

Natural Lighting

FEATURES

- Can eliminate up to 90% of electrical lighting needs during daylight hours saving significant money on electrical energy cost.
- Best Visible light transmission of 89% without loss of color 100 CRI full spectrum.
- Unbeatable radiation barrier can produce up to R-48 insulation value.
- Easy drop down system to ensure simple leak proof installations.
- Side extraction available to produce up light.
- Minimal roof penetration needed for uniform light distribution, skylight to floor ratio approx. 2%

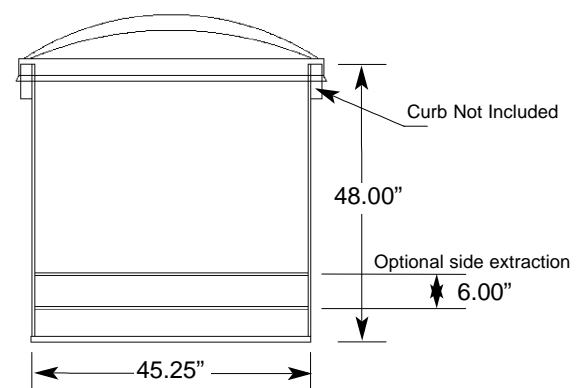


SPECIFICATIONS

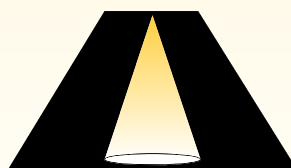
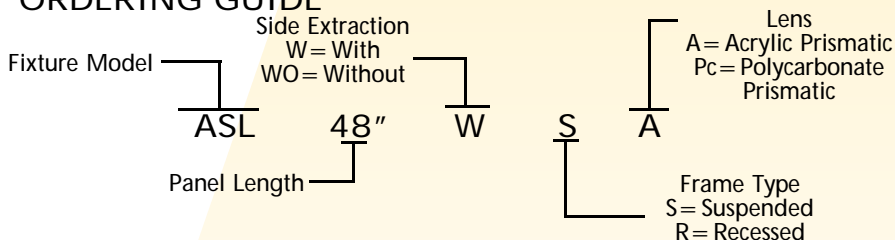
- PANELS: .50" foam board with white plastic laminate on outside of panel and .020 95% specular material on inside of panel.
- BOTTOM LENS: .1875 prismatic acrylic or polycarbonate
- TOP DOME: High impact clear acrylic double dome with extruded aluminum frame.

CROSS SECTION

Cross section shown is standard 4X4 Suspended Frame. Size of opening may vary with different installations. Length is standard 48" custom lengths may be specified.



ORDERING GUIDE

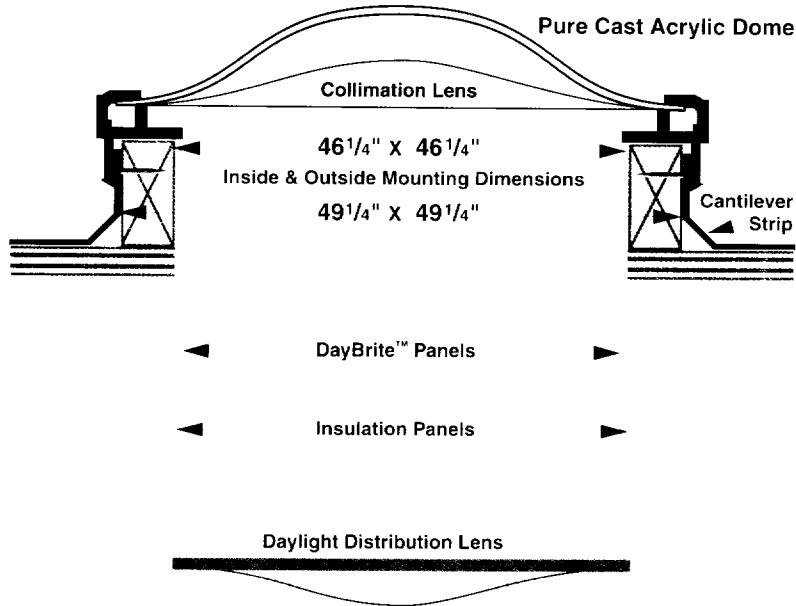


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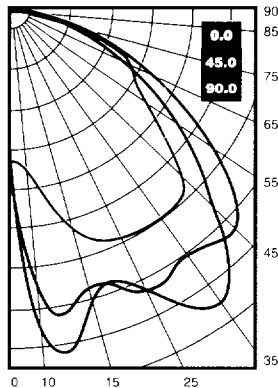
SkyLite



