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# Gold standard

**How commercial daylighting systems are helping improve today's sporting facilities**

By Del Williams

**A**rtificial lighting cannot compare with the aesthetics and sustainable design of bright natural daylight in indoor gyms, sports arenas and recreational spaces. Daylighting not only enhances the function and beauty of these venues for students, athletes and spectators, but also makes viewing clearer and colors truer.

Functionally, studies have shown that such daylight exposure also can enhance health, energy and mood. Yet, too often, participants and spectators at these venues find themselves under harsh, artificial electric or fluorescent lighting with minimal exposure to natural light.

Today, commercial daylighting systems are making the aesthetic as well as design and functional benefits of natural daylight possible at indoor sports, fitness and recreational venues.

They also are enabling a variety of creative architectural expressions such as spotlighting, full daylight, near darkness, and controlled dimming suitable for video presentations and concerts. These systems direct natural daylight far into such indoor settings via rooftop domes and highly reflective tubing, in place of costly electrical lighting.



That's why many architects, designers, administrators, and facility managers are increasingly turning to such innovative daylighting systems to showcase indoor events.

Compared to the often yellow or bluish hues of artificial lighting, bringing natural daylight into such venues improves the aesthetics of big games, workouts, and recreational events. It allows the true colors, action, and details on the field of play or in the gym to be seen more clearly, easily, and vividly with ample, high-quality daylight. Such sustainable design is also providing substantial energy savings and enhancing health and safety.

### Beyond skylights

While traditional skylights long have been used to allow more sunlight to enter indoor spaces, they have a number of drawbacks. From a functional point of view, skylights are prone to leaks, and sunlight directly entering

**“[Daylighting systems] are a significant part of a sustainable retrofit renovation program where daylight allows us to save energy while also improving the interior environment for better member and employee wellness.”**

— Paul Steinhäuser, General Partner,  
White Bear Racquet and Swim Club

the skylight can leave some indoor areas too sunny and others in shade as the sun crosses the sky.

The direct sunlight also allows in a lot of heat as well as UV light. The added heat increases cooling costs, while the UV light fades and deteriorates surfaces.

Unlike skylights that allow sunlight to enter only from upper levels of the building, commercial daylighting systems, also known as Tubular Daylighting Devices (TDDs), can direct natural light through up to 100 feet of highly reflective tubing that can accommodate 45-degree and even 90-degree angles. The natural light exits modern fixtures to evenly brighten gyms, sports arenas and other indoor recreational spaces.

“By efficiently capturing daylight at the roof, transporting it through reflective tubing, and delivering it inside the gym or sports arena through optically engineered diffusers, a first-rate TDD can be several times more

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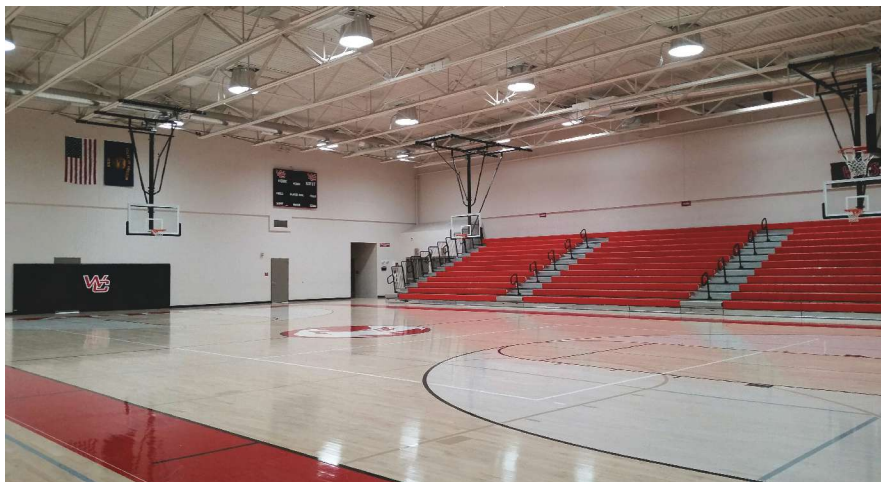


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effective than a skylight or window in terms of daylight delivered with minimal heat transfer," says Dana Carlson, a product manager at Solatube.

Companies like Solatube have developed better ways to capture, transfer and deliver sunlight without the heat, UV light, or maintenance of skylights through advanced domes, ultra-reflective tubing, customizable diffusers and other means in the past 25 years.

Unlike traditional skylights, such engineered TDDs are designed to control the problematic aspects of sunlight. They reduce glare and inconsistent light patterns. They also screen infrared rays that can overheat indoor spaces as well as ultraviolet rays that can fade gym and stadium interiors.

Because the TDD designs reject solar heat at the rooftop dome and allows essentially just the visible spectrum of light to enter, this reduces indoor heat and cooling costs, which

is a boon to those exercising, competing, or otherwise engaged in rigorous sporting events. The results have been showcased in Olympic venues, school gyms and health clubs worldwide.

## Daylighting success

For example, at the 2008 Beijing Olympics, when architects were challenged with designing facilities to stringent environmental standards, this had to be balanced with creating competitive sports facilities that satisfied the needs of both athletes and spectators.

Effectively daylighting the Science & Technology University Gymnasium, which served as an indoor sports facility for a wide range of fitness, aquatics and competitive sports activities, became a crucial design goal in order to reduce the need for artificial lighting.

