

# Green Architecture as Teacher: The Wolken Center

A nonprofit group teams with a sustainable architecture firm to create a beautiful, low-impact building that uses over 70 percent less energy to operate than a comparable office building.

by Polly Cooper and Ken Haggard



The architects designed the Wolken Center so that all of the interior spaces can operate on daylight alone during the day.

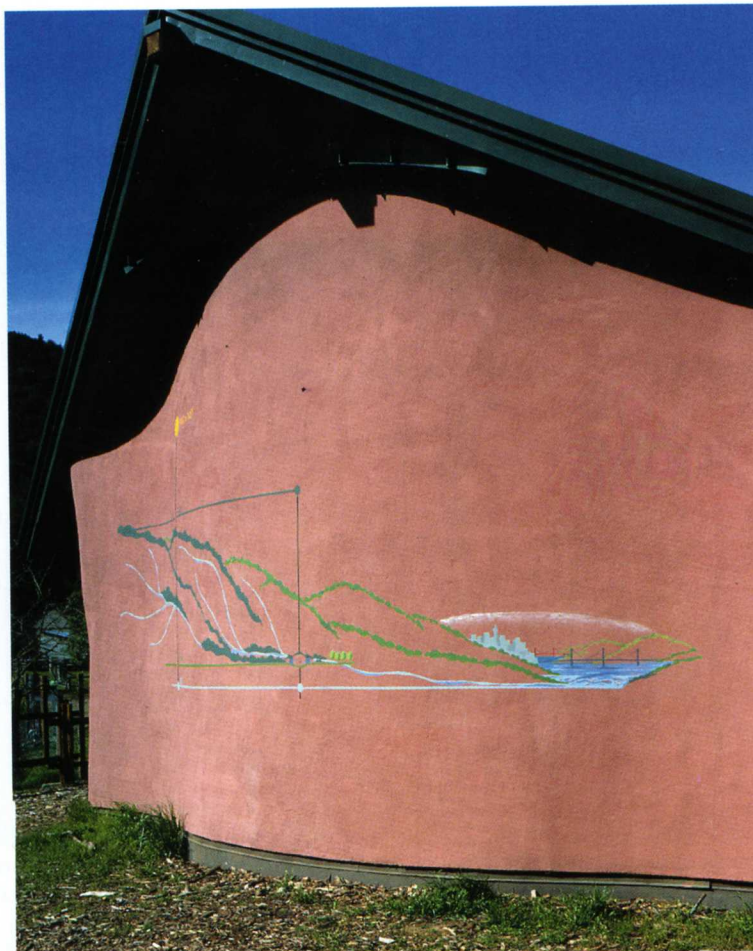
The Wolken Center features three south-facing dormers—one on each pavilion—which bring natural light deep into the building, add more south glazing and aid in night ventilation during the summer.

**H**idden Villa, a nonprofit foundation located at the edge of Los Altos, California, in the heart of Silicon Valley, is situated on 1600 acres that are now part of the Mid-Peninsula Open Space District. Hidden Villa operates many public programs for the area's children, including a year-round environmental education program for schools, churches and other organizations, a very popular summer camp program, a youth hostel, a small farm with a very intensive organic gardening program and a variety of social diversity programs.

Hidden Villa developed the Wolken Education Center to serve three main purposes relating to organization's mission. First, the staff for the Environmental Education Program (IVEEP) and Camp program had long since outgrown their old facilities and needed new offices specifically designed for their unique activities. In addition, Hidden Villa's expanded educational efforts required new public facilities, including a conference room, library and restroom facilities. And third, the programming committee of Hidden Villa wanted the new facility to provide a living example of sustainable architecture and wanted the building's sustainability features to be an essential part of the educational program.

### **Sustainable Architecture Demonstration**

The ability of both visitors and users to recognize and understand what the sustainable design features are and how they operate was a critical part of the building's function. In response to the need for educational materials, we produced twenty display boards designed to be an integral part of the conference room. These boards illustrated various aspects of the building, including sustainability, setting, passive solar heating, passive cooling, daylighting, electricity generation, materials, equipment, water reuse and aesthetics.



