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NASEO National Association of State Energy Officials

ZERO ENERGY COMMERCIAL BUILDINGS CONSORTIUM CBC

Project Profile

A Zero Energy-Capable Building

Credit: Ted Betz, Betz Photography

Overview

Site Details

- Location: San Rafael, CA
- Building type(s): Assembly, Multi-unit residential
- New construction
- 6,200 ft^2
- Completed November 2005

JANE D'AZA CONVENT, HOUSE OF FORMATION

When a fire destroyed their grand Victorian landmark in 1990, the Dominican Sisters of San Rafael saw an opportunity to develop a series of smaller buildings that reflected their contemporary vision, including a strong commitment to environmental responsibility.

The House of Formation, one of these buildings, introduces incoming novitiates to their chosen life. In addition to the eight-bedroom residence, the building houses offices and common areas, a large kitchen, a dining room, and a chapel. The tranquil landscaping promotes contemplation and an awareness of the Order's goal of minimizing its ecological footprint.

Energy

The building is oriented along an east-west axis, allowing for effective daylighting. South-facing windows are shaded to prevent heat gain and glare. The windows are operable, providing natural ventilation and a connection to the outdoors.

The project team used optimum-value-engineering (24″-on-center) framing, which allowed for more insulation at the exterior walls and reduced thermal bridging. Under the roof, raised-heel trusses allow the sprayed-in-place cellulose insulation to extend to the building perimeter, improving thermal performance.

A 7.1-kW photovoltaic system mounted on the project's pitched roof was anticipated to generate 10,600 kilowatt-hours of electricity per year. In addition, a solar water-heating system replaces the need for about 19 million Btus of natural gas each year. A gas boiler with an energy factor of 0.935 provides backup water heating.

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The team chose gas wall heaters for their individual controllability and their energy efficiency. Attic vents for cooling have their own photovoltaic power source. Other energy-efficiency features include Energy Star appliances and low-flow faucets and showerheads.

Efficiency Strategies

Wall Insulation. Use spray-applied insulation in cavities with many obstacles or irregularities. Use advanced framing techniques.

Solar Cooling Loads. Shade south windows with exterior louvers, awnings, or trellises.

Daylighting for Energy Efficiency. Orient the floor plan on an east-west axis for best use of daylighting.

Hot Water Loads. Use water-efficient showerheads. Use water-efficient faucets.

Non-Solar Cooling Loads. Use operable windows.

Water Heaters. Use solar water heaters.

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

Heating Systems. Size heating systems appropriately.

Refrigerators and Freezers. Use Energy Star-rated refrigerators and freezers.

Other Energy-Efficient Appliances. Use Energy Star dishwashers.

Roof Insulation. Design roof system with raised rafters or trusses to avoid cold corners.

For an in-depth case study, visit:

buildings.newbuildings.org/overview.cfm?projectid=895

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