

enlighten

THE BIMONTHLY NEWSLETTER OF THE DAYLIGHTING COLLABORATIVE

www.daylighting.org

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DAYLIGHTING
collaborative®

Thank you to the members who support the Daylighting Collaborative's mission of **lighting every building using the sky**:

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PREVENTING CONDENSATION ON WINDOWS

Building designs that employ strategies for using daylighting sometimes involve window arrangements that are a little different than traditional view window design. These designs may include clerestory windows or skylights. Architects and engineers need to be aware of strategies to prevent condensation on windows and skylights.

Moisture condenses on windows when the temperature of the inside surface of the window is colder than the dewpoint of the air next to the window. If the surface temperature is below freezing, frost will form. Condensation most often occurs on the inside surface during the winter, but it can also occur on the outside surface during the summer, particularly if the window has a Low-E coating. Exterior condensation is normally not a problem since the exterior is designed to tolerate more serious weather conditions.

Why bother preventing condensation? There are several reasons. One is that moisture from windows/skylights can damage wall and ceiling materials. Also, persistent moisture, along with dirt or other nutrients, promotes biological growth like mold and mildew. Additionally, most people simply do not like water dripping on them while indoors.

There are two basic approaches to avoid condensation on windows: 1) Make the interior surface of the window/skylight warmer, and/or 2) make the air near the inside surface dryer.

MAKE THE INTERIOR SURFACE OF THE WINDOW/SKYLIGHT WARMER

Select high performance fenestration products. The National Fenestration Rating Council (NFRC) uses a measure called Condensation Resistance (CR). CR ranges from 0 to 100 with higher numbers indicating better condensation resistance. The American Architectural Manufacturers Association (AAMA) also has a rating called Condensation Resistance Factor (CRF). For recommended CRFs based on climate and interior relative humidity, see the 2009 ASHRAE Fundamentals Handbook, page 15.56, Figure 28.

For view windows, consider multiple glazings with Low-E coatings and an inert gas in the gap between the panes. If the glazing is not intended to provide a view

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TRAINING UPDATE

JIM BENYA AND ABBY VOGEN HORN PRESENT LIGHTING AND DAYLIGHTING TRAINING AT GREENBUILD 2009

Daylighting Collaborative Advisory Committee member Jim Benya and Abby Vogen Horn will present a pre-conference workshop, *Lighting and Daylighting Design with Efficiency*, November 10, 2009 at Greenbuild in Phoenix, Arizona. This full-day training will examine the latest technologies and strategies to achieve superior lighting design that is essential for energy efficient and high performance buildings.

The training is designed for architects, engineers, lighting designers, contractors, interior designers, lighting contractors, manufacturers, dealers and distributors, lighting wholesalers and distributors and anyone interested in commercial building design. The USGBC has approved this training at the 300 level and AIA members will receive 6 HSW/SD learning units. The training has also been approved by NCQLP for 6 lighting education units.

You do not need to register for the Greenbuild conference to register for the course. To register, you will need to complete the Greenbuild registration form at www.greenbuildexpo.org/schedule. Register by September 7, 2009 to receive the Early Bird Special rate.

For more information on the topic and detailed registration steps, please visit www.ecw.org/university and click the "Lighting and Daylighting Design with Efficiency" link.

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to the outside, consider translucent materials such as nanogels, glass blocks, or certain plastics that insulate better than glass. These materials also typically have lower visible transmittances, so more glazing area may be needed to meet the daylighting targets. An energy analysis can determine the energy impact of replacing well-insulated opaque wall or roof area with glazing. An energy analysis can also estimate the annual energy cost savings, which may show that a high performance window/skylight is actually a lower-cost option when the life of the window/skylight is considered (life cycle cost analysis).

Fix leaks. A poor seal or crack can cause cold air to leak through. In these cases the glazing should be repaired or replaced.

Provide heat near the window/skylight surface. Baseboard convective heaters under windows are commonly used, but there are limits to the height of a window it can heat. As the warm air rises, it cools, and it could eventually stop rising if it cools to room temperature. Radiant ceiling panels can help warm the tops of tall windows. Blowing warm air onto the window/skylight surface can also be effective, but not if the fan is shut off for long periods such as overnight. This method is more energy intensive than the high performance window/skylight, but it may be suitable when dealing with an existing building.

MAKE THE AIR NEAR THE INSIDE SURFACE DRYER

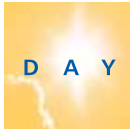
Making the air near the inside surface of the window/skylight dryer can be accomplished in a number of ways.

Dehumidify the air. Some spaces that typically have high humidity, such as natatoriums, can benefit from a strategy to lower the humidity. As their name implies, dehumidifiers are useful for this purpose. Providing more ventilation air, when the outside air is dry, may use less energy than a dehumidifier. If a space is humidified, consider lowering the humidifier setpoint during extremely cold weather. In places where moisture is added to the air, such as shower rooms or kitchens, prevent the moisture from spreading to other parts of the building by turning on an exhaust fan.

Provide good air movement at the window/skylight. Air near a cold surface naturally cools, and as it cools its relative humidity increases. Stagnant or slow-moving air has more time to become saturated and form condensation. The idea here is to get the cooled air away from the window/skylight surface before the air cools enough to become saturated and form condensation. If the supply air from the heating system does not circulate the room air enough, consider a ceiling fan. Deeply recessed windows, like bay windows, impede good air flow at the window surface. Avoid closing drapes, blinds or other window treatments that restrict air flow near the surface.