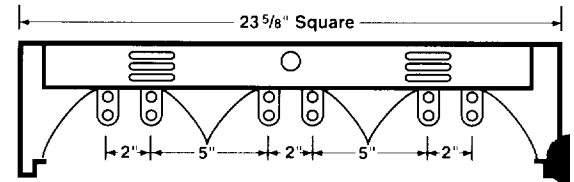
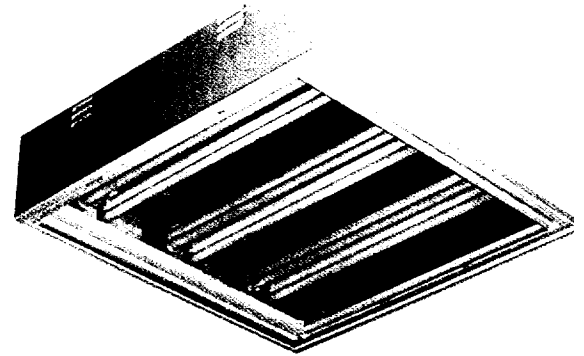
Warranty	Lifetime
ICBO	#4063
U-Factor	.84
Solar Heat Gain Coefficient	.22
Visible Transmission	.92
Daybrite™ Panel	>97% Reflective
Skylight Frame Style	Curb Mount / Self Flashed
Color Rendering Index	100% Full Spectrum
Polarized Diffusion	True Glare Free Patented Design

Photometric Data

Solar Source (Lumens)	140,000
Luminaire Width	3.78'
Length	3.78'
Height	4.0'
Photometry Type	C
Total Opacity Efficiency	88.1%
Test Distance	20"
Space to Mtg. (S/M H)	2.82



BAYLIGHTER™

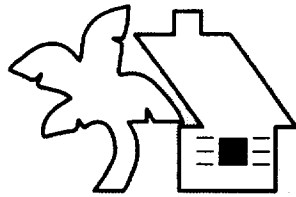


3-Piece reflector / wireway cover is designed for easy maintenance. Center piece is removable without the use of tools.

Type of Fixture	Suspended
Fixture Lamp	40 / 55W BIAx (6)
Ballast Type	Electronic
Input Watts	198 / 330
Fixture Efficiency	71.8
Fixture Efficacy	67.4
Lamp Life (Hrs.)	20,000 / 12,000
Lamp Color (CRI)	85
Space to Mtg. (S/M H)	1.62

Typical System Layout for Individual or Hybrid General Area Lighting

	Room Size	Ceiling Height	Grid Spacing	Mounting Height	Test Plane Height	Average FC
SkyLite™ Series	300' x 300'	25'	33.5' x 33.5'	20'	2.5'	75.0 FC



Eco-Smart™ Homes & Buildings Program
www.ecohouse.com

Building Energy Efficiency Cost / Benefit Analysis

Job Name: Eckerd Corporation

Melded kWh Rate: 0.078

\$\$\$ Saved = Electric savings * 1.5 (HVAC savings + Maint. Savings, Florida average)

Proposed: Install 12 Passive Daylighting units (4' x 4') to illuminate the approximately 8000 square feet of retail sales area. Cost figures are rough estimates based upon new construction, and integrating the currently designed electronic ballast/t8 lighting to operate dimmed power and light levels, controlled automatically in response to daylight levels provided. System layout provides for full illumination of the store at 50% of maximum outdoor sunlight (Grey or hazy cloud cover). Savings are based upon eliminating the need for electrical lighting an average of 8 hours per day. For conservatism, savings estimates do not include hours where electric lights will be operating dimmed power levels.

Area: Retail Sales Floor

<u>Current</u> <u>kW/fixt.</u>	<u>Fixt.</u> <u>Qty.</u>	<u>Total</u> <u>kW</u>	<u>Hrs.</u> <u>Used</u>	<u>Current</u> <u>kWh</u>	<u>Proposed</u> <u>kW/fixt.</u>	<u>Fixt.</u> <u>Qty.</u>	<u>Total</u> <u>kW</u>	<u>Hrs.</u> <u>Used</u>	<u>New</u> <u>kWh</u>	<u>kWh</u> <u>Saved</u>	<u>Ann. \$\$</u> <u>Saved</u>	<u>Addit.</u> <u>Cost</u>	<u>Payback</u> <u>(yrs.)</u>
0.086	120	10.3	5,110	52,735	0.086	120	10	2,190	22,601	30,134	3,526	0	0.00
0.062	70	4.3	5,110	22,177	0.062	60	4	2,190	8,147	14,031	1,642	0	0.00
Totals				74,913					30,748	44,165	5,167	12,000	2.32

