

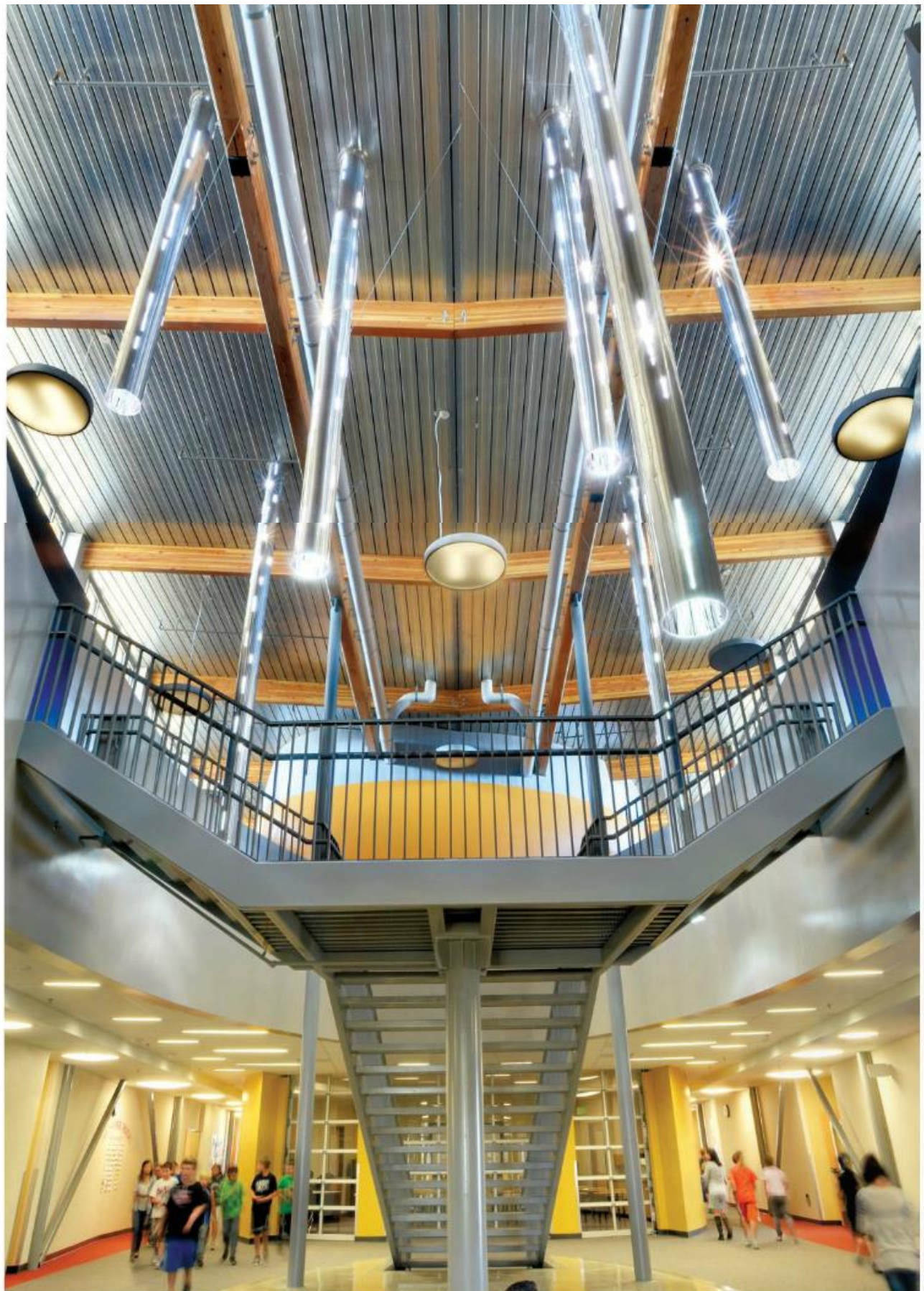
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The **IMPORTANCE** of a Daylighting System

ENERGY SAVINGS ARE JUST THE BEGINNING OF ALL THE BENEFITS THAT ARE AVAILABLE. BY MICHAEL SATHER

Energy savings seems the obvious reason to daylight a space. If you can reduce the need for electric lighting by using daylight, you can save money. However, energy savings is really just the icing on the cake.

The cake itself would be the human performance benefits associated with daylighting. It's no secret that humans prefer to be in a well daylighted environment versus one relying solely on artificial light sources. Countless studies cite the benefits of daylighting in terms of increased productivity, reduced absenteeism, enhanced employee retention and improved student test scores. Environment dictates behavior, and people are happier and more excited about coming to work or going to school in a space that offers comfortable and reliable natural light. This makes sense since research on Seasonal Affective Disorder (SAD) indicates that our brain chemistry is directly influenced by the amount of daylight we receive.

When considering the impact of daylighting from a financial perspective, you may spend \$1 per square foot



FACING PAGE The students and staff at Red Hawk Elementary in Colorado know the benefits of daylighting thanks to the design of RB+B Architects Inc.

