2003 Northeast Green Building Awards- PLACES OF WORK

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Educational Support Center

Quabbin Regional School District, Barre, MA

Project Description:

The new administrative building for the Quabbin Regional School District is a 7,800 S.F. single-story wood and steel frame structure on a full, heated, accessible basement located 3-miles from the center of Barre, Mass. and adjacent to an existing High School. It has parking for 37 vehicles and is served by municipal water and sewer. This is a publicly funded building, which has achieved a high performance in spite of its being constructed within the stultifying strictures of Mass public bid law requirements.

Site:

A triangular parcel bounded by a road and power line adjacent to the high school, the site was disrupted during the school construction. The new administration building was the agent of its site's regeration. It slopes 10-15% toward the southeast, and is a granular, gravelly, boulder-strewn subsoil.

Program:

The building combines administrative offices for School Superintendent and Special Education - as well as professional development training space, required to function either as one large or two smaller, independent spaces. The training spaces are to function independently from the administrative offices to enable their evening use by community groups, Town boards and committees.

Design Response:

The building is elongated east and west with a central entry to a lobby dividing and independently serving the two primary functions. The plan is cranked (bent) to enlarged the area opposite the entry so that it might contain activities such as training workshop registrations, refreshments service, etc. The lobby roof is elevated to create narrow clerestory windows which admits direct east sunlight. This is the only space where direct beam sunshine is sought — where its presence is an uplifting asset rather than a troublesome distraction. The administration required partition offices which are organized along the north and south perimeter, with common facilities (meeting room, toilet room, copiers, storage, etc.) in the center. The professional development training space uses the public toilet rooms as a buffer. Entry and egress, as well as lighting and daylighting, are organized so that the space functions successfully either as a single space or as two, when the central dividing partition is pulled across.

Daylighting:

Creative daylighting is a central design aspiration of this project. Skylights are used to top light the central administrative area and to define the special integrity of the separate professional development raining room spaces. Partitioned offices have 35% of their wall area as window, with the aperture located to maintain a darkened corner for a video display terminal. Translucent blinds allow occupants to determine their balance of sunshine and view throughout the year. The daylighting design was tested and refined using physical modeling with various combinations of aperture size, location, glazing and screen / shade transparency, etc. being compared, and optimum solutions derived.

Primary daylighting design objectives were to achieve 25-30 footcandles ambient lighting in overcast conditions (2,000 fc) in all occupied spaces — a daylight factor of 1.5% — and to establish an even, glare-free work environment, particularly in the professional development training spaces where VDT's will be extensively in use. The core spaces of the office wing are

bathed in light from the overhead skylights. Their ceilings contain a mixture of translucent, transparent opaque tiles, or, in one case, no ceiling tiles at all, depending on the use of the space. In the interior conference room has transparent tiles overhead which reveal the passing clouds.

Artificial lighting:
The artificial lighting is a mixture of direct and direct/indirect lighting. Fixtures in the office core and the professional development training room space dimmed in relation to the natural daylight level. Partitioned office space lighting is controlled thus: —manual on switch and an occupancy-sensing controlled off switch.

Building envelope:
The wood-frame structure is strapped internally to thicken the exterior walls and reduce thermal bridging. The cavity is insulated with cellulose (sprayed) - produced locally from recycled newspaper. A tight building envelope was achieved by the cooperation, diligence and tenacity of all parties. The fiber-cement siding clapboards are set slightly away from the building sheathing / drainage plane, performing as a vented rain screen, ensuring that moisture does not penetrate into the wall cavity – which thereby extends the life of the structure.
Upon completion, the building was blower door-tested for tightness and for thermal integrity, using an infrared scanning camera.

Mechanical systems:
This is a small building, in a cold climate, with a mixed occupancy and partial, intermittent use. It required ventilation and air conditioning. Multiple residential-sized units were used to simplify the zoning. Each of six zones has an air handler and condenser, and taking heat from two boilers. Constant fresh air (demand controlled) is provided to all occupants using an energy recovery ventilator. All of this is controlled with a DDC Energy Management System. In retrospect, the digital control system is too complex for such a small building, and is primarily a consequence of the decision to recover heat from the exhaust ventilation air streams of the six H/AC sub-systems. It is not clear, however, that a single unified system using a chiller — which would enabled a unified HVAC plant — would have been any less troublesome on a building of this size.

Project Data
Areas: Upper Floor — 7,800 sq. ft. (PDT Room 1,200 s.f.; Offices 5,000 s.f; Ancillary 1,600 s.f.) Basement —7,800 sq. ft. of which 1/3 is mechanical, 1/3 is storage, and 1/3 is maintenance and workshop activity.
Cost: $2,050,000 including all sitework.
Completion Date: February 2002

Energy Performance:
Heating and hot water — (Fuel oil)
Annual use of 2140 gallons of #2 fuel oil
31,420 btu/s.f./year (considering 1/3 of the basement as usable space)
Lighting, mechanical equipment, plug loads— (Electricity)
Annual use of 71,312 Kwh. 24,940 btu/s.f./year (considering 1/3 of the basement as usable space). This may decrease as lighting controls settings are more finely tuned.
Air tightness:
Tested leakage @ 50 pascals — 4,920 cfm; 1.64 ACH. Estimated natural infiltration — 0.11 ACH. Equivalent leakage area per 100 sq. ft. of shell area — 1.02 sq. inches