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UPCOMING EVENTS



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The Daylighting Collaborative will have a booth at the Greenbuild International Conference and Expo in Phoenix, Arizona on November 11–13, 2009.

WEBCASTS

FREE GREEN BUILDING WEBCASTS IN AUGUST

Energy Center University is offering free viewing of select webcasts for commercial and residential builders during the month of August. These webcasts are designed for architects, engineers, builders, remodelers, energy consultants and others interested in high performance and energy efficient buildings. *Green Buildings: Harvesting the Low-lying Fruit (Architects' Module 1 of 2)* is presented by Eric Truelove, P.E., LEED AP and *Introduction to Green Building* is presented by Robin Pharo, President, Healthy Homes. Register today at www.ecw.org/university and click the "Summer Special" link.

Powered by the Energy Center of Wisconsin, Energy Center University offers live event and online continuing education programs to more than 4,000 commercial, industrial and residential building professionals every year. For more information on Energy Center University, please visit www.ecw.org/university.

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In summary, to prevent condensation on windows, keep the interior surface temperature of the window/skylight warmer than the dewpoint of the air near the surface. Generally this can be accomplished with high performance fenestration and dry air movement near the surface. ■

DID YOU KNOW...

By Donald W. Aitken, Ph.D., LEED AP, Donald Aitken Associates.

HOW CAN DAYLIGHT BE ADMITTED TO A BUILDING WHILE SOLAR HEAT GAINS ARE NOT?

Only one or two percent of exterior daylight is required to light a building. Particularly on bright, clear sky, hot summer afternoons when building peak kW and AC tons capacities are set, only a tiny fraction of outdoor light is required indoors. In fact, on the very day we would like daylighting to work the best is the same day daylight is most readily available!

Most windowed buildings let in far more light from the outside than required with little concern for light quality or cooling load avoidance. All that is required is to thoughtfully use daylight while avoiding excess heat gains during the hotter months of the year. For instance, sunlight is typically avoided, while soft diffuse skylight and ground reflected light is welcomed. Vertical glass/clerestories tend to work better than horizontal glass (skylights), since they admit indirect daylight while avoiding direct sunlight from the high summer sun. Vertical glass also tends to admit more light in the winter, when it is physiologically and psychologically desired (to mitigate Seasonal Affective Disorder) and the heat easily removed by introducing cool outside air. Western exposures/glass should be avoided, or carefully shaded from the hot late afternoon sun in the summertime.

While cooling load avoidance daylighting strategies apply to air-conditioned buildings, these are the same common sense shading and glare control actions one would take to stay comfortable in non-air-conditioned buildings.

WHY IS HVAC DOWNSIZING EMPHASIZED WHILE EQUIPMENT EFFICIENCY IS MADE A SECONDARY CONCERN?

Eliminating the unnecessary is far superior to improving its efficiency, and therefore, should be the first concern. For instance, high performance glazing will generally reduce the required size of the HVAC system, lower peak electrical demand, lifetime energy use and maintenance costs for a facility and, through first cost reallocation, is less expensive than that portion of the HVAC system it replaces.

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MORE TRAINING

The **Lighting Controls Association** offers free, comprehensive online education about lighting controls technology, application and commissioning: www.aboutlightingcontrols.org/Education_Express/welcome.php

Lighting Control & Design's continuing education courses present the latest technology in lighting controls and offer professional development credit for your Architectural (AIA/CES) or Engineer license renewal. Schedule a daylight harvesting seminar in your office or earn credits remotely. www.lightingcontrols.com/design/onlinelearning/index.asp

Southface provides education and outreach on saving energy, conserving water and preserving the environment. **Basics of Daylighting in a Green Environment** offers an introduction to the use of daylighting in commercial spaces. The course shows why daylighting should be considered, the basic guidelines for using daylighting and some words of caution when using certain daylighting techniques. www.southfaceonlinelearning.org/daylighting/about.php

The **Collaborative for High Performance Schools (CHPS)** has five three-hour seminars available on designing high performance schools. www.chps.net/events/workshops.htm

The **Whole Building Design Guide** contains a wealth of information on integrated whole building design techniques and technologies. www.wbdg.org/references/mou_daylight.php

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Alternately, for example, one could construct an ice storage system to lower peak electrical demand. Not only does the ice system increase first cost, but it will increase lifetime maintenance as well. Also, it will need to be replaced two or three times (incurring that first cost each time) since the system's useful life is less than the useful life of the building.

Whether it is dimming ballasts, complicated control systems, or movable louver shading systems, beware of any component that increases net first cost without lasting the life of the building. For any component that does not last the life of the building, the first priority is to downsize, eliminate or simplify it. Smaller equipment costs less initially, costs less each time it is replaced, and invariably uses fewer resources and less energy to operate and maintain. Then, and only then, might systems and components that increase cost and complexity, in the name of energy efficiency, be useful. ■

MEMBERSHIP UPDATE

THE DAYLIGHTING COLLABORATIVE WELCOMES TWO NEW MEMBERS!

MechoShade Systems Inc. has been the innovator for manual, motorized and automated solar shading and room darkening solutions for over 30 years. MechoShade Systems Inc. develops energy efficient solar shading at the window wall to achieve personal, thermal, and visual comfort in conjunction with the more efficient use of natural resources.



Orion Energy Systems serves manufacturing, industrial, warehousing and commercial industries with a suite of proprietary, energy-efficiency technologies that reduce energy consumption by 50 percent or more, while increasing the quality and quantity of light, and reducing greenhouse gas emissions.



We're grateful to all our members for their generous support and collaboration in developing and delivering the resources the building design community needs to light every building using the sky.