

Daylighting Rarely Done Right

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February 27, 2009 Daylighting could be one of North America's most sought and seldom realized building goals. How could the well documented benefits of more natural light in schools and buildings be so desired yet so elusive? The answer is no mystery and can be resolved to the benefit of the students, building inhabitants, building owners, even the environment.

"Despite a long history of using daylighting as a design strategy, building owners, architects, engineers and lighting designers are only just beginning to understand how to use it effectively," according to a Building Operating Management article. "The biggest problem with daylighting design is we still take a traditional building approach to a daylighting project," says Eric Truelove, director of sustainable design and HVAC engineer for Renschler. In other words, the architect and owner design the building and then hand it off to the engineers, who hand it off to the contractors."

"In a typical case, the architect's design offers plenty of glass for light, but that light brings with it too much heat, forcing the engineer to increase the cooling tonnage when the building is complete. It also becomes difficult to decrease lighting energy costs because when the building is complete, occupants demand blinds to cut down on glare. As a result, the blinds are drawn much of the day, requiring the use of electric lights. An owner who thought daylighting was going to save money finds out that the design not only costs more upfront but costs more to operate as well." So the end result is the no daylighting productivity benefits and ongoing added expenses with no end in sight.

This is a very expensive and counterproductive result. When you consider that buildings are responsible for about seventy per cent of the electricity used in America and that the daylighting unachieved scenario is multiplied by ten of thousands of times every year, the composite cost is no doubt in the tens of millions. Since America is a large net energy importer, these unnecessary costs are a drain on our economy. I would like to call attention to a simple but very effective way to reverse this expensive and unproductive trend. This step alone could provide the desired daylighting in new and existing buildings, while reducing cooling, heating, and lighting costs.

The challenge of daylighting is to have the natural light but control the glare and heat. Once again according to Director Eric Truelove, architects almost always want clear glass and specify glass with transmittance of 80 percent. "They often don't realize until you show them that glass with 40 percent transmittance looks clear too," he says.

"By selecting for certain optical properties, the building owner not only maintains a view out the window and brings daylight in, but increases energy efficiency as well. By going from a transmittance of 80 percent to 45 percent, Truelove says, the building's cooling load can be cut in half."

A simple solution that provides more of the desired daylighting and a decrease in the building's cooling load by one half! This is an approach that should be quickly utilized as there is no down side and a huge beneficial upside. Visible transmittance should be a consideration in building planning to the benefit of the building inhabitants, building owners, and energy efficiency goals.

This plan could be taken a step further by modifying the numerous building that failed to meet their daylighting goals. Most of these building fell short of the desires daylighting goals due to the installation of glass with a transmittance of eighty per cent or higher. By installing window insulators the light transmittance could be reduced to a range of twenty-two to twenty-six per cent. This would mean that only twenty-two to twenty-six per cent of the potential heat from sunlight would enter the building space. Window insulators would also reduce the heating load in those buildings due to the reduction of thermal heat loss.

The sheer amount of blinds and other window coverings on buildings are a testament to unachieved daylighting and energy efficiency in buildings and schools. There are many excuses for why we have known about the benefits for daylighting for so long but have done so poorly at achieving it. The costs of this failure are huge and ongoing. With the knowledge and resources we have now, there should be no more excuses.