Conclusions: The above analysis indicates that Eckerd Corp. will reduce operational and maintenance costs by an estimated \$5,167.00 per year at a single representative store, integrating Passive Daylighting systems with the electrical lighting. At an estimated additional construction cost of \$12,000 (including materials and installation vs. current lighting), Eckerd Corp. will recover its investment in 2.32 years, equal to a 43% annual return on investment.

Additional benefits from daylighting to be expected include:

increased sales and decreased returns due to higher color rendition of lighting, reduced employee errors, accidents and sick days, and increased customer satisfaction with their shopping experience. Eckerd Corporation can also generate significant positive media attention for utilizing environmentally beneficial and healthy construction practices.



DESIGN

If Sun Shines In, Workers Work Better, Buyers Buy More

By JOHN PIERSON

Staff Reporter of THE WALL STREET JOURNAL

Daylight is coming back. Ever since the first cave crept doors for safety, humans have sought to bring sunlight in from outside. The late architect Mies van der Rohe even argued at "the history of architecture is the story of man's struggle for light — the story of the window."

The struggle suffered a major reversal 1879, when Thomas Edison invented the electric light. After that, most architects tilted more and more on man-made light. A very small percentage of our buildings have adequate daylighting, says Robert Birkebile, a Kansas City, Mo., architect.

Recently, though, European countries have begun to require that a certain percentage of a building's light come from indoors — 37% in the Netherlands, for example. And in the U.S., the "daylighting" movement, which was founded on dollars-and-cents arguments about energy efficiency, has begun to cite even greater gains on higher productivity.

According to a report by the Rocky Mountain Institute, Snowmass, Colo., increased daylighting results in fewer days lost to absenteeism and fewer errors and defects. The report, "Greening the Building and the Bottom Line," cites improved heating and cooling in eight commercial buildings. And the authors, Joseph Romm and William Browning, describe specific aims:

- In 1993, Wal-Mart Stores Inc. opened a prototype store in Lawrence, Kan. The lead designer was BSW Architects, Tulsa, Okla. Called the Eco-Mart, the store experimented with a variety of design elements, including nine special skylights created by Andersen Corp., Bayport, Minn.
- The Eco-Mart cost about 20% more to build than other Wal-Mart stores. To hold down construction costs, the company decided to install the special skylights in only half the roof, leaving the other half with artificial light.

drawing natural light through the skylights. But "something else has gotten the corporation's attention," says the institute. In every Wal-Mart store, each cash register is connected in real time back to headquarters in Bentonville, Ark. According to Tom Seay, who was then the company's vice president for real estate, sales were "significantly higher" in those departments in the daylight half of the store, and they were also higher there than in the same departments at other stores.

Employees in the half without daylighting continue to try to have their departments moved to the daylight side. Andersen has also developed an improved skylight for the Wal-Mart store that's due to open in January in City of Industry, Calif.

- In 1978, the architectural firm of Leo A. Daly, Omaha, Neb., offered to design a new office building for 2,700 engineers and support people working for Lockheed Corp. in Sunnyvale, Calif. Daly promised that the building would use half as much energy as the one Lockheed was planning.

The aerospace company look up the challenge. Opened in 1983, Building 157 has 15-foot-high window walls with sloped ceilings to bounce daylight deep inside. A central atrium runs five stories top to bottom and has a glazed roof. "Light shelves" on the south facade shade out the high summer sun but diffuse the lower winter light and reduce glare.

Employees say they love the building. "By nature I'm very cynical, but the conditions in this building are far superior to any I've experienced in 30 years in the aerospace industry," says one engineer.

Daylight has also saved Lockheed 75% of its lighting bill and cut overall energy costs in half because daylight generates less heat than artificial light and requires less air conditioning. The \$2 million in energy improvements paid for themselves in energy savings in four years.

What Lockheed hadn't expected was that productivity would rise because ab-

absenteeism dropped 15%, which paid for 100% of the improvements in the first year. Architect Lee Windheim quotes Lockheed officials as saying increased productivity also won the company a very competitive \$1.5 billion defense contract.

