



THE ARCHITECTS HAVE FACED SOME ADDITIONAL CHALLENGES IN TOWNS WHERE THE DESIGN REVIEW BOARDS HAVE REQUIRED SLOPED ROOFS ON THE SCHOOLS. IN THESE CASES, THE SKYLIGHTS ARE SIMPLY MOUNTED ON THE SLOPED ROOF, SOMETIMES WITH A BRONZE COLOR TO BLEND WITH THE ROOFING MATERIALS. TO THEN MAXIMIZE DAYLIGHTING TO THE SPACES BELOW, THE ARCHITECTS HAVE RESPONDED WITH A LONGER SLOPED AND HIGHLY REFLECTIVE LIGHT WELL REACHING DOWN TO THE CLASSROOM. IN THESE CASES, THE LEVEL OF DAYLIGHT ILLUMINATION IN SOME CLASSROOMS IS SOMEWHAT COMPROMISED IN FAVOR OF THE ROOF AESTHETIC.

## Skylighting in Schools— A Healthy Advantage

The Capistrano Unified School District is one of the fastest-growing districts in Southern California. In the 1970s, the District built some schools whose classrooms had few windows and were lit only with electric lights. The students complained these were “dull” and “claustrophobic.” Based on these complaints, and concerns about energy efficiency and student well-being, the members of the School Board became convinced that natural light was essential for a healthy and positive classroom setting. Thus, the Board directed all architects hired to design new campuses to maximize natural lighting in the schools, using both skylights and windows.

Since the Board decision mandating natural light in the early 1980s, the District has built nine elementary schools, five middle schools, and two high schools, all of which have skylights in the classrooms. The District is very enthusiastic about its skylights. A School Board trustee recalls, “While parents tend to complain to the Board about everything in a school, I have never heard a single complaint about the skylights.”

### *The Skylighting System*

The various architectural firms hired by the School District have experimented with a variety of skylighting configurations. Perhaps the most successful, developed by PJHM Architects Southwest, is a splayed ceiling design in which an inverted plastic pyramid diffuser recessed into the ceiling creates an even distribution of light, while minimizing unwanted heat transfer and avoiding glare.

Because this diffuser sits above the plane of the ceiling, it is outside of normal vision lines in the classroom, and does not create a glaring condition. It also adds a third insulating layer to the double glazed skylights, and tends to



CLASSROOM WITH LIGHTS OFF AND SKYLIGHT DIMMED, PROVIDING EXCELLENT CONDITIONS FOR TAKING NOTES DURING VIDEO LESSONS

keep any unwanted heat stratified in the insulated skylight well, where it will not contribute an additional load to the air conditioning system. White gypsum board is used to create a reflective surface in the well to increase the amount of light reflected down into the classroom.

An aluminum louver system is mounted under the 6' x 6' roof-top skylight. The louvers, oriented east/west to control the angle of the sunlight, can be adjusted manually to reduce the amount of daylight entering the room. When the louvers are completely closed, the room still receives a modest amount of daylight, enough for taking notes during a video presentation. Substitutes and new teachers often do not know how to use the louvers, but the children quickly show them.

Public areas in the schools, such as the libraries and multi-purpose rooms which have higher ceilings, use a similar skylight design, but without the ceiling diffusers. Here the louvers are controlled with an electric wall switch, similar to a dimming control for lights. Again, when the louvers are completely closed, the rooms are softly lit at about 10 footcandles, sufficiently dim for theatrical or video presentations.

### *The Electric Lighting System*

Twenty recessed 2x4 fluorescent troffers form a 22' square donut of electric lights around the 14' x 14' skylight well. Prismatic lenses diffuse the light widely, providing even illumination to the classroom's bulletin board walls, which bounce light back into the center of the room. The ring of electric lights provide an additional 25 to 30 footcandles of light on the classroom walls during the day and an average illumination on the desktops of 50 footcandles at night.

The lighting system with two T-8 lamps and one electronic ballast per fixture uses less than 1.4 Watts per square foot at full power. The fixtures are on a bi-level switching system so that half of the lamps can be turned off at any time. Some classrooms also have an additional switch for lights along the front teaching wall so that the teacher's whiteboard can be specifically highlighted.



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IN ARCHITECTURE SCHOOL. PJHM HAS BEEN

REFINING ITS APPROACH EVER SINCE,

ADDING SUBTLE BUT IMPORTANT DETAILS,

SUCH AS PROVISIONS FOR CLEANING THE

INVERTED DIFFUSERS, AND THE LAYOUT OF

THE HVAC SUPPLY AND RETURN REGISTERS

WHICH INTEGRATE WITH THE CENTRAL SKY-

LIGHT WELL. THEY NOW USE THIS SKY-

LIGHTING DESIGN AS A STANDARD FEATURE

FOR ALL OF THEIR CLASSROOM DESIGNS,

EVEN FOR OTHER SCHOOL DISTRICTS.

