



• **in this issue**

The focus of this issue is on practicing more sustainable design. Sustainability in design can be taken to mean more efficient technologies, incorporating more daylighting, and connecting to more disciplines during the design. In keeping with those principles, we at the LDL want to keep you updated with the connections we have established in our day-to-day activities.

• **sustainable lighting classes**

The Lighting Design Lab continues our series of lighting classes that focus on creating more energy effective lighting in buildings. This quarter series includes with *Energy Effective Light Sources and Fixtures, Buildings and Light*. See class descriptions on page 4 or page 6 for registration details. Secure on-line registration for all of our events is at our website — www.lightingdesignlab.com. All classes are eligible for continuing education credit.

• **BetterBricks in Boise**

Beginning in the first quarter of 2004, Southern Idaho and Eastern Oregon will have a local BetterBricks contact. In partnership with the University of Idaho, a new staff member will build upon the efforts of the existing BetterBricks technical resources including the Lighting Design Lab and the three Daylighting Labs. The new staff person will help connect design teams with both BetterBricks and other sustainable design resources in Boise.

• **ASHRAE/IESNA AIA Special Project 102**

This is a special project committee to develop and Advanced Energy Guide for Small Office Buildings. It is collaboration of ASHRAE, AIA, IESNA, US Dept. of Energy, and the New Buildings Institute. The mandate is to create a user-friendly guide to builders and designers for creating office buildings that achieve overall energy savings 30% greater than ASHRAE 90.1-1999.

• **ASHRAE 90.1 Lighting Standards**

The Lighting Design Lab and the Northwest Energy Efficiency Alliance have participated in energy code development in the region for several years. The 2004 version of ASHRAE 90.1 Energy Standard for Buildings was the basis for the newest revision of the Oregon Energy Code. ASHRAE 90.1 forms the basis of many of the energy codes in this country.

• **LEED™ Site Technical Advisory Group**

The US Green Building Council is revising LEED™ version standards. They are incorporating lessons learned from the initial standards, and expanding the scope of the standards. Michael Lane is a member of the LEED™ Site Technical Advisory Group, and is the primary contact for Credit 8. For more information about the Site Credit 8, see article on page 2 of this issue, or contact Michael directly at michael@lightingdesignlab.com.



ldl
connections

Above: view of a daylighting model of the recently completed Seattle City Hall. New Seattle public buildings are now required to achieve LEED™ certification, and many of them utilize daylighting as a way of gaining credits and creating a more productive building. Additional LEED™ points may be gained via lighting credits - see article on page 2.

Photo courtesy Bohlin Cywinski Jackson Architects, Bassetti Architects and the BetterBricks Daylighting Lab

News

in this issue.

- 1 ... LDL Connections
- 2 ... LEED™ Lighting Credits
- 3 ... Thrifty Mockup
- 4 & 5... Fall Classes
- 6... Registration Form
- 7 ... Daylight by Design
- 8 ... LDL Contacts

LEED™ lighting credits.

by Michael Lane LC



Above: NE 90th Street Bridge in Redmond, WA. New lighting credit criteria for LEED projects would create significantly challenge nighttime lighting on projects such as this urban bridge.

Photo courtesy LMN Architects / Sidney Genette, Lighting Designs Inc.

LEED is “a national standard that aims to improve environmental, health and economic performance of buildings using established and / or advanced industry principals, practices, materials and standards”.

In the US Green Building Council LEED™ Rating System Version 2.1, Credit 8 deals with exterior nighttime requirements under the title of “Light Pollution Reduction”. The credit’s intent is to

- eliminate light trespass
- reduce light pollution
- reduce impacts on nocturnal environments

The first requirement of the credit is:

• Meet or provide lower light levels and uniformity ratios than those recommended by the Illuminating Engineering Society of North America (IESNA) Recommended Practice Manual: Lighting for Exterior Environments (RP-33-99).”

The second requirement is for Exterior Luminaires: (Fig 1)

• Design exterior lighting such that all exterior luminaires with more than 1000 initial lamp lumens are shielded and all luminaires with more than 3500 initial lamp lumens meet the Full Cutoff IESNA Classification.

The third requirement is:

• The maximum candela value of all interior lighting shall fall within the building (not out through windows).

