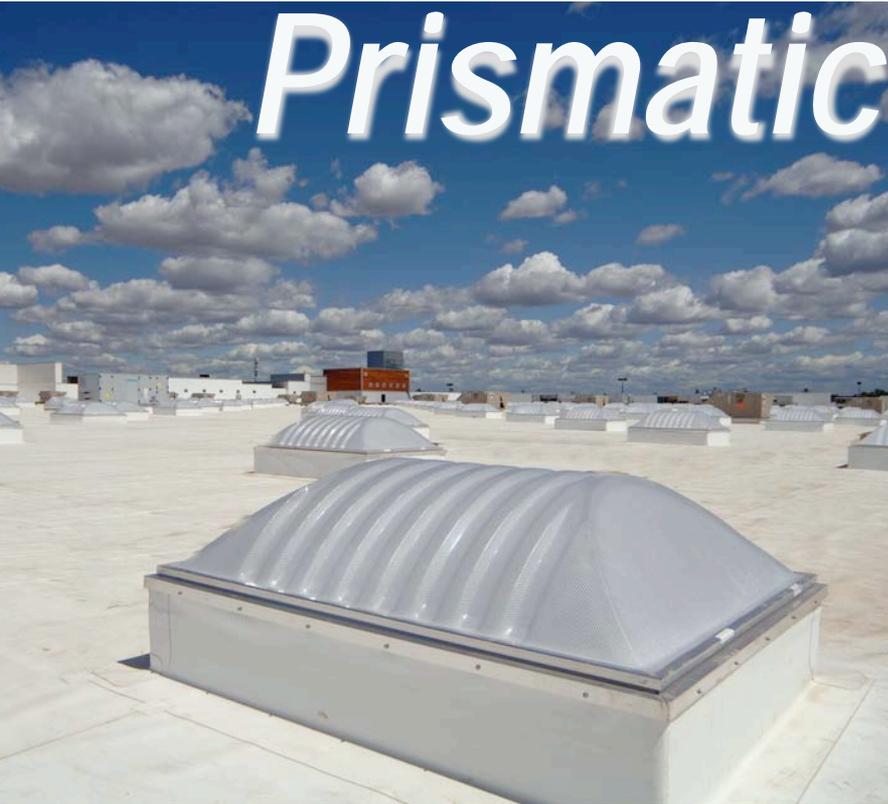


*PUT YOUR ROOF TO WORK  
FOR YOU WITH*

*Prismatic Daylighting*



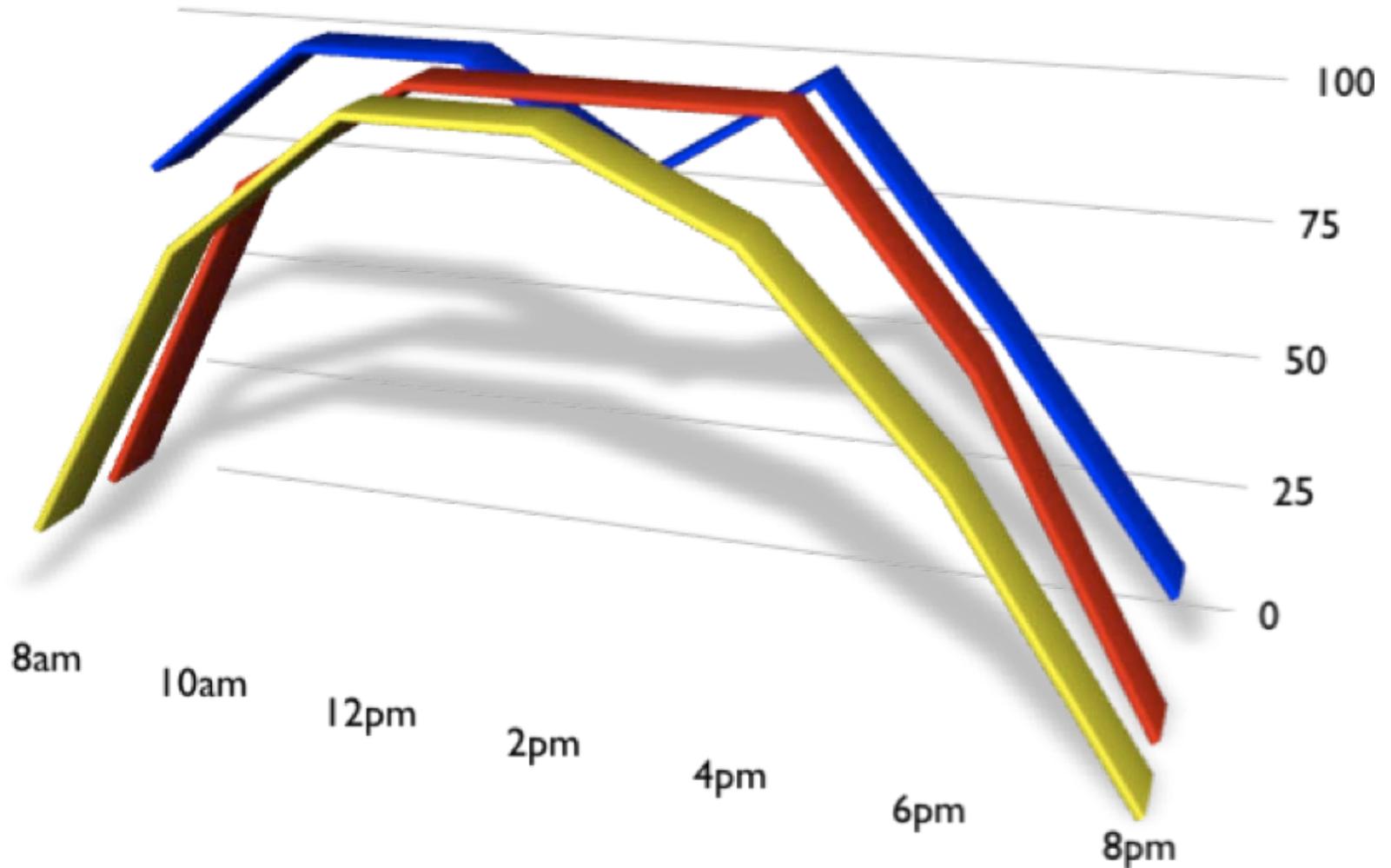
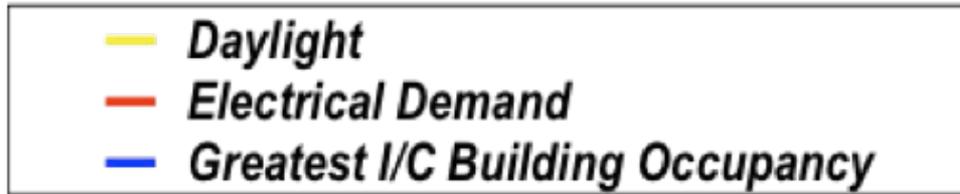
*There's No Greater Efficiency Than Off!*

*What One Thing Has The Single Greatest Affect On Energy Demand*

**THE SUN**



# DAYLIGHT & ENERGY DEMAND



# *Harness The Energy Of The Sun*



*And Reduce Expensive and Precious  
Energy Demand In The Process*

# *SUNLIGHT is POWER*



*The sun produces both visible and IR waves of light that can be harnessed in many ways*



*Since the beginning of time, man has utilized natural daylight as his main source of illumination. Our eyes were made to use the full color of daylight.*

*Up until the 1960's,  
building designers  
and architects  
designed a building's  
reflective lighting  
plan around the use  
of natural light from  
glass windows,  
clearstories,  
skylights and roof  
monitors*



# MODERN BUILDING TECHNOLOGY



*60% - 80% More Energy Than Necessary*

