nbi new buildings institute

Project Profile

Ultra-Low Energy Building

Photo courtesy of Sally Painter Photography

Overview

Site Details

Building Size: 230,760 SF (includes garage)

Location: Portland, Oregon

Construction Type: New

Construction Year: 2011

Building Type: Multifamily and Educational

Measured Energy Stats

19	-	1	=	18
BUILDING'S TOTAL EUI		RENEWABLE PRODUCTION EUI		BUILDING'S NET EUI

Site Energy Use Index (EUI) kBtu/SF/year

The Energy Equation: **the building energy use** *minus* **the renewables production** *equals* **the net energy of the building**. Buildings may be 'Getting to Zero' and have a net EUI above zero. If renewable production exceeds energy use its net EUI is below zero (negative) and it is creating surplus energy.

THE RAMONA

The Ramona is a mixed-use development in the urban Pearl District of Portland, Oregon. The building hosts 138 units of affordable housing and two educational facilities. Portland Public Schools rents 13,000 SF for programs for children ages 3 to 6. A nonprofit community group also leases space on the ground floor.

Planning & Design Approach

The design team used the Architecture 2030 program goals as the primary driver for energy performance. The aim was to meet the 50% better than Commercial Building Energy Consumption Survey (CBECS) level, or an EUI of 23 kBtu/SF/year for a building of this type and size. The team strived to build a tight envelope, serve it with the most energy efficient equipment and fixtures available, and provide renewable energy systems such as photovoltaic and solar hot water.

Energy Efficiency Strategies and Features

High Performance Building Envelope - The building has a very tight envelope, energy efficient windows and increased levels of insulation. Whole building pressurization test had a leakage rate of 0.22 cfm/SF at 75 pascals - 12% better than the strictest federal standard in place at that time. Walls have blown-in insulation (R-23) that fills the entire wall cavity. The roof has rigid insulation with a R-32.5 on top of the roof trusses. Roof penetrations are limited due to a heat recovery system that eliminates individual exhaust fan motors over each stack of bathrooms as well as to the careful design and co-placement of plumbing vents. A continuous air barrier extends across the entire envelope, and special attention was paid to the transition between the walls and the roof. Additionally, argon-filled, vinyl casement windows (U-value of 0.26) are caulked and sealed inside and out to prevent air leakage.

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Project Team

Owner: Nurture 247 Limited Partnership

Developer: Turtle Island Development LLC

Architect: Ankrom Moisan Architects

Engineer: PAE Consulting Engineers

General Contractor: Walsh Construction Company

Building Envelope: RDH Inc.

Energy Modeler: PAE Consulting Engineers

Financing & Cost

Cost/SF: $127/GSF (excludes tenant improvement for educational spaces)

Awards

LEED® Gold

For more information:

The Ramona website: http://goo.gl/jqe4P0

PAE Consulting Engineers: http://goo.gl/BKvWSC

New Buildings Institute

New Buildings Institute (NBI) is a nonprofit organization working collaboratively with commercial building professionals and the energy industry to improve the energy performance of commercial buildings.

Efficient Mechanical System - Apartments use zonal electric resistance heat –some baseboard and some wall-mounted fan-forced–controlled by separate electronic thermostats. Air-to-air heat pumps heat and cool common areas and supply fresh air through ducts to individual units. Separate heat pumps are provided for laundry facilities on each floor, fitness rooms and office spaces. Exhaust fans in bathrooms and kitchens run continuously to remove odors and increase occupant comfort, and waste heat is recovered to pre-heat incoming air.

Domestic Hot Water - Solar hot water panels meet about half of the hot water demand, with the remainder heated by a gas-fired central boiler.

Lighting - All light fixtures in apartments are dual-pin fluorescents with integral energy efficient ballasts (rather than screw-in compact fluorescent lamps). The interior designer used a layout of linear fixtures located close to hallway walls on alternate sides of the hall to produce a consistent level of illumination without creating shadows as people walk through the hall. Common area fixtures that aren't required for egress lighting are controlled by occupancy sensors.

Plug Loads - Refrigerators and dishwashers are all Energy Star. Efficient clothes washers and dryers are co-located in facilities on each floor. A load washed in cold water cost only $0.50, while a hot water load costs $1.00. High efficiency traction elevators use about 60-80% less energy than hydraulic elevators.

Renewables - In addition to the domestic solar hot water system, the building has 30 kW of photovoltaic panels.

Lessons Learned

- Air infiltration assumptions play a big role in the energy model, though it is hard to know in advance what the rates will be. Blower door tests show a rate of air change per hour 12% better than the assumption used in the model. This may be a large factor in why the actual EUI has been better than the predicted EUI.
- The design team evaluated 12 different exterior wall assemblies and looked at each with 3 different window types. R-values varied dramatically without windows, but the differences were minor once the windows were included. This made clear that the amount and quality of the glazing had significant energy implications and led the team to reduce the size of the bedroom windows and specify highly efficient windows.
- Energy modeling showed that a high efficiency central boiler was more efficient than electric water heaters (even "tankless") in each individual apartment. Additional insulation on the hot water pipes reduces heat loss.
- The developer has committed to tracking whole-building energy use for five years. They will investigate whether the building energy use varies by floor and/or solar orientation, whether the dashboards for residents on the 4th floor result in additional energy savings over that of residences on the other floors that do not have a direct feedback mechanism.