The fourth requirement is:

• The maximum candela value of all exterior lighting shall fall within the property.

The fifth requirement is:

• Any luminaire within a distance of 2.5 times its mounting height from the property boundary shall have shielding such that no light or brightness from that luminaire crosses the property boundary.

LEED™ Credit 8 is a difficult but not impossible credit to achieve. Proper placement and orientation of all interior and exterior luminaires is critical. Eliminating exterior uplights and using Full-Cutoff luminaires will go a long way in capturing this credit. This credit is currently being looked at to address issues of tree uplighting, American flag lighting & security lighting for buildings where the property line is the edge of the building (as in a downtown setting).

A comprehensive version of this article is available for download as an Adobe Acrobat PDF file from our website at lightingdesignlab.com/articles. Additional resources on LEED™ and other sustainable resources are listed in the side-bar at left. If you have specific questions about qualifying for LEED™ Credit 8 on a project, contact Michael Lane LC of the Lighting Design Lab at michael@lightingdesignlab.com

Fig 1 limited to less than 1000 lumens



Noncutoff
A luminaire light distribution where there is no candela limitation in the zone above maximum candela. (IESNA)

Right: Use of non-cutoff luminaires is restricted by the LEED™ Credit 8 requirements.

green lighting resources.

BetterBricks
www.betterbricks.com

U.S. Green Building Council
www.usgbc.org

Leadership in Energy & Environmental Design (LEED™)
www.usgbc.org/LEED

American Institute of Architects
www.aia.org

American Society of Heating Refrigeration and Air Conditioning Engineers (ASHRAE)
www.ashrae.org

City of Austin Sustainable Resources
www.ci.austin.tx.us/sustainable/

City of Portland - Office of Sustainable Development
www.sustainableportland.org

City of Seattle Sustainable Building Program
www.cityofseattle.net/dpd/sustainability

USGBC Green Building Conference
www.greenbuildexpo.org

Federal Energy Management Program
www.eere.energy.gov/femp

Smart Communities Network
www.sustainable.doe.gov



BETTERBRICKS

thrifty mockup.

by Eric Strandberg LC

When Lighting Consultant Ed Johanson approached the Lab to Mock-Up a proposed retrofit strategy that could save even more energy than the usual retrofit, naturally we were interested.

His client was a discount retailer, lighting their store using 8' two lamp fluorescent strips with two 8', 60 watt energy saving lamps and magnetic ballasts, (two, F96T12/CW/ES in this case). The fixtures are mounted end to end on 10' centers (between the store aisles). The usual retrofit upgrade for this kind of system is to convert the fixtures to use four, 4' T8 lamps and electronic ballasts (four, F32T8/741 in this case).

Below: this retail retrofit used fixtures with alternating numbers of lamps in each 4 foot section of an 8 foot long fixture. Note that the closer section has a single set of sockets while the farther section has two sets.



A retrofit like this is a good idea for a number of reasons. It improves light quality due to the tri-phosphor lamps and the non-flickering electronic ballasts. It also lengthens the maintenance cycle by going to a 20,000-hour lamp (from a 12,000-hour lamp). Additionally it increases the light output while saving energy, but not a lot of energy (from 123 watts nominal to 114 watts nominal).

Ed planned to use 8' fixtures with three 4' lamps (one lamp cross section, tandem with / a two lamp cross section). The fixtures would be mounted end to end so the result is; one lamp followed by two lamps, followed by one lamp, etc. The use of three 4' lamps per 8' instead, of two 8' lamps per 8' (or the usual four 8' lamps), will result in substantial energy savings. His concern however, was twofold. On the one hand he was concerned that the lamp reduction would result in unacceptably low light levels, and on the other hand that the alternation of one lamp to two lamps to one lamp again would result in uniformity problems with the light distribution. Another change was the addition of a reflector to the new fixtures, (the existing system used just plane strips), this would result in a higher percentage of light being directed down onto the merchandise. The proposed reflectors will have a 10% uplight component (the fixtures used in the mock-up had no uplight). Having some uplight is important to maintain overall room brightness, while controlling glare (you don't want bright fixtures against a dark background).



Above: lighting consultant Ed Johanson verifies light levels from the luminaires. It was important that both lighting and energy performance were verified. Using two rows of the new type (shown) and two rows of the old system, light levels from each system could be measured and compared.

