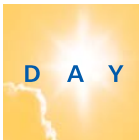


# enlighten

THE BIMONTHLY NEWSLETTER OF THE DAYLIGHTING COLLABORATIVE

[www.daylighting.org](http://www.daylighting.org)

volume 2, issue 1 • april 2009



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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## DAYLIGHTING DESIGN TOOLS

Building designers are relying more on computer analysis to provide daylighting design information and feedback immediately to the design team. Historically, these tools were sufficiently complex that only researchers involved with product development and/or primary field research were able to use them. Today, however, there are many tools available that have varying levels of complexity in both input required and output obtained. There are free programs available as well as ones for purchase.

#### Advantages:

- Parametric in nature—when you change one design element the resulting effects on other design elements are automatically changed
- Some software provides three dimensional analysis
- Can be easy to learn
- Many programs have wizards to assist in model development

#### Disadvantages:

- Some software can be costly
- Often difficult to find team member capable of completing the modeling
- Can be difficult to learn
- Many programs have wizards to assist in model development (be warned—many wizards must be changed to accurately provide results for your project—ESPECIALLY if using software to evaluate thermal impacts of daylighting)

Depending on the goal of the analysis, software tools utilize different methods to achieve results and renderings. The categories of computer based tools are differentiated by the calculation methods they use:

**RADIOSITY** is the calculation method for expressing reflection. It is a computer graphics method to calculate diffuse light distribution and reflection in three dimensional environments. The resulting 3-D images are characterized by soft gradual shadows.

**RAYTRACING** is a rendering technique that calculates an image of a scene by simulating the way rays of light travel in the real world. It is called raytracing because

*continued on page 2*

## UPCOMING EVENTS

The Daylighting Collaborative will be at LIGHTFAIR International on May 5–7, 2009 at the Jacob K. Javits Convention Center in New York, NY. LIGHTFAIR is the world’s largest annual architectural and commercial lighting trade show and conference. If you are planning on attending the trade show, please visit us at booth #131.

We encourage you to participate in the Daylighting Institute held the two days prior to the LIGHTFAIR tradeshow, May 3–4, 2009. Visit [www.lightfair.com](http://www.lightfair.com) for more information.

ALSO.....You are invited as Daylighting Collaborative’s guest to attend LIGHTFAIR® INTERNATIONAL 2009 by using this complimentary VIP Pass to access the LFI Exhibit Hall. Experience the latest product introductions and industry trends, plus earn CEUs/ LUs/HSW credits. All at the largest annual architectural and commercial lighting trade show and conference in the world!

To use your complimentary VIP Pass, you must register online at <https://www.xpressreg.net/register/lite059/start.asp?sc=LFI09DAY>

This pass will enable you to enter the LFI Exhibit Hall, free of charge, all three days of the show!

Register by April 10, 2009.

Note: A \$65 processing fee will be applicable after April 10, 2009.

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it tries to simulate the path that light rays take as they bounce around within a space—they are traced through the scene.

- Backwards Raytracing is the process of following rays of light from the eye to the light source to produce an image (the opposite direction photons actually travel).
- Forward Raytracing follows rays of light from their source in an arbitrary direction. It attempts to determine where they end up when following a number of reflections on scene surfaces.


A full explanation of the above calculation methods can be found at <http://www.daylighting.org/designaids.php>

Zack Rogers of Integrated Design Associates ([www.ideasi.com](http://www.ideasi.com)) has developed a comparison of the capabilities of various software programs. Please note that some of these software tools are no longer available (Lumen Micro, Lumen Designer) or have newer versions now in place (3d VIZ capabilities are expanded in 3dMAX). They are included because they are still in use.

