



## Let the Light In: Sunlight, That Is

Maryruth Belsey Priebe

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Lights are being switched off in the Automotive Training Center at **Manchester Community College** (MCC) in Connecticut. But students won't be tinkering on vehicles in the dark. Instead, their work spaces will be illuminated by natural sunlight, thanks to the installation of 48 tubular daylighting devices (TDDs) in the two new automotive labs.



These before-and-after shots show the dramatic difference that reflected sunlight makes to a dark hallway. (Princeton University, Facilities Organization, Arthur Murphy)

### Channelling sunlight for energy savings

"Except for very, very cloudy days, students in the automotive labs require no electric lights at all, thanks to the tubular skylights," extols Chris Drobat, vice president of **Lavallee-Brensinger Architects** and project manager for the MCC automotive lab project. Tubular skylights have many advantages, but perhaps most obvious is the reduction in electric lighting costs which can **add 30 percent to an educational building's energy tab**.

The newest skylight technology, TDDs collect daylight through clear, weatherproof domes mounted on the roof. The sunlight is then directed down a highly reflective tube, and then through a diffuser mounted to the ceiling in the room.

To further enhance the energy savings, the MCC project incorporated photocells to monitor daylight availability and adjust supplemental electric lighting as needed. Although the task of coordinating light sensors in each of the tubes with individual banks of electric lights to provide even lighting throughout each lab has proven to be a bit of a challenge, overall the savings look very promising.

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Cooling costs will also go down with tubular skylights since the light-to-heat-ratio is much better with skylights compared to electric lights. Light bulbs convert a lot of energy to heat, resulting in a net heat gain, driving cooling energy costs up. TDDs don't suffer from that problem.

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Plus, tubular skylights all but prevent the heat transfer common to windows and skylights. "We did a study to compare both pyramidal and flat translucent skylights with a frost fiberglass panel system to the tubular skylights and found that the heat transfer was significantly less with the tubular skylights," comments Drobat.

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This is due in large measure to the smaller roof penetrations-about 21 inches each-required for tubular skylights. Drobat explains: "The area of the roof penetrations would have been five to ten times greater for traditional skylights to produce the same amount of light."

Though the architects tried to utilize energy use software to estimate the potential savings of tubular skylights over electric lights and conventional skylights, they were unable to produce accurate results. Why? The software couldn't accept the absence of heat transfer with the tubular skylights.

### Lower installation and maintenance costs

But energy savings aren't the only benefit of TDDs; they're also cheaper to install, even at about \$2,000 each. Due to the need for larger roof openings and heavier structural steel, as well as the impact on the R-value (resistance to heat transfer) of roofing materials, traditional skylights would have cost MCC two to three times more than TDDs.

Tubular skylights also generally require less maintenance, according to David Aigner, facility manager at the [Institute of American Indian Arts](#) (IAIA) in Santa Fe, NM. "Once you install them, you can just forget about them," he comments. The smaller roof footprint of tubular skylights means fewer flashing failures and next to no leaks.

The recent IAIA Library Technology Center retrofit included the addition of 20 tubular skylights. The project is part of IAIA's efforts to meet goals laid out by their Sustainable Futures Initiative. Over the course of their building expansion project, which will increase square footage from 71,000 to 350,000 by 2014, they aim to achieve reductions in energy consumption in newly constructed buildings from the base rate of 104,000 Btus per square foot to 54,000 Btus per square foot through efficient designs such as daylighting.

"We've had such great success with this project," comments Aigner. "[Solatubes](#) [a popular tubular skylight brand] are now a standard product in all new buildings under construction. We've been very happy with the product. It allows architects and designers flexibility for integrating daylight deep into a building without having to work around traditional skylighting constraints." They have plans to add 36 more tubular skylights in three new buildings set for completion by 2013.

### Seeing clearly

"They look like giant LED lights!" That's how Marc Bellerose, Chair of the Automotive Program at MCC describes the tubular skylights. "Automotive centers are normally dark and dirty places, but this is the exact opposite."

The true academic value of skylights lies in the introduction of natural light into learning spaces (see this report on [Daylighting in Schools](#)). By diffusing sunlight, tubular skylights are ideal for educational facilities, providing evenly distributed daylight over an entire area without glare, even on sunny days.

They can often be installed in a wide variety of classroom settings-through multiple stories, around corners, and as deep as 50 or more feet into the building-making them much more versatile than windows or conventional skylights. And when darkness is required-say, for video presentations-most tubular skylights can be dimmed.

According to Drobat, it's not uncommon to hear reactions of surprise over the light quality provided by TDDs. "Next to the tubular skylights, high-efficiency daylight-quality fluorescents look yellow," explains Drobat.

Aigner's experience has been similar. "People look at us like we've lost our minds when we tell them that the light coming from a tubular skylight is natural daylight."

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