Middlebury Zero Energy School Team: Middlebury Elementary

I. Project Introduction

i. Project Summary

Figure 1. View of the main entrance and southern facade.

Mary Hogan Elementary School is the sole public elementary school for the towns of Middlebury and East Middlebury, located in the Champlain Valley of Vermont. Nestled between public athletic fields and the highly-trafficked Route 7 commercial corridor, Mary Hogan currently educates 450 students in Kindergarten through 6th grade. The current Mary Hogan building has been developed through a mix of additions and renovations that has left the building programmatically disjointed. While still functional, the building systems are sub-par, requiring high operating and maintenance costs. The noise of mechanical systems often disrupts educational activities, and many features will need to be repaired or replaced in the coming years. Instead of constantly pouring money into Mary Hogan, we propose the construction of a low-maintenance, adaptable Zero Energy elementary school that caters to the needs of students and community members. In order to foster a connection with the natural environment and reduce issues of traffic noise and congestion, the new project is located on the fields near the county's middle school, adjacent to a nature preserve, and only a mile away from the current site.

Our project aims to design a Zero Energy elementary school that complements the evolving educational and programming needs of the 21st century. The vision of the school is embedded in its name: Middlebury Elementary School. The school design serves to create a centralized learning hub (the "middle") modeled after the community of small-town Vermont (the "bury"). Designed to mirror the elements of a thriving town, the building is centered around a "Main Street" that connects central spaces and smaller learning environments. The school prioritizes flexible spaces to foster collaborative learning communities and interdisciplinary connections. Through visible Zero Energy design features and connections to the natural environment, the school strives to instill sustainability as an everyday learning ethos. By highlighting, not hiding, Zero Energy design strategies, Middlebury Elementary is intended to serve as a learning tool and an inspiration for school districts and communities around Vermont. The state's long, frigid winters lead to high energy expenditures, and contribute to skepticism about the potential of Zero Energy design in the state. Through experiential learning that engages students and community members in conversations about energy efficiency and renewable energy, Middlebury Elementary hopes to serve as a beacon for the town and surrounding New England communities.

Design Strategy

We are an interdisciplinary team with a diversity of backgrounds representative of Middlebury College's liberal arts approach to higher education. For this project, we used an integrated design process that drew upon the skills and unique experiences of each of our team members and focuses on communicating with community members to design a school meant to fit the needs of Addison County.

Project Data

- Middlebury, VT
- Climate Zone: 6A
- Two-story, 500 student capacity
- 21 classrooms + 4 labs
- 70.1 kBtu/ ft²•yr Source Energy Goal

Technical Specifications

- Wall Insulation = R-48 (effective value, adjusted for thermal bridging)
- Roof Insulation = R-75
- Slab Insulation = R-20
- Window Performance: mix of fixed and operable triple pane windows, SHGC = 0.21 - 0.35, U-Factor = 0.1099 - 0.1299 Btu/h•ft²•°F
- HVAC specifications = GSHPs. Demand-controlled DOAS with HRVs to provide ventilation air.
- Lighting Power Density = 0.38 W/ft² overall