The Mock-up consisted of half of the room with an installation of fixtures that are typical of existing conditions and the other half was the proposed solution. All the lamps were new, (but "burned-in" for 100 hours) so we measured initial footcandles. Following are some of the results that were gathered. Note the higher light levels, but lowered power levels for the three lamp system. Also note, that the T8 lamp has a higher percentage of maintained lumens than the T12.

If you would like to do a Mock-Up at the Lab please contact me at 206-325-9711 x28 or go to the Mock-Up section of Lighting Design Lab to get started.

Lamp	Nominal system Watts	Measured system Watts & (Volt/Amps)	Total raw lamp lumens; Initial (Mean)	Measured Foot Candles @ 48" AFF*, below center of fixture
(2) F96T12CW	123 watts	120 (127)	11,000 (10,120)	42
(4)F32T8/741	114 watts	Not available	11,400 (10,840)	Not available
(3)F32T8/741	93 watts	86.5 (87)	8,550 (8,130)	53

*Above Finished Floor

winter 2004

events.

Registration on Page 6

did you know?

Members of professional design organizations (AIA, NCQLP/LC, ALA, BOC, and others) may be able to receive continuing education credits for attending events offered by the LDL.

To self-certify your credits (sometimes called learning units) make sure you keep the Certificate of Completion that we distribute at each event.

Learning unit credits are almost always issued at a rate equal to the contact hours. So a 3 hour class would be worth 3 credits.

For information about how your organization works with continuing education credits visit their website at:

AIA
aia.org

ALA
americanlightingassoc.com

ASID
asid.org

BOC
nec.net/boc.htm

BOMA
boma.org

IFMA
ifma.org

IIDA
iida.com

NCQLP
ncqlp.org



BETTERBRICKS

All Registration **must be in advance**. All fees must be **paid in advance**. No registrations or fees will be accepted at the door. On-line registration is available at <http://www.lightingdesignlab.com/classes>

sustainable lighting classes

1 • energy effective light sources. \$30

Billings:	Monday 1/26	• 1:00pm - 4:00pm
Missoula:	Thursday 1/29	• 1:00pm - 4:00pm
Eugene:	Tuesday 2/10	• 2:00pm - 5:00pm
Portland:	Wednesday 2/11	• 2:00pm - 5:00pm
Boise:	Wednesday 2/18	• 2:00pm - 5:00pm
Pocatello:	Thursday 2/19	• 2:00pm - 5:00pm
Seattle:	Tuesday 2/24	• 2:00pm - 5:00pm
Spokane:	Thursday 2/26	• 2:00pm - 5:00pm

This class begins with examination of the general performance characteristics of light sources. Issues such as efficacy, lamp life, lumen depreciation and color will be addressed. Daylight as a light source is integrated into the class. Source technologies such as the following will be covered: daylight; high performance incandescent; fluorescent; high intensity discharge; and light emitting diodes. Participants will leave with an understanding of the strengths and weaknesses of different light sources and the process of selecting the most effective one for a lighting application.
(3 CEU contact hours)



2 • fixtures, buildings & light. \$30

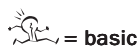
Eugene:	Tuesday 3/9	• 2:00pm - 5:00pm
Portland:	Wednesday 3/10	• 2:00pm - 5:00pm
Boise:	Wednesday 3/17	• 2:00pm - 5:00pm
Pocatello:	Thursday 3/18	• 2:00pm - 5:00pm
Billings:	Monday 3/22	• 1:00pm - 4:00pm
Missoula:	Thursday 3/25	• 1:00pm - 4:00pm
Seattle:	Wednesday 4/7	• 2:00pm - 5:00pm
Spokane:	Thursday 4/29	• 2:00pm - 5:00pm

Energy effective lighting design means putting light where it is needed and desired and eliminating light where it is not needed nor wanted. Understanding how light is distributed by a luminaire is key to the process of effective and efficient lighting of a space. This class reviews the performance of indoor and outdoor luminaires and examines windows and skylights as luminaires. The participants will leave with an understanding of how luminaire performance is classified, how system performance is evaluated, and how luminaires can be specified.
(3 CEU contact hours)



• project design reviews. no cost.

