Title

A Model of Success: The Carnegie Institute for Global Ecology

Permalink

<https://escholarship.org/uc/item/9vx411sb>

Authors

Weeks, Kirstin
Lehrer, David
Bean, Jonathan

Publication Date

2007-05-01

Copyright Information

This work is made available under the terms of a Creative Commons Attribution License, available at <https://creativecommons.org/licenses/by/3.0/>

A Model Success: The Carnegie Institute for Global Ecology

Kirstin Weeks, David Lehrer, and Jonathan Bean

Center for the Built Environment (CBE), University of California, Berkeley

May 2007

Can a building be friendly to both the environment and its occupants? According to a detailed survey taken of occupants at the Carnegie Institute for Global Ecology, the answer is an unqualified yes. When this airy, daylit building on the Stanford University campus was completed in 2004, the building was predicted to use 45% less energy than permitted by code and 40% less water than the average building of similar size. The American Institute of Architects recognized this “extremely low-energy laboratory and

office building” as one of the Top Ten Green Projects of 2007. What’s remarkable about the Global Ecology building is not only how efficient it is, but also how highly the building’s users—a team of 45 researchers—rate the building. 100% of the survey respondents were satisfied with air quality. Occupants enjoy good thermal comfort, too, with satisfaction results in the 99th percentile. Acoustics, lighting, and office layout, likewise, ranked high. Overall, the Carnegie Institute’s building has received one of the highest overall occupant satisfaction ratings of over 300 buildings CBE has surveyed.

Planning for Success

What process led to a building with such stellar occupant satisfaction and performance? Engineers, architects, the client—including the client’s research staff—worked together in a collaborative, integrated process, beginning with a design charrette. A committee from the Carnegie Institute met with the project manager and design architects. Together, they went over basic ideas, identified the needs of those who would use the building,

**“We need to make
a fundamental
paradigm shift:
money to carbon.”**

Scott Shell, EHDD Architects

A Model Success: The Carnegie Institute for Global Ecology



Photo: Kirstin Weeks

Architect

EHDD (Esherick, Homsey,
Dodge, and Davis) Architecture
500 Treat Avenue
San Francisco, CA 94110
(415) 285-9193
www.ehdd.com

Electrical Engineer

Engineering Enterprise
1305 Marina Village Parkway
Alameda, CA 94501
(510) 769-7600
www.engent.com

Mechanical, Electrical, and Plumbing Engineer

Rumsey Engineers
9 Linden Street
Oakland, CA 94607
(510) 663-2070
www.rumseyengineers.com

Landscape Architect

Lutsko Associates, Landscape
2815 18th Street
San Francisco, CA 94110
(415) 920-2800
www.lutskoassociates.com

Structural Engineer

Rutherford & Chekene
427 13th Street 2nd Floor
Oakland, CA 94612
(510) 740-3200
www.ruthchek.com

Civil Engineer

BKF
4780 Chabot Drive, Suite 104
Pleasanton, CA 94588
(925) 396-7700
www.bkf.com

identified the types of office and lab space needed, and discussed options for where the building should be placed on its site. In addition, the participants agreed upon the common goal of a sustainable building meeting the requirements for LEED Gold or Platinum certification. Such a building would add minimal carbon to the atmosphere during both construction and operation. However, Carnegie Institute staffers decided not to pay consultants to seek LEED certification.

Integrated Design & Engineering

Some charrette participants were interested in providing an interior courtyard to provide protected outdoor space; others wanted to forego a true north-south orientation to build better visual connections with neighboring buildings. Ultimately, optimal solar orientation won out, and a narrow building with long north and south facades was built. The architects cite this as the single most important design decision. “As Joe Escherick frequently said, ‘We’re going back to what we knew 200 years ago,’” recalled project designer Chuck Davis. Responding to those who desired a courtyard, the team designed the lobby with retractable walls that create an open lounge space whenever weather permits, which can happen in any month of the year in this climate.

As the design process progressed, the architects began working closely with Rumsey Engineers, focusing their attention on climate, the north-south siting of the building, and innovative low-energy cooling strategies such as

Researchers with the Institute played an active role in optimizing the innovative night sky cooling system.



Photo: Paul Sterbentz



Photo: Paul Sterbentz

using distinct strategies for ventilation and cooling systems.

To control temperature, the building uses radiant cooling rather than forced air. To provide fresh air, operable windows are used in the upstairs office levels; ventilation is provided by mechanical means only in the labs below. Using distinct methods for ventilation and cooling may contribute to greater occupant comfort because indoor conditions can be managed without forcing large quantities of air through the space.

