nbi new buildings institute

Project Profile

Ultra-Low Energy K-12 School

Photo courtesy of MMM Group

Overview

Site Details

Building Size: 58,500 SF

Location: Windsor, Ontario, Canada

Construction Type: New Construction

Construction Year: 2010

Building Type: K-12 School

US Climate Zone: 5

Measured Energy Stats

25 - 3 = 22

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.

DR. DAVID SUZUKI PUBLIC SCHOOL

The Dr. David Suzuki Public School combines readily available and demonstration technologies to create a school building that serves as a living laboratory for 550 students in Windsor, Ontario. The two-story kindergarten through 8th grade school includes classrooms, a gymnasium, music, art, science, special education classrooms, library and office spaces for 32 staff. The school literally makes design strategies visible, by locating radiant panels, mechanical systems and rainwater catchment pipes behind transparent surfaces, easily observable by students and teachers. Despite the cold climate, the school uses a mere 25 kBtu/SF/year—more than 60% better than the Canadian Model National Energy Code for Buildings.

Planning & Design Approach

The approach to the ultra-low energy design is to maximize building insulation, minimize lighting loads and serve loads with a highly efficient mechanical system. The building's mechanical systems are tailored to the individual needs of occupants in various spaces. Free cooling through natural ventilation is the primary strategy, and the system separates conditioning (heating and cooling) from ventilation to reduce fan energy.

Energy Efficiency Strategies and Features

High Performance Envelope - Key to the building's energy efficiency is an airtight and well-insulated envelope (roof R-30 and walls R-24). Carefully located high performance windows (double glazed with argon-filled glass and low-E coating) permit daylighting while managing heat gain and glare. Blower door tests

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Project Team

Owner: Greater Essex County District School Board

Architect: McLean + Associates Architects

MEP Engineer: Smylie & Crow Associates, Inc.

Sustainability/Energy Consultant: MMM Group

Contractor:
Mady Contract Division, Ltd.

Civil Engineer:
Lucente Engineering, Inc.

Financing & Cost

Cost/SF: $232/SF

Awards

LEED® Platinum

For more information:

High Performing Buildings:
http://goo.gl/gn9DBk

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.

confirmed the building's airtightness - with a measured air leakage rate of 17.3 cfm at 7 Pa, or about half of what was targeted in design.

Lighting - Daylighting provides the primary source of illumination. Occupancy and daylight sensors control the premium efficiency T8 systems in classrooms and T5s in the gymnasium. LEDs make up the remainder of the lighting. All lights are switched off at the end of the day via the Building Automation System.

Heating and Cooling - Natural ventilation provides free cooling when conditions permit. An indicator light in classrooms and the gym tell occupants when they may open windows, and sensors automatically disable the mechanical cooling in that zone. A ground-source heat pump system consisting of 28 wells at a depth of 370 feet is used to heat and cool the building. The school utilizes a combination of technologies for space conditioning that includes water-to-water and water-to-air heat pumps and a variable refrigerant flow (VRF) system.

Ventilation - Five air handling units (AHU) serve the building. The two for the classrooms help manage humidity and ensure condensation doesn't collect on the floor. Outdoor air is first conditioned by an enthalpy wheel (which also provides energy recovery), and ventilation air is delivered through variable air volume (VAV) boxes. Two of the other AHU's include passive features for preconditioning air before it enters the building – one utilizes a solar air heater when heating is required, and the second is connected to an earth tube system. The gymnasium and other variable occupancy spaces include carbon dioxide sensors to regulate ventilation rates.

Renewables - 36 kW of photovoltaic system is tied to the grid and generates revenue for the school through the Feed In Tariff program of the Ontario Power Authority.

Lessons Learned

- Owner commitment, involvement and dedication to low energy outcomes is critical to success.
- Complex systems require commissioning.
- Schools can incorporate readily available technology, leverage incentive programs and serve as a tool in educating students and the community.
- $1,750,000 of incremental costs yielded $80,000/year in energy and water savings and an additional $19,000 per year in maintenance savings. Daylight sensors, occupancy sensors and the ground-source heat pump system were other very cost-effective measures that offset less cost-effective measures also incorporated into the building.