Integrated Design Planning Is Key to a Healthy Classroom

Sustainable design would seem to be a natural ally of educational facility planning, yet many school districts do not enthusiastically embrace being certified by sustainable protocols. Some say it's because the LEED approach (Leadership in Energy and Environmental Design) is not well-adapted for school architecture. Other districts say the costly process pinches already tight budgets, arguing: "That will cost me three classrooms of new furniture; there must be a better way."

There is a way to provide health and environmental benefits in classroom design without "spending" an armchair or table leg on

LEED certification strategies can reduce costs and boost effectiveness

By Guy J. Overman, AIA

design or monitoring costs. The answers lie in the process of integrated mechanical and electrical design. Here are tips and strategies used by the Collaborative for High Performance Schools (CHIPS) in California and the Washington Sustainable Schools Protocol (WSSP) in Washington State in an effort to address the challenges of building healthy classrooms.

Conduct an eco-charette

The integrated design advantage becomes apparent during the early design phase as the plan, elevations, and sections are being developed. Rather than the architect turning over the floor plan to the consultants and asking them to "make it work," the design team meets with the owner, engineers, lighting lab, and utility consultants in an eco-charette, looking for architectural solutions to mechanical/electrical issues and vice versa.

Plan classroom orientation

The first step in increasing efficiency in a mechanical system is reducing solar heat gain. This is unwanted energy that mostly passes through windows with poor solar orientation. Classrooms should be oriented in an east/west direction to allow glass on the north/south exposures. The southern exposure should have glass shaded by canopies or light shelves; the northern exposure should allow direct light into the classroom. To gauge the effectiveness of light shelves, their size, placement, reflectivity, and shading potential should be studied in a year-round cycle using a lighting lab.

Minimize artificial light

Next to solar heat gain and body heat, artificial light is the largest contributor to unwanted energy in the classroom. Using light shelves, natural light can be effectively bounced farther into the classroom. This approach, combined with light monitors and interior light wells, can dim or eliminate artificial light in the

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At Wilson High School in Tacoma, Wash., displacement-ventilation mechanical systems supply clean, filtered air to the building and classrooms at low velocity.

classroom. High-efficiency T5 lamps, positioned to provide indirect light by bouncing it off ceiling surfaces, consume less energy and supply a higher intensity of light output than other artificial light sources.

Use displacement ventilation

Normally, ceilings are used for mechanical air distribution. This blow-down approach has proven to be inefficient and contrary to the laws of nature, since warm air rises. At Wilson High School in Tacoma, Wash., displacement-ventilation mechanical systems supply filtered air at low velocity near the floor level. As the air warms from body heat and light fixtures, it rises, displacing air in the room and forcing it up internal light shafts.

At Lake Stevens Mid-High School in Lake Stevens, Wash., the high-volume shared-learning area acts as the light shaft and return air duct. Vents at the top of the shaft connect to heat exchangers that remove the heat, exhausting 100 percent of the air, while the air handlers draw in fresh filtered air and return it to the classroom. This integrated design approach uses casework to provide air distribution at the toe-kick and a light shaft in lieu of return air ducts. In addition to providing energy-efficient delivery, it reduces ambient noise levels; most importantly, germ-laden inside air is not recirculated. ■

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