Rumsey Engineers also proposed an innovative night-sky cooling system in which water is sprayed on the roof at night. When the spray is exposed to the cool night sky, it is cooled by radiation. The water is then collected and stored in an insulated tank. The next day, this cooled water can be used in the radiant cooling system to cool the building and absorb heat

from the occupied spaces, and the cycle repeated. Researchers with the Institute played an active role in the design process, working out calculations that resulted in a more effective design using smaller water droplets in the spray system.

Paul Sterbentz, facility manager for the Global Ecology building, remarked that the collaboration between engineers, researchers, and architects from day one was a key factor leading to the success of this building. His only regret is that collaboration was not more extensive with the electrical engineer as well, which could have avoided a few problematic fixture arrangements and specifications.

Features of the building that, at first glance, might appear to be purely aesthetic gestures also function to keep occupants comfortable. Large horizontal shading devices on the exterior of the south facade keep direct sun and associated heat gain out of perimeter offices throughout the summer and limit glare in the winter, while vertical louvers on northern windows prevent morning and evening solar gains in the summer from blasting staff in the open offices on the second floor. Light shelves on view windows throughout the building combined with clerestory windows and a slim building profile bounce daylight deep into the occupied space. Daylight sensors reduce artificial light levels when daylight is sufficient, saving additional energy. Operable windows make a sophisticated natural ventilation scheme possible for the second floor offices, while a sealed facade in the lower level lab spaces allows for the tightly controlled environmental conditions required for experiments.

A Model Success: The Carnegie Institute for Global Ecology

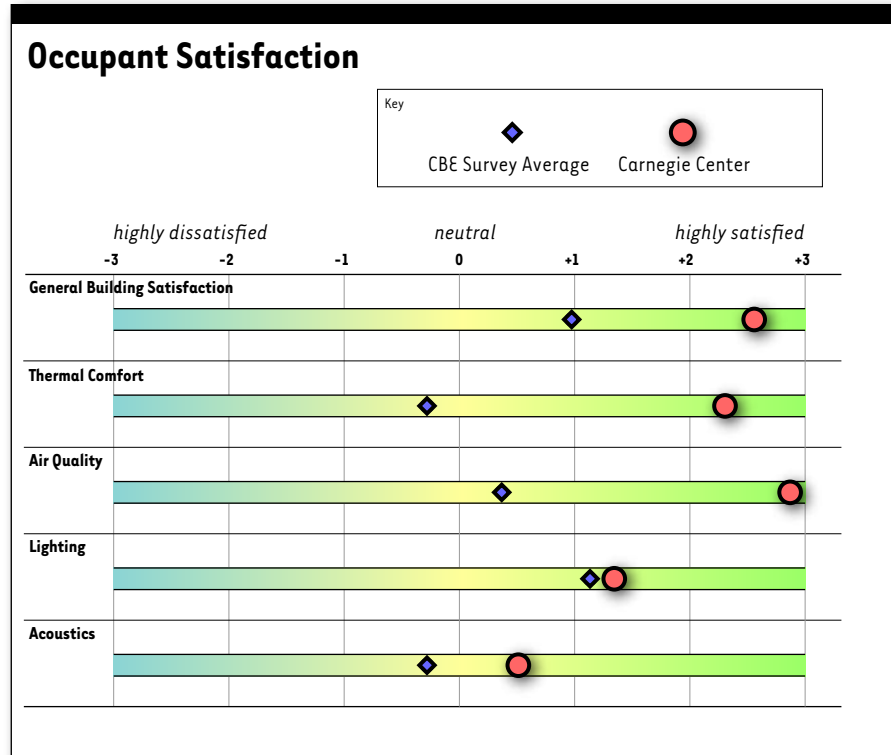
Outstanding Results

CBE's occupant survey, which takes only ten minutes for a user to complete, gives valuable information about which aspects of a building work well—and which do not.

Our survey of the Carnegie Institute shows that users of the building are particularly satisfied with air quality. This seems to be a result of both the natural ventilation strategies on the upper level and the mechanical ventilation system with HEPA filters on the lower level. The facility manager reports that some people come to the building specifically for its good air quality, as they find it to be the only place on campus where they can escape their allergies.

In addition to air quality, the survey shows that occupants are also satisfied with lighting. The director and facility manager mention that staff are happy with plentiful daylight and views to windows. Some who are less satisfied cite an issue with glare on the computer screen due to lack of window coverings. This represents a trade-off, because keeping the windows uncovered enhances the penetration of natural light into interior workspaces.