But it was determined that skylights could not meet the design requirements. The gymnasium's steel-frame roof also presented a design challenge. In addition to the numerous obstructions, the diffusion plane was nearly 56 feet (8m) above the ground.

To overcome these challenges, a daylighting system allowed daylight to be



## Daylighting not only enhances the function and beauty of these venues for students, athletes and spectators, but also makes viewing clearer and colors truer.

transmitted over 26 feet (8 m) to avoid construction obstacles. Second, the high performance design provided ample natural light, which was evenly distributed throughout the space. An innovative Daylight Dimmer used a butterfly baffle design to ensure even light distribution in any position, controlled by a wall-mounted switch that allowed easy illumination level adjustments from 2 percent to 100 percent.

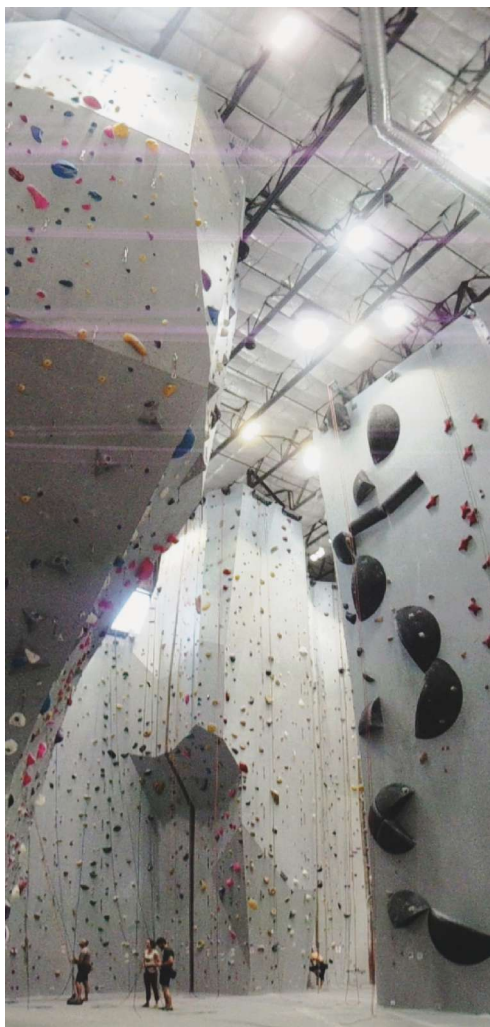
"Compared with traditional lighting systems, [daylighting systems] have a unique advantage with better progressed view and a wide application field," says Weimin Zhuang, architect dean at Architecture Design Institute of Qinghua University. "They reduced power usage and exceeded our environmental design goals."

When Westside Christian High School in Tigard, Ore., began construction of a new gym, incorporating daylight into the school's gym became a main objective. Administrators wanted students to benefit from exposure to natural light during the school day while reducing the building's electricity use.

But this posed a problem because the gym was designated for an interior location with no access to the outside. The original strategy was to install traditional skylights, but concerns about adequate illumination and hot spots prompted the architect to seek other options.

That is when InteriorTech, a building specialty contractor, proposed the use of a daylighting system to meet the administration's daylighting needs. After reviewing daylight modeling data and comparing output performance to that of traditional skylights, the administration realized that a daylighting system would provide a greater abundance and higher quality of light while reducing energy use.

Upon receiving approval, InteriorTech installed innovative daylighting system units for daytime lighting. These modular daylighting units are engineered to deliver massive amounts of daylight to large volume spaces with high, open ceilings. LED lights complemented this with timers for nighttime lighting.



Since installing the daylighting system, the school's gym has become a showcase for natural lighting. The units' advanced optics capture large amounts of high-quality daylight for abundant output during athletic events, assemblies and concerts. With daylight illuminating the gym, electric lights stay off during the day. This has allowed the school to cut its electricity consumption, lower its utility bills and minimize its carbon footprint.

"In addition to providing such incredible natural light and reducing energy use, the units are attractive and fit into the overall ceiling structure in such a way that they enhance the beauty of the space," says Dr. Deborah Miller, Head of School Westside Christian High School.

White Bear Racquet and Swim Club in White Bear Lake, Minn., similarly sought to integrate daylight in many key areas of their facility to support their total wellness approach to fitness, provide a more natural and healthful environment, demonstrate their commitment to sustainability and reduce lighting energy requirements.

A daylighting system was installed that provides full daylight coverage to the entry, reception, main circulation, Ingredients Café, and the 10,000-square-foot fitness center. An integrated photocon-

trol system controls the lighting in the daylight areas, ensuring that the lights are turned off during most of the daylight hours.

The daylighting systems have reduced White Bear's electric lighting load by half from 115.5 kWh/day to 57.75 kWh/day or 21,000 kWh/year while reducing air conditioning load from reduced electric lamp and ballast heat.

"[Daylighting systems] are a significant part of a sustainable retrofit renovation program where daylight allows us to save energy while also improving the interior environment for better member and employee wellness," says Paul Steinhauser, general partner of White Bear Racquet and Swim Club. "Our goal is to eliminate the use of fossil fuels completely, while increasing awareness in the community on the benefits of sustainable design practices." **CCR**

Del Williams is a technical writer based in Torrance, Calif.