IMAGE BY FRED FUHRMEISTER/TIME FRAME IMAGES

ABOVE Energy savings is but one of daylighting's many benefits.

IMAGE COURTESY OF SOLATUBE INTERNATIONAL INC.

in a typical office for annual electric lighting costs, but in that same office you may well spend \$200 per square foot on employee salaries. Thus, even a small improvement on the human side can dwarf the electrical energy savings. The good news is that a space with properly designed daylighting and integrated lighting controls will experience both the human performance and energy benefits. Depending where you are in the country, daylighting a space can realistically be done anywhere from 60 to 90 percent of the occupied year, assuming normal 8 a.m. to 5 p.m. operating hours.

Sustainability is another aspect of daylighting. Companies of all sizes are spending serious money to promote corporate sustainability and project an environmentally conscious image to their employees, investors and customers. Many things can be done to reduce the carbon footprint of a building or improve the sustainability metric. Visibility of the sustainable feature will offer a direct impact on the building occupants and therefore



should be considered first. How many visitors or employees in a building will recognize there is recycled content in the carpet or a state-of-the-art HVAC system? When a building is properly daylit the results are clearly visible, allowing everyone who enters the space to immediately experience them.

Selecting the right daylighting system for the space can make all the difference. As mentioned above, a properly designed daylighting system can have a very positive impact on building occupants and energy savings, but a poorly designed daylighting system can have a detrimental impact. Visual discomfort is usually the most important thing to be aware of—making sure the daylighting system does not provide direct sunlight or glare. Thermal discomfort can also be a concern, as direct sunlight on work stations can add unwanted heat and make workers very uncomfortable at certain times of the day or year.

THREE COMMON FORMS

Here's an overview of the three most common forms of daylighting:

Windows

The most common form of daylighting is definitely windows. Being a vertical fenestration product they do allow for views, which is their biggest advantage. Proper window design depends on building orientation and an understanding of how the sun moves throughout the day and year. Two windows of the same size in the same building can have very different effects on occupants and operating costs depending on which direction they are facing. Specific types of glass and coatings can be selected to minimize solar heat gain, but there is often a tradeoff in terms of visible transmittance. Fortunately, there are some great options for window coverings and even automated shading controls that are available to help overcome glare and heat-gain issues. Windows, by nature, are limited to the perimeter of the building, so they don't solve the problem of bringing daylight deep into interior spaces.

Skylights

Large, monumental skylights definitely have their place in creating dramatic effects and can offer a view to the sky that connects people to the outdoors, or they can be made of translucent materials to



ABOVE Daylighting options have three common forms, including tubular daylighting devices.

BELOW The design by Humphries Poli Architects to turn a grocery store into the Philip S. Miller Library in Castle Rock, Colo., called for daylighting.

IMAGES COURTESY OF SOLATUBE INTERNATIONAL INC.



ABOVE Guests at the El Monte Sagrado in Taos, N.M., are treated to a vibrant interior thanks in part to daylighting.

RIGHT This Mariano's in Chicago uses daylighting to enhance the customer experience.

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help diffuse the daylight and minimize heat gain. Smaller unit skylights are often designed to diffuse light before entering the space. As toplighting strategies, all skylights will require a relatively large roof opening and are dependent on the sun's orientation for effectiveness. A drawback of most skylights is that they are associated with shifting patterns of light as well as solar heat gain and loss due to the large openings required. Skylights can also be problematic when going into a drop ceiling; they require a straight shaft made of drywall or similar materials and tend to lose most of the light as it reflects down. Being square or rectangular, a skylight shaft cannot make any turns or navigate around plenum obstructions.

Tubular Daylighting Devices

Tubular Daylighting Devices (TDDs) are the most versatile of all daylighting strategies. They are often used in new construction, but are also the easiest daylighting solution for retrofit applications because they typically don't require structural modifications. They consist of a rooftop dome to capture sunlight, reflective tubing to transfer the light and a diffuser to spread the light. Their small aperture allows for them to minimize thermal impact on a building. TDDs come in many sizes (from 10 inches dia. to 29 inches dia.) to allow for daylighting in just about any space. Advanced TDDs can offer dome optics to collect low-angle sunlight and reject overwhelming high-angle sunlight, creating a more consistent and reliable daylighting experience. Some manufacturers may also offer photometric data or even do their own light studies that allow them to accurately predict light levels and determine optimum layout. Depending on the specular reflectance



of the tubing, a TDD can potentially run a great distance and even create multiple angles, allowing for maneuvering around plenum obstructions and making multistory and underground installations possible. They can offer a variety of diffuser options for both open ceilings and drop ceilings, allowing them to match the look of any space. Most manufacturers also offer a dimmer option to control how much daylight enters the space. There are even advanced TDDs now on the market that are designed to daylight very large spaces with enhancements to bring useable light down to the task level—something that has been very problematic for traditional skylights.

Keep in mind that when selecting the right daylighting strategy, the building occupants should be the primary concern, and the look of the space should be secondary. Everybody deserves daylight, and the technology is available to deliver it into any space while maintaining occupant comfort and the overall design intent. *ede*

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