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NASEO National Association of State Energy Officials

ZERO ENERGY COMMERCIAL BUILDINGS CONSORTIUM CBC

Project Profile

A Zero Energy Building

Credit: Philippe S. Cohen

Overview

Site Details

- Location: Woodside, CA
- Building type(s): Higher education, Other
- New construction
- 13,200 ft^2
- Completed June 2002

LESLIE SHAO-MING SUN FIELD STATION AT JASPER RIDGE BIOLOGICAL PRESERVE

The Leslie Shao-Ming Sun Field Station was designed to meet the needs of the Jasper Ridge Biological Preserve, a 1,200-acre protected area in the foothills of the Santa Cruz Mountains, five kilometers from Stanford University. With a mission "to contribute to the understanding of the earth's natural systems through research, education, and protection of the Preserve's resources," Jasper Ridge has a long history as a site of significant research in ecology. The majority of studies are concerned with environmental change and the resulting consequences for biotic communities. The Preserve provides a natural laboratory for researchers, educational experiences for students and visitors, and refuge for native plants and animals.

Energy

One of the explicit energy goals for the building was to achieve net-zero carbon emissions on a recurring annual basis. The most significant strategies employed to maximize energy conservation focused on the building's cooling, heating, and lighting systems. Due to the warm climate, the building's largest energy load is cooling. Only one room (the herbarium, which houses biological collections) requires air-conditioning.

The strategy for cooling the remaining 94% of space included the following strategies:

- Effective site selection and building orientation;
- Efficient insulation (rigid insulation on the exterior of the roof eliminates thermal leaks from structural elements);
- High-performance glazing and maximized daylighting;

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- Strategically designed shading (deciduous vines and south-facing solar collectors shade south-facing glass); and
- Operable windows in all occupied spaces for natural ventilation.

The insulation, glazing, and solar exposure also reduce winter heating loads. An active solar collector and a hydronic heating system satisfy more than 80% of the building's heating needs.

More than 90% of daytime lighting is provided by daylight through the use of north-facing light monitors, shaded south-facing glass, and reflective surfaces. High-efficiency electronic ballasts and full-spectrum fluorescent ceiling lamps are used when daylight is inadequate.

Other energy-conserving features include Energy Star rated appliances and tankless water heaters.

A 22 kilowatt, grid-connected photovoltaic system makes the building a net producer of electricity.

The energy monitoring system has provided important information that has further improved system performance. Improved matching between the inverter and PV panel output has increased energy production by more than 25%.

Efficiency Strategies

Solar Cooling Loads. Orient the building properly. Use south windows with a low SHGC.

Daylighting for Energy Efficiency. Use south-facing windows for daylighting. Orient the floor plan on an east-west axis for best use of daylighting. Use building elements to redirect daylight and control glare. Use north/south roof monitors and/or clerestories for daylighting.

Hot Water Loads. Use water-efficient dishwashers. Use water-efficient clothes washers.

Non-Solar Cooling Loads. Use siting and topography to enhance summer breezes. Use operable windows. Reduce internal heat gains by improving lighting and appliance efficiency.

Water Heaters. Use demand water heaters.

Light Levels. Minimize outdoor lighting.

Photovoltaics. Use a photovoltaic (PV) system to generate electricity on-site.

Heating Systems. Use hot water heat distribution.

For an in-depth case study, visit:

buildings.newbuildings.org/overview.cfm?projectid=457

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