The lighting specialist is available to provide schematic design review of proposed lighting strategies on your commercial and industrial lighting projects. Please contact the specialist for your territory to directly set up an appointment in your office.



= basic



= intermediate



= expert

3 • daylighting day. no charge.

Billings:	Monday 2/23	• 9:00am - 3:00pm
Bozeman:	Tuesday 2/24	• 9:00am - 3:00pm
Missoula:	Wednesday 2/25	• 9:00am - 3:00pm
Seattle:	Thursday 3/4	• 9:00am - 3:00pm
Spokane:	Wednesday 3/17	• 9:00am - 3:00pm
Boise:	Thursday 3/25	• 9:00am - 3:00pm

This is a day of lectures and hands-on experimentation. You will learn about the barriers to using daylight and how to overcome them by selecting the most effective marketing strategies - daylighting design as a critically important workplace performance interest of your commercial building clients and their tenants or employees. You will hear about getting over the myths, getting down to the business of design decision making. You will learn WHAT daylight and daylighting design is and isn't, HOW to develop the best daylighting design strategies for siting your building, developing its basic organization and massing, shaping the room and its windows, forming the skin, and integrating the electric lighting. Lastly, the best design tools for making and assessing the results of these decisions will be reviewed. (6 CEU contact hours)



Idl class locations:

Billings:	Prudential Floberg Realtors 1550 Poly Drive Billings MT	Missoula:	Univ. of Montana Continuing Education, Room 203 32 Campus Drive Missoula MT
Bozeman:	Montana State University Strand Union Bldg, Room 276 7th & Grant Bozeman MT	Pocatello:	Idaho Power Meeting Room 301 East Benton St Pocatello, ID
Boise:	(2/18 & 3/17) Albertsons West Plaza Training Room 1 220 Parkcenter Blvd Boise ID	Portland:	Univ. of Oregon Portland Center Portland Room #102 722 SW 2nd Ave Portland, OR
	3/25 Location TBA	Seattle:	Lighting Design Lab 400 E Pine St Suite 100 Seattle WA
Eugene:	(2/10) EWEB Community Room (3/9) EWEB Training Center 500 E 4th Ave Eugene, OR	Spokane:	WSU Spokane Phase I Classroom Bldg 668 N Riverpoint Blvd Spokane WA

• additional lighting events.

IALD Annual Meeting Education Conference	Vancouver, BC January 30 - 31	www.iald.org
Lightfair 2004	Las Vegas, NV March 29 - 30	www.lightfair.com
Daylighting Institute	Las Vegas, NV March 29 - 30	www.lightfair.com

registration form.

Fall 2003 Classes

PAYMENT POLICY: Fees **MUST BE PAID IN ADVANCE before attending class.** Purchase Orders, checks, and credit cards are accepted. A credit toward future LDL classes will be issued for unused registration fees. Complete and fax this form to 206-329-9532. Class fees are waived for university students.

NO PAYMENT OR REGISTRATION WILL BE ACCEPTED AT THE DOOR.

Secure On-line registration is available at <http://www.lightingdesignlab.com/classes>

registration fee paid by. (circle one)

credit card • enclosed check • purchase order • credit from previous LDL event • university student fee waiver

registration information.

Name • _____

Company • _____

Profession • _____

I Pay My Electric Bill To • _____

billing information. (must be complete to process card transactions)

Phone • _____ Fax • _____

E-Mail • _____

Address • _____

City, State, Zip • _____

Credit Card Number (**VISA & MasterCard ONLY**) • Please include your CVV Code - last 3 digits of the number on the back of your card near your signature

Expiration Date • _____

please check the circles of the class(es) and event(s) you wish to attend (on-line registration available). event locations on page 5.