*The east wall of the public wing of the Wolken Center features a mural showing Hidden Villa's watershed and its relationship to San Francisco Bay.*

Richard Paradowski

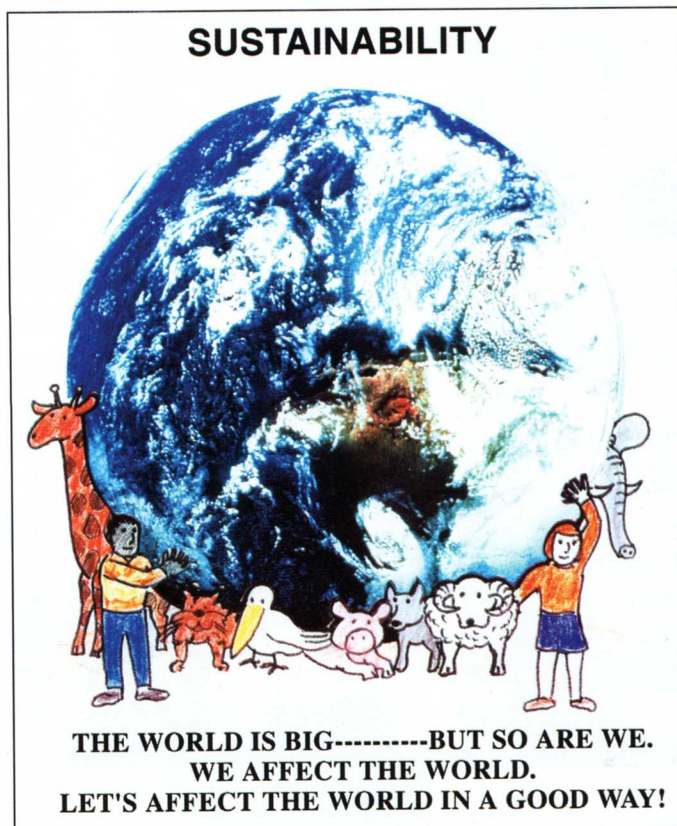
We designed two education boards on each topic—one for young children, which was very brief and conceptual (see drawing this page), and one for older children and adults, which was more specific, using numbers to quantify results. For example, in addition to defining sustainability, the young adult sustainability board gives a "bottom line" summary of the results of sustainable design in terms of the amounts of CO<sub>2</sub>, NO<sub>2</sub> and NO<sub>x</sub> pollution avoided by applying these principles to the design of the Wolken Center. These figures were developed using both Energy 10 and Calpas 3 programs as part of the thermal optimization studies of the building's design.

### **Thinking it Through**

The sustainable building committee at Hidden Villa had very carefully developed an in-depth program for the building. Because of this, it was relatively easy to condense this information down to a diagram of the program, which became the basis for the design.

In developing the program, we had to resolve a potential conflict between the public area and the office space. This resulted in a plan that grouped the offices around a court with the public area of the building jutting to the east, which is the direction the public arrives from. The east wall of this wing features a mural showing Hidden Villa's watershed and its relationship to San Francisco Bay (see photo this page).

The resulting plan allowed for three pavilions hooked together at the corners, permitting each to have a large area of south-facing wall for direct solar gain. Each pavilion also features a south-facing dormer. These dormers are important, because they bring natural light beyond the 12-foot (3.7-m) reach of effective daylighting from the windows. In addition, they add more south glazing and aid in night ventilation during the summer.



*Children's board on sustainability*

## Load Reduction

Natural lighting was a critical design concern for reasons of health, productivity, energy conservation and aesthetics. We designed all the interior spaces to operate on daylight alone during the day. The three-pavilion plan allows good access to exterior light and views at the edges, supplemented by roof dormers located in the center of each wing.

The structure of the roof is an arrangement of prefabricated trusses at 2-foot (0.6-m) intervals constructed of certified sustainably harvested lumber. Continuing these trusses through the dormer helped the system maintain its economic advantages and provided a series of finned lighted openings in the center of the main offices, library and work and conference rooms. The result is a large

reflective area that distributes natural light without glare, and provides more distributed mass to help with night vent cooling in the summer.

The roof of the southernmost wing of the building is covered with 45 AstroPower photovoltaic panels (5400 peak watts) connected to the local utility by an intertie system. The array is sized so that on a yearly basis, the Wolken Center produces as much electricity as it will use. This allows the utility to act as a battery, rather than a regulated monopoly, in regard to this building.

We made every effort to minimize electrical loads. The refrigerator is a SunFrost, solar water heaters supply hot water for washing, efficient propane appliances serve as backup heaters and compact fluorescents provide lighting at night throughout the building.

The graph on this page illustrates the result of the careful integration of all these systems with the passive building design. The building boasts a 73.5 percent reduction in energy use compared with a comparable office building in Los Altos built to California's Title 24 standard.