# *Electric Lights Energy & Effectiveness*



*Common  
Industrial  
Building*

*Lights On  
and Burning  
Energy  
However  
Sometimes  
Still Dark*

# *Clear Skylight Glazing*



*Skylight  
Glazing  
First with  
clear and  
then  
opaque  
domes to  
knock down  
light for  
diffusion*

# *Prismatic Skylights*

*High  
Performance  
Prismatic  
Skylights  
Maximize  
Light  
Transmission  
with the  
optimum level  
of diffusion*

*No Lights On!*





***SNOW IS 100% CLEAR  
BUT LOOKS WHITE***

***PRISMATIC***

***Like 4000 Mirrors per Sq. Ft. / Glazing***

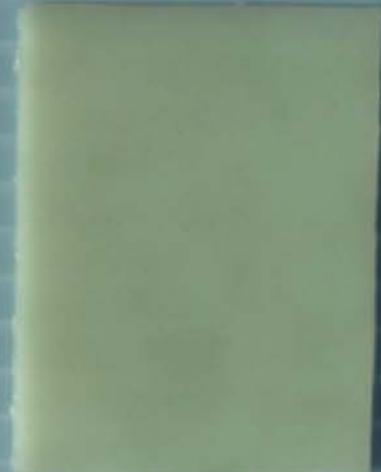
- **Transmit 35% more light while still providing 100% diffusion compared to any standard industrial skylights on the market.**
- **Direct more of the transmitted light to the work plane without glare, hot spots or UV damage to merchandise or furnishings**
- **Catch up to 20% more light at low sun angles than standard shapes**
- **Are 50% stronger than required by any Building Code**