Daylight Simulation Tools / Methods	Sim. Speed	Pre-Design			Schematic Design							Design Development	
		Climate Analysis	Solar Shading Analysis	Annual Insolation	Daylight Delivery Systems	Solar Animations	Renderings / Photos	Glare / Luminance Ratios	Interior Illuminance	Annual Illuminance	Glazing Analysis - Optical	Window Analysis - Thermal	Electric Lighting Integration
3D VIZ*	Fast		S			F	F	S	S	L**	L		F
Acid 3D*	Fast		S			F	F	S	F	L**	S		F
DAVSIM	Slow		F+	F+	S*	F+	F+	F+	F+	S	S		F+
DOE2*	Fast	F		S				S	S	L	L	L	L
Ecotect	Fast	F	F	F+	S*	F+	F+	F+	F+	F+	F+	R	R
Energy Plus	Fast	F		S				S	S	L	L	L	S
Heliodon**	Slow		F	S		L	F	S	L	L	L		
Lumen Designer*	Fast		F			F	F	S	F	L**	S		F
Lumen Micro*	Fast		F			F	F	L	S	L**	S		F
Humal Calculations	Fast	S	S	S	L			S	S	S	S	S	S
Mirrco-Base**	Slow						S	L	L		L		
Optics 5	Fast							L	L		L		
Outdoor Modeling**	Slow		F		S		F	L	S	S**	L		
Photopia	Slow		L	L	F		?	?	L	S**	F		
Radiance	Slow		F	F	F	F	F	F	F	F	S		F
Sketchup	Slow		F	F+		F+	F+	F+	F+	F+	F+	R	R
SkyCalc	Fast	S			L					L	L	L	L
SPOT	Slow	S					S	S	S	S	L	S	S
TracePro	Slow		L	L	F			S	L	S	F		
Windows 5	Fast											F	

\* Radiosity engine - simulations subject to radiosity limitations  
 \*\* Physical modeling - simulations subject to physical modeling limitations  
 + Radiosity engine w/ post process raytrace for renderings  
 + Relies on interface with Radiance for simulation  
 \*\* Output can be used with manual calculations to provide simulation

Key		Radiance User Interfaces		Radiance Engine	
R	Radiance	Rayfront		SPOT	
F	Full Ability	Desktop Radiance		DAVSIM	
S	Some Limitations	Adaptive		Ecotect	
L	Limited Ability	SketchUp			



Created by Zack Rogers  
 Integrated Design Associates, Inc.  
[www.ideasi.com](http://www.ideasi.com)

The table above is provided here with permission of Zack Rogers of Integrated Design Associates. For additional information on the contents of the table, please visit [www.ideasi.com](http://www.ideasi.com)

The Daylighting Collaborative will be presenting a training program on daylighting design tools. Please check [www.daylighting.org](http://www.daylighting.org) for information on the upcoming event to be delivered in collaboration with the Energy Center University. ■

## RESOURCES

Work is underway on the revised *Advanced Lighting Guidelines (ALG)*. With contributions from the country's top experts in lighting design, this new edition, due out later this year, will include technical advances and enhanced application guides, as well as integration with the U.S. Department of Energy's *Commercial Lighting Solutions*. In addition to the revised content, the ALG will move to an online format allowing subscribers easy access and regular updates. Additional information on the update as well as the current edition can be found at the New Buildings Institute website [www.newbuildings.org/lighting.htm](http://www.newbuildings.org/lighting.htm).

## NEW ON THE WEBSITE

**We need your help!** To provide new information, we depend on inquiries from those who use the site! If you need to know something, please let us know. We currently are developing our calendar for adding new content. Let us know what's important for you to know.

## MEMBERSHIP UPDATE

We are making some changes to the Daylighting Collaborative to open access to daylighting information and expand the opportunities for collaboration and financial support of our mission. These changes include:

- Eliminating individual membership. All content on [www.daylighting.org](http://www.daylighting.org) is publicly available now.
- Redefining sponsorship opportunities as membership in the Daylighting Collaborative. This change recognizes your involvement in advancing the practice of daylighting design.

Our new membership model identifies three categories of organizations providing support to the Daylighting Collaborative. These categories are:

**SUSTAINING MEMBERS** Utilities, public benefits programs and regional programs promoting high performance building and sustainable design that recognize daylighting as an essential strategy for their programs and support the Daylighting Collaborative and its mission.

