Case Study

Overview

Site Details
- New Construction
- Completed 2009
- 38,700 square feet
- Located in Middletown, Rhode Island

Activity Types
- Administration
- Childcare
- Elder Care
- Counseling

Efficiency Measures
- Efficient HVAC design
- Efficient lighting
- High performance envelope design
- Controls

Covered Metrics
- Whole building EUI = 64.9 kbtu/sf
- Annual electricity use
- Advanced Buildings Core Performance

CHILD AND FAMILY

Child and Family of Newport County (CF) is a nonprofit organization dedicated to strengthening families and communities through services such as preschool childcare, counseling, home care for the elderly and disabled, substance abuse education, home-based child welfare, transitional housing for homeless mothers and their children, and workforce development. CF traces its origins to 1866 with the Home for Friendless Children and has grown since then by acquiring different properties in Newport County. The organization has raised funds for a centralized headquarters building that would allow more effective coordination of their programs and foster a greater sense of community within CF staff and the populations they serve.

This is the first building in Rhode Island to participate in the Advanced Buildings® program.¹

The new CF building can be described as two buildings with separate functions joined by a two story common “streetscape.” The childcare portion of the facility is housed in a single-story wing located on the South side. The counseling and community support services will take place in the first floor area of the two-story wing on the North side of the streetscape. Administrative functions are located on the second floor of the North wing.

¹ Source: CF website.
Key Objectives

- Create a high performance building that meets the requirements of the Advanced Buildings Core Performance program, with the goal of achieving 30 percent\(^2\) energy savings beyond the Rhode Island Energy Code.
- Consolidate operations into a single, new facility that would service the organization for the next 100 years.

Technologies and Design Strategies:

**Efficient HVAC Design**

The varying uses of the building and differences in operation hours, lighting levels, required comfort levels and space organization represented a significant challenge to designing an HVAC system that was energy efficient, met the customers’ needs and was cost-effective.

This challenge was addressed through the architectural form of the building, by organizing the different space uses along a common streetscape spine, allowing for the segregation of the different uses and corresponding HVAC zones.

Ultimately, the design resulted in the use of three VAV RTUs, each serving one of the main portions of the building: streetscape (22 tons with 10.2 EER), administrative and counseling (36 tons with 10.0 EER) and daycare (22 tons with 10.2 EER). Additionally, a dedicated two ton cooling system cools the central server room. The system efficiency was enhanced by using supply fans with variable speed control, demand control ventilation, full economizer capability, power exhaust fans equipped with VSDs, premium efficiency motors, and ECM motors in FPT Boxes.

The design incorporated high efficiency, non-condensing boilers that achieve 88 percent thermal efficiency through improved combustion controls, exceeding the Advanced Buildings requirement of 80 percent.

**High Performance Envelope Design**

Improving the performance of the building envelope, especially that of the extensive roof area, was a major concern for the team. The team implemented a strategy that included R-25 continuous insulation on the approximately 10,000 square feet of flat roof area, as well as R-40 insulation in the approximately 14,000 square feet area of sloped roof attic space.

For above-grade walls, the team implemented a strategy that exceeded the Advanced Buildings requirements by using two inches of R-10 rigid continuous foam and R-19 batt infill insulation.

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\(^2\) According to J. Caldeira of Vision 3 Architects
Window and skylight performance was also enhanced. Energy savings result from decreased heat gain and loss during unoccupied periods. The team selected windows, which represent a vertical glazing fraction of 17 percent, with an assembly U-value of 0.37 and SHGC of 0.26. The single skylight used in the daycare area, has an assembly U-value of 0.40 and a SHGC of 0.26, both exceed the Advanced Buildings requirements.

Efficient Lighting And Control Strategies
The lighting design presented some of the same challenges as the HVAC design regarding space use and operating hour differences. Additionally, the client requested that a minimum of different light fixtures be used in order to simplify operation and maintenance. The resulting design had a lighting power density of 0.91 W/square foot and was achieved using Super T8 florescent light and ballast combinations with occupancy-based lighting controls.

Measurement and Evaluation

Energy Performance
The performance benchmark for this project was the International Energy Conservation Code 2003 (IECC 2003). The final design has a projected annual operating cost of $42,989 which is 31 percent lower than the code-compliant base case.

The annual energy savings are projected to be 117,394 kWh and 4,021 therms, saving Child and Family of Newport County $18,633 each year. The incremental cost to meet the Core Performance criteria was an estimated $128,023 less a total utility incentive of $54,808, achieving a simple payback of 3.9 years and a ROI of 28 percent.

For more information about Advanced Buildings Core Performance, visit: www.advancedbuildings.net

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By the Numbers

- Total project cost: $7.5 million
- Energy efficiency upgrade costs: $128,023
- Energy efficiency investment payback (including incentives paid): 3.9 years
- Internal rate of return on energy efficiency investment: 28%
- Estimated annual electricity savings: 117,394 kWh
- Estimated first year utility bill savings: $18,633

About Advanced Buildings
Advanced Buildings offers a direct path to high energy performance in new commercial building projects. An Advanced Buildings designation represents a best-in-class building that adds value and stand out for their energy efficiency and healthy environments. In addition to the New Construction Guide, Advanced Buildings offers a suite of tools and resources that help design teams achieve superior energy efficiency.

Advanced Buildings is developed and managed by New Buildings Institute with support from utility and public benefits organizations as well as foundation funding.

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.

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