1 • energy effective light sources. \$30

- Billings: Mon 1/26 • 1:00pm - 4:00pm
- Missoula: Thurs 1/29 • 1:00pm - 4:00pm
- Eugene: Tues 2/10 • 2:00pm - 5:00pm
- Portland: Wed 2/11 • 2:00pm - 5:00pm
- Boise: Wed 2/18 • 2:00pm - 5:00pm
- Pocatello: Thurs 2/19 • 2:00pm - 5:00pm
- Seattle: Tues 2/24 • 2:00pm - 5:00pm
- Spokane: Thurs 2/26 • 2:00pm - 5:00pm

2 • fixtures, buildings and light. \$30

- Eugene: Tues 3/9 • 2:00pm - 5:00pm
- Portland: Wed 3/10 • 2:00pm - 5:00pm
- Boise: Wed 3/17 • 2:00pm - 5:00pm
- Pocatello: Thurs 3/18 • 2:00pm - 5:00pm
- Billings: Mon 3/22 • 1:00pm - 4:00pm
- Missoula: Thurs 3/25 • 1:00pm - 4:00pm
- Seattle: Wed 4/7 • 2:00pm - 5:00pm
- Spokane: Thurs 4/29 • 2:00pm - 5:00pm

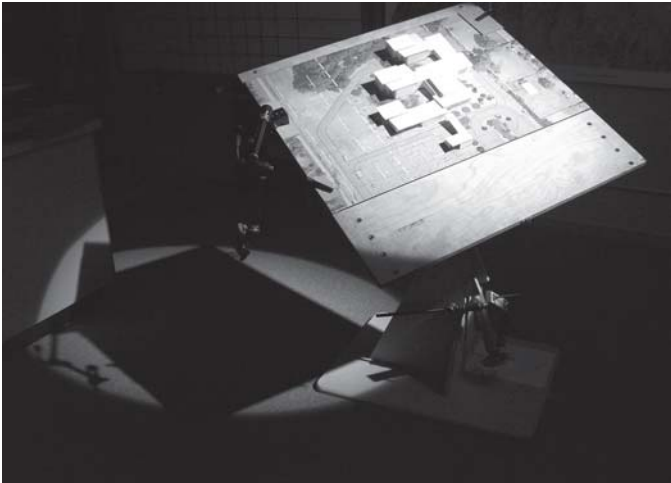
3 • daylight day. no charge.

- Billings: Mon 2/23 • 9:00am - 3:00pm
- Bozeman: Tues 2/24 • 9:00am - 3:00pm
- Missoula: Wed 2/25 • 9:00am - 3:00pm
- Seattle: Thurs 3/4 • 9:00am - 3:00pm
- Spokane: Wed 3/17 • 9:00am - 3:00pm
- Boise: Thurs 3/25 • 9:00am - 3:00pm

You can register instantly and securely on-line. Payment is accepted by credit card, check and purchase order.
www.lightingdesignlab.com/classes

daylight by design.

by Joel Loveland



Above: A daylighting model on the direct sun simulator (heliodon) in the BetterBricks Daylighting Lab.

Photo courtesy Seattle BetterBricks Daylighting Lab and Mithun Architects

The role of sunlight in critical visual task areas such as the office or classroom stems from its tendency to overheat a room and cause glaring disability. As much as daylight can increase the learning in a classroom, the direct beam of sunlight can cause similar decreases. If a well-designed daylighted workplace can cause a 20 percent increase in productivity over a baseline, in a non-daylight-illuminated building, sunlight can cause near-equal decreases in productivity, resulting in nearly a 40 percent swing.

With the realization of the critical importance of a healthy, productive and explicitly daylight-illuminated workplace came the synergistic effect of saving energy if the electric lights were off when the daylight was available. Additionally, because we know that sunlight generally decreases our ability to work effectively, well-designed daylit buildings will be shaded from the penetration of sunlight. This will additionally reduce the cooling energy use of a typical building by 10-20 percent.

Buildings that take the best advantage of diffuse, well shaded daylight for illumi-

nation in critical task spaces can often reduce their electrical energy use by more than 40 percent through the reduction of electric lighting requirements and especially important peak-cooling demand. The United States Green Building Council's Leadership in Energy and Environmentally responsive building Design has placed daylight in a pivotal role in the LEED standard. A well daylit building that controls the electric lights with the availability of daylight will be well on its way to being certified as a silver-rated sustainable building. The use of *daylighting* as a building's primary source of illumination can provide as many as one-quarter to one-third of the needed credits to attain Silver Certified status.

Daylight is the light of day, but in most commercial or institutional buildings where critical visual tasks are dominant, it's the light of day—without sun, or at least the direct rays of the sun. Daylighting is the design of buildings using the diffuse rays of the light of day as the primary light source in critical task areas. There are several useful ways building science has momentarily simplified, reduced and commodified daylight, and therefore the sky.