The Wolken Center opened just as the infamous California electricity crisis got everyone's attention with rolling blackouts and very substantial rate hikes. Using sus-



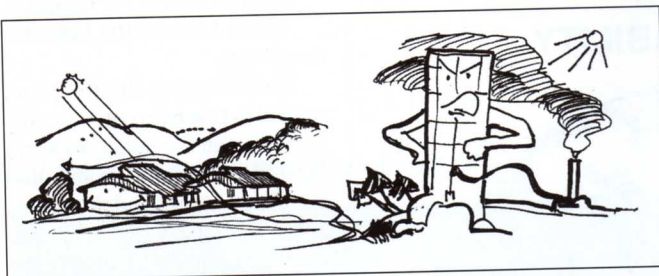
Ken Haggard

One of the educational programs at the Wolken Center is an intensive organic garden.

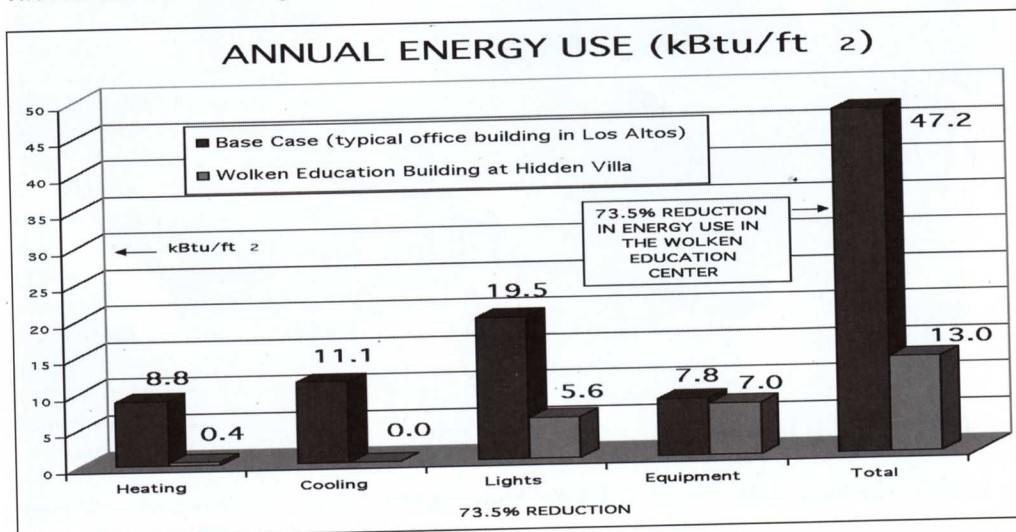
This building is an extension of our previous work in Central California, and combines direct gain/distributed mass, direct gain/concentrated mass, natural lighting via roof dormers and straw bale construction. The distributed mass consists of the

internal stucco on the straw bales, the exposed concrete slab of the floor, the double 5/8-inch (4 cm) drywall ceilings and some 2-inch (4 cm) interior stucco walls. A large amount of distributed mass allows us to get very effective night vent cooling,

even in the office wings, which have high internal loads. Concentrated mass consists of seven 9-inch (13-cm) thick water tanks located behind windows on selected south facing walls.



Two Attitudes toward building



Annual energy use



Richard Paradowski

The roof of the southernmost wing of the building supports a photovoltaic system that produces as much electricity on an annual basis as the Wolken Center uses.

a building that works on every level.

It was a real joy to work with a client so committed to sustainability. Only a few short years ago, many architects felt that they had to hide the fact that a building was passively heated and cooled or consciously designed to reduce its environmental impact. Today, it is clear that sustainability has not only broadened our architectural vocabularies and clarified our goals, but it has also shown us that there are really only two attitudes toward building (see drawing, page 30). Once we place a design in the context of sustainability and ask the question, we all know in our hearts which is better. This is a good time to be a green architect. ☺

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tainable energy strategies reduces the organization's vulnerability to energy price volatility and supply disruptions.

**Beautiful and Sustainable**

We also wanted the building to be aesthetically pleasing. We put a lot of effort into creating a building with a harmonious relationship to the surrounding natural forms. It was also important that both visitors and staff felt welcomed and comfortable.

The Wolken Center is a working display of sustainable materials. Examples include straw bale walls, premanufactured

trusses built with certified sustainably harvested lumber, an earthen plaster wall in the conference room, recycled wood for trim and cabinets, sunflower seed hulls in soy glue for countertops, tile with recycled content, library book shelves from bamboo and sustainably grown wood, and a metal roof from mostly recycled steel. The sustainable materials, human scale, natural lighting and pleasing natural forms combine to make



Ken Haggard

Continuing the prefabricated roof trusses through the dormer helps the system maintain its economic advantages and provides a series of finned lighted openings that distribute natural light without glare.



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The metal roof on the Wolken Center is made from mostly recycled steel.