## SKYLIGHT LIFE EXPECTANCY

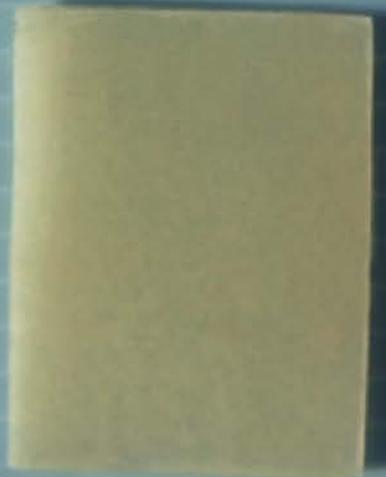




NEW COPOLYESTER



7 YEAR OLD COPOLYESTER  
(8% VLT LOSS WITH SOME YELLOWING)



NEW FIBERGLASS



12 YEAR OLD FIBERGLASS  
(23% VLT LOSS WITH MAJOR BROWNING)

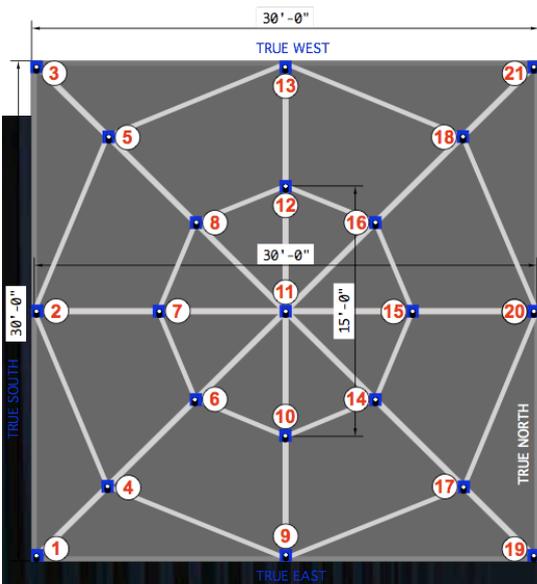


**PROJECT INSTALLED IN 1980**  
**Prismatic Skylights**

# 30 Years of Performance



# Photometric Lab Testing For Light Transmission and Diffusion



00 ROOF MOUNTED PHOTOCELL-LEVEL BOTH DIRECTIONS

PHOTOMETRIC LAB PHOTOCELL LAYOUT

— 3" WIDE STRIPS

■ 9" SQUARES WITH PHOTO CELL





**FOOT CANDLE & PHOTOMETRIC PERFORMANCE TEST BETWEEN A MIRROR-TRACKING SKYLIGHT  
AND  
SUNOPTICS "SIGNATURE" DOME SHAPE (DOUBLE GLAZED USING CLEAR PRISMATIC ACRYLIC OVER  
HIGH WHITE PRISMATIC ACRYLIC IN BOTH A 4' X 4' SIZE AND A 5' X 6' SIZE (5x6 standard in all WalMarts).**



**PHOTOMETRIC AND FOOT CANDLE TEST**

TIME: 8:15 AM, MAY 16TH, 2008

SAMPLES:

**SAMPLE 1**



**SAMPLE 2**

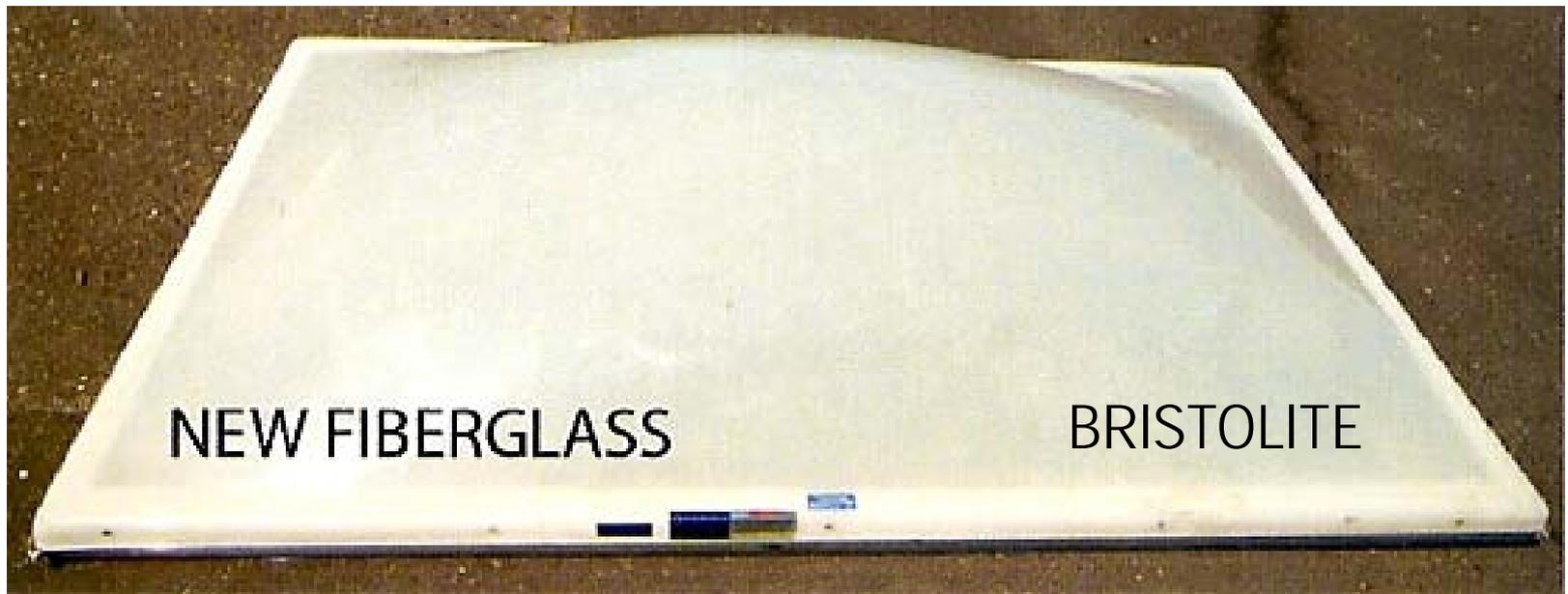


**SAMPLE 3**



CAMERA APERTURE AND EXPOSURE SETTINGS ARE THE SAME FOR ALL THREE PHOTOS. NO DOCTORING OF PHOTOS.





