Fales Elementary School

Westborough, Massachusetts

BUILDING DATA

Square Footage: 70,242 SF
Construction Cost: $45,000,000
Total Project Cost: $56,800,000
Cost/Square Foot: $650/SF
Grants Recieved: National Grid for EV charging stations and for energy modeling services
Estimated Energy Cost Savings: $153,766
Projected EUI: 30 kBtu/ft²
Seeking LEED Gold and LEED Zero Certifications

GENERAL INFORMATION

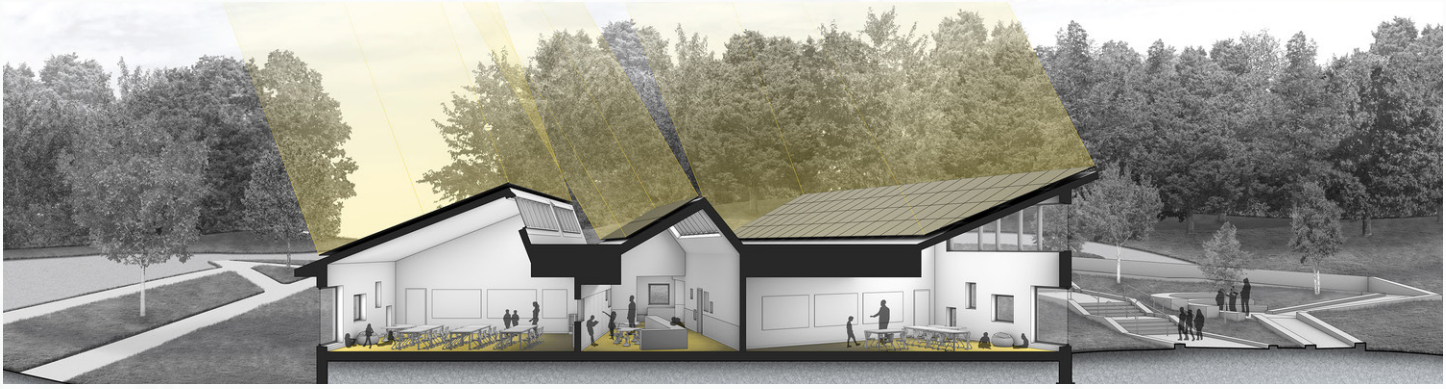
Annie E. Fales Elementary is a K-3 school located at 50 Eli Whitney Street in Westborough, Massachusetts that serves approximately 400 students. The new high performance design of the school was greatly influenced by Westborough's commitment to net-zero energy use, and includes meeting both ambitious energy reduction goals as well as on-site renewable energy production. Through early community engagement and goal-setting – and with the help of HMFH Architects and R.W. Sullivan Engineering ¬ the new school design provides a space which nurtures the academic, social, and emotional development and wellbeing of its students. Westborough is also working with National Grid to establish a net-metering contract. This will allow the school to off-load excess energy generated in the summer and draw electricity in the winter, when the PV array cannot meet the school's full electric load. If the school produces more energy than needed on an annual basis, National Grid will give a credit to offset electrical costs for other schools in the district.

The layout of the school was driven by the goal of creating a collaborative area which can accommodate the growing population while staying committed to environmental responsibility. The ground-floor public spaces (cafeteria, gymnasium, and administrative offices) are built into the hillside to reduce heat loss and gain through exterior walls. Classrooms are clustered by grade level and are located in their respective wings, while all having direct access to the centrally-located spaces used by all grade levels, such as the art and music classrooms. The second floor teaching spaces have a north-south orientation which allows for windows and skylights to provide natural light and views to the outdoors.

In order to fulfill the many energy targets set for this project, Fales Elementary School has a large number of sustainable design elements. All aspects of design, including building orientation, massing, and system criteria, play a role in enabling the building to hit its ambitious sustainability targets.

Sustainable Design Elements

The building runs entirely on electricity. The saw tooth roof houses a 25,000 square foot, 508 kW photovoltaic array that produces all the building's annual energy needs. Forty, 600-foot-deep geothermal close-loop wells and centrally located heat pumps provide space heating and cooling as well as domestic hot water.



The high-performance exterior envelope controls winter heat loss and summer heat gain. Insulation values were increased to 50 percent better than code, and a combination of a low window-to-wall ratio of 23 percent, triple glazing, and attention to window orientation diminish heat loss and gain through glazed elements, typically the weakest link in envelope performance. Displacement ventilation delivers a stream of low-velocity air a few feet off the floor and exhausts the air at the ceiling level, improving the air quality, temperature fluctuations, and noise associated with other ventilation systems. Water saving measures include low flow plumbing fixtures and the use of drought-tolerant planting that will not require irrigation. The use of native plantings was also incorporated in order to restore the site's naturally occurring ecological zones.

The LED lighting system adjusts according to daylight and occupancy sensors, lowering the electric draw. Even with all lights on, the building uses only 0.47 watts per square foot, less than half the energy code requirement. As a final measure, a central building management system monitors and controls all systems, including HVAC, lighting, and the PV array. Data points throughout the building create a detailed picture of each system, providing the feedback needed for staff to tweak settings and operating schedules towards energy optimization. Additionally, the building management system links to web-based education software, for students and the community at large to understand how the building is using and producing energy.

This exemplar was prepared by NEEP with information provided by HMFH Architects. For more information about high performance schools, please contact John Balfe at jbalfe@neep.org.