- In 1987, Nederlandsche Middenstandsbank opened a new headquarters in Amsterdam that bank officials hoped would be "organic, which integrated art, natural materials, sunlight, plants, energy conservation, low noise and water." Instead of a monolithic tower, the 538,000-square-foot building is broken up into 10 slanting towers, laid out in an S-curve with gardens and courtyards over parking and service areas. No desk is more than 23 feet from a window, and interior louvers in the top third of windows bounce daylight onto office ceilings.

These and other measures to conserve energy paid for themselves in just three months. Meanwhile, absenteeism among NMB employees has dropped 15%.

Other researchers have found other benefits to daylighting. Roger Ulrich of Texas A&M University studied gall-bladder surgery patients housed on both sides of a corridor at a nursing unit. On one side the rooms looked out at a brick wall, on the other, at tree-dotted lawns.

The patients with the tree view had fewer postoperative hospital stays and fewer negative evaluations from nurses. They also took fewer pain relievers and had fewer minor postsurgical complications.

Most of the gains ascribed to daylighting come from simple architecture rather than complex high technology. Architects and engineers in the daylighting movement tend to limit their high tech to nonmoving glass and lenses. Eighty-five percent of the solution, says Mr. Birkebile, the architect, is "orientation of the build-

ing for the solar angles rather than for the way the street goes, and designing the building's original skin to accept the winter sun while rejecting the summer sun."

"The more low-tech the better," adds Nancy Clanton, an electrical and lighting engineer in Boulder, Colo. "It costs less and it lasts longer."

So what are the arguments against more daylight in buildings? Harry Gordon, a Washington, D.C., architect, notes that electrical lighting is becoming more efficient. As this happens, the savings from daylighting decline. Like his colleagues, Mr. Gordon, who chairs the American Institute of Architects' Committee on the Environment, advocates a "balance" of the two kinds of light.

Mr. Birkebile adds that architects should proceed cautiously with daylighting. "We need sun, but sun also causes skin cancer and eye disease," he says.

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SPECIAL REPORT

EFFICIENT BUILDING AWARDS

Energy & the Environment

E&E Honors Go to Schools Saving \$64,000/Yr. With Integrated Daylighting, TES Applications

by EDWARD A. CILURSO

PHOENIX—Extensive use of daylighting and thermal storage helped the new campus of the Cerritos Elementary and Alhambra Middle schools here achieve estimated annual ener-

gy cost savings of over \$64,000 and win EUN's 1995 Efficient Building Award for Energy and the Environment.

The project was nominated by skylight supplier Natural Lighting Co., Glendale, Ariz.

The 283,300-square-foot campus entered service in June. It features over 450 skylights covering all instructional areas and the gymnasium. They have improved lighting quality, reduced annual electric lighting

costs by about \$21,250, and should earn a seven-year payback.

The incremental cost of all the efficiency measures included in the new schools was \$675,000. Annual electricity savings of 432,000 kilowatt hours (kwh) and an 8.4-year payback are expected on the overall project.

The skylights feature a reflective foil shaft and translucent white diffuser lens that extends ten inches below the plane of the flat ceiling. A typical classroom has four four-by-four-foot skylights, which can supply 125-150 footcandles throughout much of the day. Most feature motorized shade

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screens to allow teachers to darken rooms if necessary. The gymnasium uses 15 six-by-six-foot skylights that allow all the room's metal halide lighting to be turned off during the day.

Paul Grocoff, an engineer with project consultant Orutt/Winslow Partnership here told EUN that most of the skylights offset the need for artificial lighting for at least part of the day. Teacher participation is

windows along corridors also save energy. The library was problematic, according to Grocoff, because its ceiling varies from 10 to 25 feet high. A pyramidal skylight by Kalwall, Manchester, N.H., with a shading coefficient of 0.23, is located on the high ceiling and allows a reduction of lighting power density for the space to 1.06 watts per square foot.

The clerestory windows feature high-performance glazing

by Southwall Technologies, Palo Alto, Calif., that reduces their shading coefficient to 0.31. Together, the two systems save about 27,000 kwh a year.

"What I really like about this project is that they used the concept of daylighting in every possible area," remarked Paul Bilbrey, Natural Lighting's president. He added that schools are a challenge to lighting designers because they typically have more occupants than

offices and require more space for workstations.

The campus also features a thermal storage system rated at 3,000 tons per hour. According to Grocoff, the system should save the school nearly \$25,000 in annual utility costs.

The project earned \$133,400 in utility incentives from Salt River Project to fund thermal storage and the use of T8 lamps and electronic ballasts.

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