NEW FIBERGLASS

BRISTOLITE

# Sunoptics Photometric Analysis Bristolite vs. Sunoptics

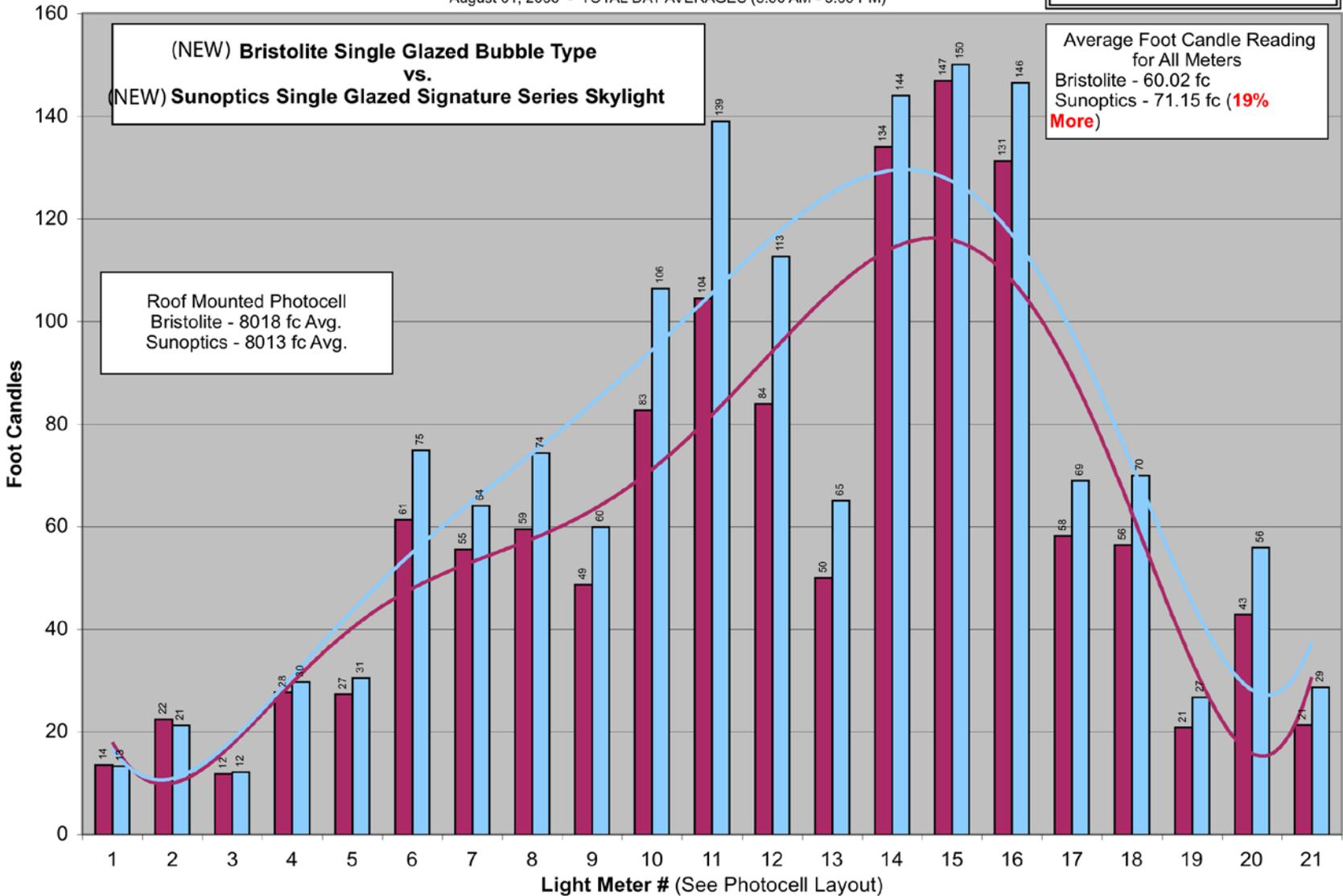
August 01, 2006 - TOTAL DAY AVERAGES (8:00 AM - 5:00 PM)