With respect to thermal comfort, 87% of occupants report satisfaction. This is noteworthy because an 80% satisfaction rate is the industry goal, but according to CBE research, this goal is rarely achieved. Perhaps more interesting is the fact that although temperatures in this building sometimes rise above 76°F on hot days, the facility manager reports that there have been no complaints about excessive temperature. This situation supports the theory of adaptive comfort, which states that in naturally



Results of the CBE Occupant IEQ Survey show high performance in several categories.

ventilated buildings—where occupants are connected more closely to the outdoor conditions, have control over windows, and access to increased air movement—people will stay satisfied in conditions outside of the comfort range of 68-72°F.

According to the CBE survey, Global Ecology Institute occupants are predominantly satisfied with acoustics—despite a workplace that consists of 83% open offices. Previous CBE research shows that acoustical satisfaction is typically low in open office spaces. EHDD worked with Charles Salter Associates to design quality acoustic spaces in the Global Ecology Institute, installing sound absorbing materials in the open office areas. Paul Sterbentz says that he has given up his initial skepticism about

the potential for acoustic success in an open office area. He describes a community culture in the open areas in which people share responsibility



for keeping the office quiet.

In addition to satisfaction with air quality and acoustic, thermal and visual comfort, the building director and manager cite aesthetics as one of the most satisfactory aspects of the building. The high ceilings, wood cladding on the facade, and general appearance of the building are among the things that people like most about this building. This may remind designers, engineers and owners alike of the importance of benefits that may be difficult to quantify in terms of money, health

or the environment, but rank high in terms of human experience.

important single element for energy and comfort, and also often the easiest to cut from a project—were designed to be very inexpensive to protect them from value engineering.

An unusual budget structure within the Carnegie Institute also helped focus attention on the importance of low operating costs. While many institutions have separate budgets for facilities and programs, in the Department of Global Ecology these budgets are combined. By reducing the utility costs the Institute will have more money available to support research.

One item that was not factored into the budget was commissioning, the process of ensuring that a building is performing as designed. In lieu of commissioning, Rumsey Engineers and the Institute staff have spent a great deal of time tracking down and fixing problems with the building. For example, there were problems with HVAC and lighting control. On the other hand, Paul Sterbentz notes that not everything might have been caught in a regular pre-occupancy commissioning session, as some problems developed well after occupancy. This effort has turned out to be more expensive than a concerted commissioning effort would have been—showing that even the most carefully designed buildings benefit from commissioning. Sterbentz suggests that to be successful, pre-occupancy commissioning should be followed up with bi-weekly checks for at least one full year.

The decision not to hire an independent commissioning agent may have been partly based on a philosophical outlook. Director Chris Field is troubled by the idea



All photos this page: Kirstin Weeks

Shading devices—important for energy and comfort—were designed to be very inexpensive to protect them from value engineering.

The Money Question

How did the team avoid the cuts that so often cripple high-potential green projects? “The budget was realistic for the program and the design was realistic for the budget,” explains Chris Field, director of the Carnegie Institute for Global Ecology. The design team was dedicated to the green building goals that were set at the beginning of the project. Such strong consensus would not allow important aspects of the project to be cut. Scott Shell of EHDD Architecture adds that the shading devices—arguably the most

A Model Success: The Carnegie Institute for Global Ecology

that one can pay millions of dollars for a building, then have to pay extra to insure that it functions properly. However, until project delivery practice improves, he has come to believe that commissioning activities need to be part of the original scope of work on all projects. Indeed, EHDD now includes commissioning as an integral part of proposals, to help avoid having it cut later on. This includes specifying monitoring and instrumentation in projects.

Net Results

The Carnegie Institute's new building is a model of environmental sensitivity, people-friendliness, cost-effective

performance and innovative resource conservation. As Scott Shell reminds us, "we need to make a fundamental paradigm shift: money to carbon." The Carnegie Institute for Global Ecology is an example of a project that takes on the carbon-reduction challenge without making any sacrifices in design quality, innovation, or occupant comfort. In so doing, it shows how diverse benefits can follow from this strong commitment, not only to the environment, but also to human health and well-being.

To learn more about CBE's survey, or to try a sample survey, visit www.cbe.berkeley.edu/research/survey.htm.

Contact Us

Center for the Built Environment (CBE)
University of California, Berkeley
390 Wurster Hall #1839
Berkeley, CA 94720-1839
510.642.4950 | fax 510.643.5571

cbe@berkeley.edu
www.cbe.berkeley.edu

Copyright © 2007 The Regents of the University of California



Photo: Paul Sterbentz