**PROFESSIONAL MEMBERS** Firms that work in the design, construction and development of buildings whose members benefit from the knowledge and information available through the Daylighting Collaborative and support its mission.

**CORPORATE MEMBERS** Firms that provide products and services to those who design and construct daylit buildings and support the Daylighting Collaborative and its mission.

For more information on membership please contact Peggy Heisch at 608.238.8276 x139 or [pheisch@ecw.org](mailto:pheisch@ecw.org). ■

## TECHNOLOGY AND RESEARCH UPDATE

We have received numerous inquiries about the research report, "*Commercial Building Toplighting: Energy Savings Potential and Potential Paths Forward*" developed by TIAX LLC for the U.S. Department of Energy—Buildings and Technology Program. The study focuses on identifying the potential energy savings and other benefits of toplighting daylighting strategies used in combination with electric lighting controls. A link to the full report is listed on our research studies webpage:

<http://www.daylighting.org/library.php?typeid=10>

## TRAINING UPDATE

**Daylighting: Lighting Every Building Using the Sky**

In this on-demand webcast presented by Energy Center University in collaboration with the Daylighting Collaborative, Abby Vogen Horn teaches you how to use natural light to illuminate building spaces, save energy and reduce costs. The live webinar held on March 18 had over 700 participants. The free webcast is now available online. View it today at [www.ecw.org/university/ecuevent.php?ecuid=2](http://www.ecw.org/university/ecuevent.php?ecuid=2).

Integrated daylighting design is the key to whole building energy savings and a successful sustainable design. This 1.5 hour presentation examines critical daylighting design techniques and considerations. Participants will gain an overall understanding of how to approach daylighting design. Topics from this session include:

- Definition of successful daylighting
- Components of daylighting design
- Integration with electric lighting
- Top and side lighting strategies
- HVAC savings with daylighting
- Current daylighting software tools

This seminar qualifies for AIA HSW/SD credits. This seminar has been submitted to the National Council on Qualifications for Lighting Professions (NCQLP) for one lighting education unit. This course has been approved by the United States Green Building Council (USGBC).

**DID YOU KNOW...**

Setting performance goals is key to realizing whole building energy savings when incorporating an integrated daylighting design. A simple, but important performance metric is lighting power density (**watts [total lamp watts x ballast factor] divided by room area [ft<sup>2</sup>]**)\*. Additionally, to really get at potential whole building savings you can set an EUI goal.

EUI is an acronym representing multiple terms: energy use index, energy use intensity as well as end use intensity. Energy use index typically refers to a comparison of multiple building data sets. This is the unit used by the ENERGY STAR® Target Finder to rate buildings. Energy use intensity or end use intensity typically refers to the total amount of energy consumed per unit of service or activity and can be used to compare energy use or consumption across an entire building on a square foot basis, energy consumption per hour of operation, or even consumption per worker.

The value of EUI, no matter which term you use, is to represent the entirety of building energy use across all end uses and all fuel types. It provides a complete understanding of the implications of design and equipment selections on energy use in that building. It can be used in both new construction and retrofit projects.

EUI can be normalized across climates and regions to compare multiple buildings. The EUI is expressed in Btu/square foot/year. It is calculated by converting all energy used in a building to a common unit, Btu, and then dividing by the square footage of the heated/cooled space in the building.

The basic calculation for a building using gas and electric is:

$$\text{Annual Electric (Btu)} + \text{Annual Gas (Btu)} = \text{Annual Total (Btu)} / \text{Square Footage} = \text{EUI (annual Btu/ft}^2\text{)}$$

To convert kilowatt hours (kWh) to Btus:

$$X \text{ kWh} \times 3412 \text{ British Thermal Units (Btu)} = X \text{ Btu}$$

$$\underline{\hspace{1.5cm}} \\ 1 \text{ kWh}$$

Identifying an EUI goal sets the stage for integrated design because all members of the design team must work together and communicate to realize the goal. For additional information, visit the Energy Information Administration at [www.eia.doe.gov](http://www.eia.doe.gov).

\* this basic calculation will give you a general approximation of lighting power density