**ALL DAY  
AVERAGE READING**

(NEW) Bristolite Single Glazed Bubble Type  
vs.  
(NEW) Sunoptics Single Glazed Signature Series Skylight

Average Foot Candle Reading  
for All Meters  
Bristolite - 60.02 fc  
Sunoptics - 71.15 fc (**19%  
More**)

Roof Mounted Photocell  
Bristolite - 8018 fc Avg.  
Sunoptics - 8013 fc Avg.

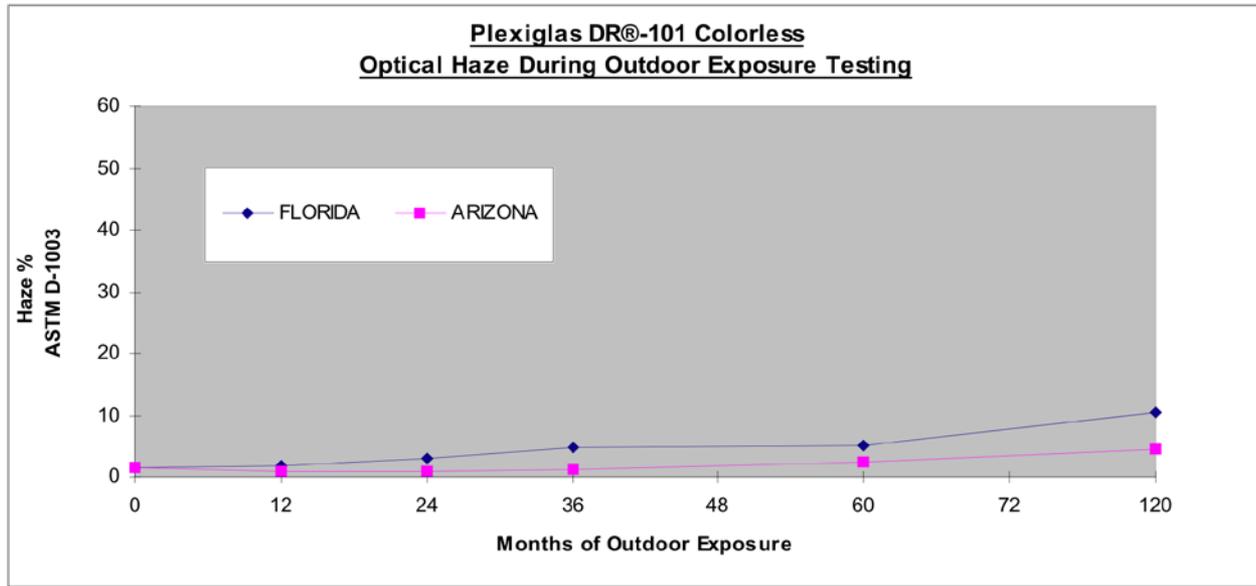
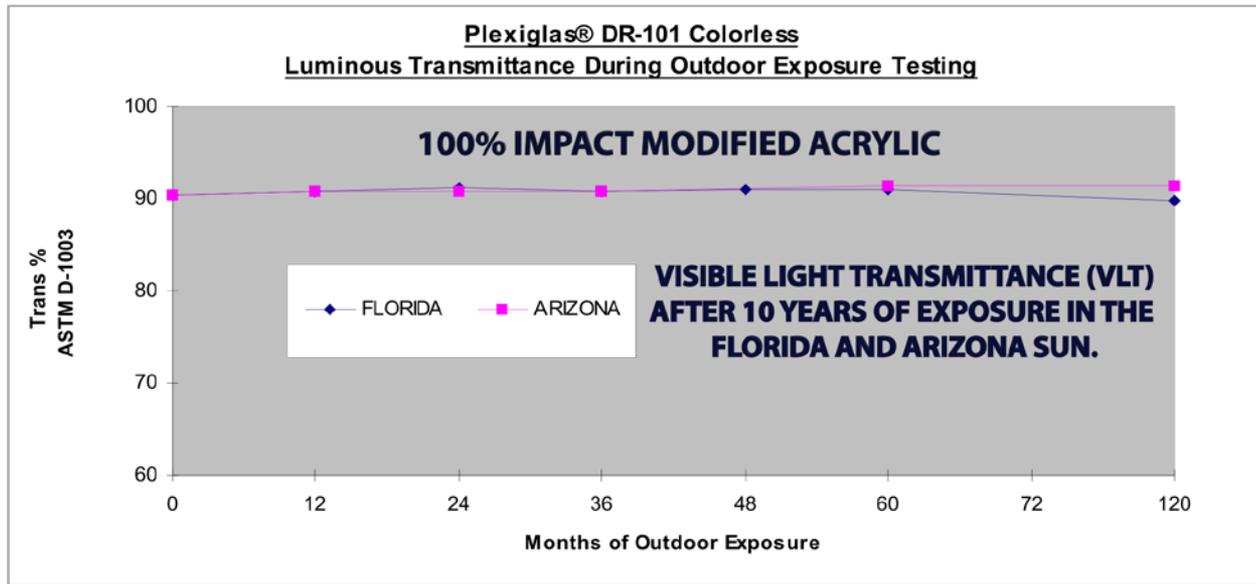