This allows a designer to begin to sort out the myriad of conditions one considers when working with complexity of the real light of day. A simplified test condition can be the shadowless overcast sky defined by the Commission Internationale De L'Eclairage, the International Commission on Illumination (CIE). This shadowless sky is often called the standard international overcast, and is generally three times as bright at the zenith as it is at the horizon.

This sky and its light are a very common condition in Cascadia, the region north of the California border and east of the Cascade

Mountain ridge. This CIE overcast sky is the general condition for approximately 200 days a year in the cities of Portland or Seattle.

The standard overcast sky is a reference condition, which is most often used for testing various building design configurations under one of two worst-case design conditions, a seemingly dark and perfected gray.

The cloudless condition, also used for testing and also unreal, is the diffuse clear sky – without sun, even darker than the overcast. It's the "big blue" sky. When have you seen a perfectly clear sky – without the sun? Never. Why is this useful? If you combine it with the luminous intensity of the direct beam of the sun, then you begin to have a real sky.

In regions in the Pacific Northwest such as Boise, ID the clear sky is the dominant condition, and getting to know the various effects of the range of luminous conditions towards and away from the sun is critical. While the surfaces of a building towards the sun will be bathed in tens of thousands of lux, the surfaces away from the sun, facing only the perfect blue sky will be darker than an overcast day at noon in the winter.

Building science has deconstructed daylight into simplified conditions, the clear sky's diffuse sources of light, from the "big blue," and its direct source—directly from the sun. Where the Standard Overcast Sky is fairly simple to understand and reflect in a building's geometry, the clear diffuse sky with the added geometry and intensity of the direct rays of the sun are nearly infinite in complexity. These are testing or modeling conditions that provide glimpses of real, but never a moment of truth until modeled or experienced in a built space.

Pacific Northwest architects work with daylight analytically, simulating their design decisions in the BetterBricks Daylighting Labs of the Pacific Northwest, deconstructed into overcast sky simulation rooms and heliodon sun simulators. Most importantly they integrate the real patterns of the light of day in the experience of light in their designs.

The complete, original, expanded version of this article is available in the Daylighting section of www.lightingdesignlab.com.

lighting design lab



400 East Pine Street #100, Seattle WA 98122
www.lightingdesignlab.com

PRSR
FIRST CLASS
U.S. POSTAGE
PAID
SEATTLE, WA
PERMIT #5130

lighting design lab news
is published by the lighting design lab
400 E. Pine Street #100 Seattle WA 98122

to contact us.

General Phones · 206.325.9711
800.354.3864

Fax · 206.329.9532

Project Manager · **Diana Grant** - ext 24
diana@lightingdesignlab.com

Schedule Coordinator · **Elizabeth Ellisor** - ext 0
elizabeth@lightingdesignlab.com

Lighting Specialists · **Michael Lane** - ext 26
michael@lightingdesignlab.com

· **Shaun Darragh** - ext 27
shaun@lightingdesignlab.com

· **Eric Strandberg** - ext 28
Mockup Coordinator
eric@lightingdesignlab.com

BetterBricks Daylighting Specialists · **Joel Loveland** / 206-616-6188
877-604-6592 joel@lightingdesignlab.com

· **Kevin VanDenWymelenberg** / 206-616-5166
kevin@lightingdesignlab.com

· **Chris Meek** / 206-616-7014
chris@lightingdesignlab.com

Librarian & Editor · **Randy Smith** - ext 29
randy@lightingdesignlab.com

Stage Technicians · **Adam Griffen** - ext 37
adam@lightingdesignlab.com

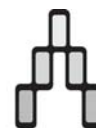
· **Nacho Bravo** - ext 31
nacho@lightingdesignlab.com

our sponsors.

Northwest Energy Efficiency Alliance
Seattle City Light
Puget Sound Energy
Snohomish PUD
Tacoma Power
British Columbia Hydro
University of Washington
State of Alaska

BetterBricks is a nonprofit initiative of the Northwest Energy Efficiency Alliance. Our free service connects commercial building professionals with the information, tools, training and consultation needed to design and construct high performance buildings. To learn more about our services, call 1.888.216.5357 or visit our website at BetterBricks.com.

With support from:



BETTERBRICKS