**12 Year Old  
Fiberglass  
Skylight**

**11 Year Old  
Sunoptics  
Prismatic  
Skylight**

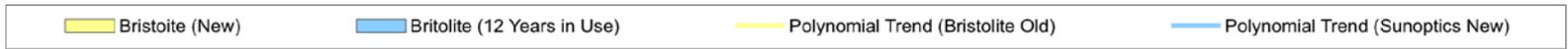
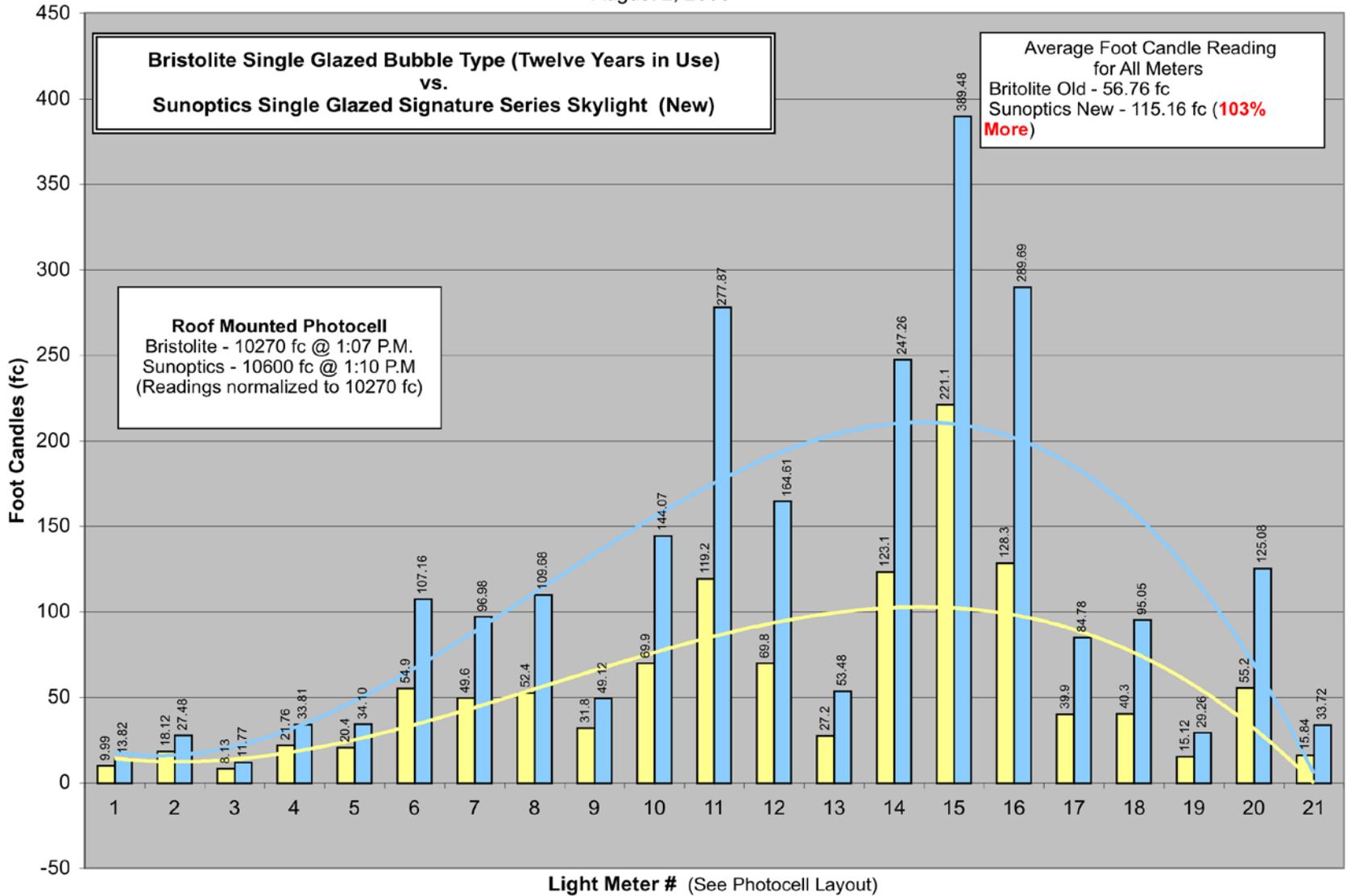
**100% IMPACT ACRYLIC IS NOW STANDARD GLAZING IN ALL SUNOPTICS PRISMATIC SKYLIGHTS**

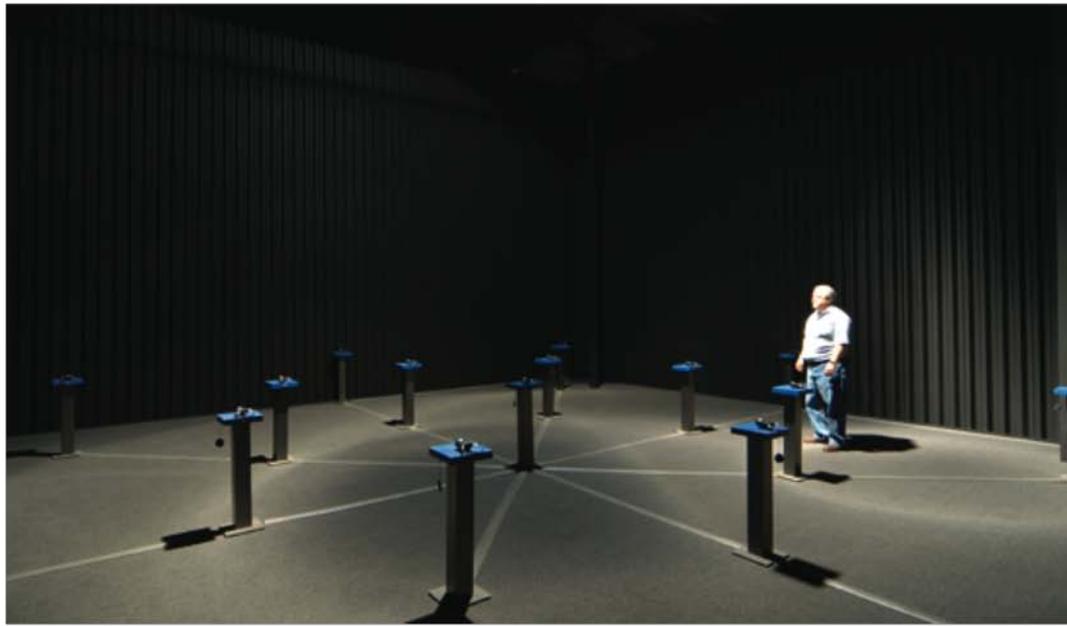


# Skylight Photometric Comparison Test

(New Sunoptics vs. Old Bristolite)

August 2, 2006





HOT SPOTS ALONG WITH DARK SPOTS WITH THE ORION

# Multiple Photometric Comparisons

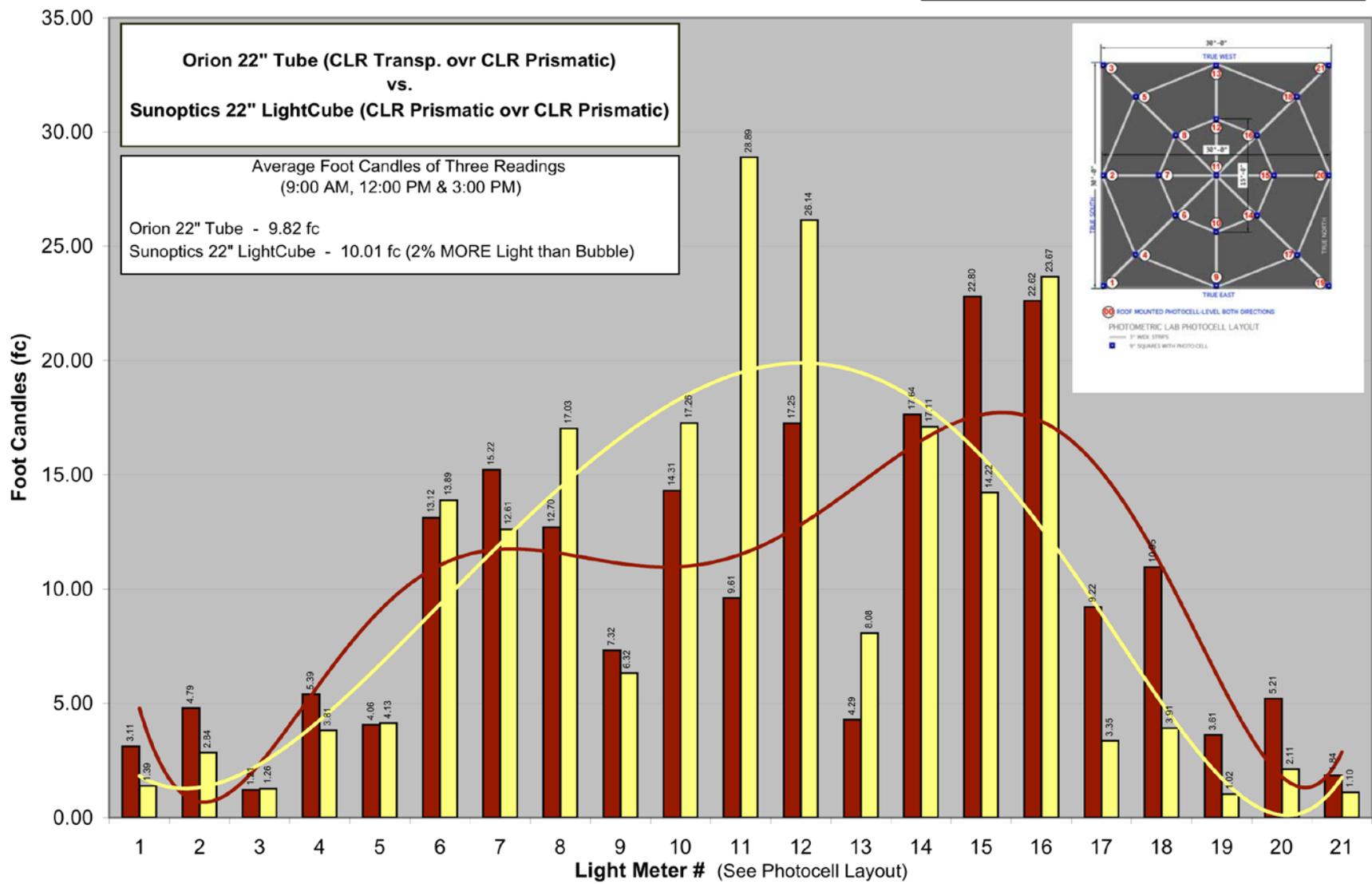
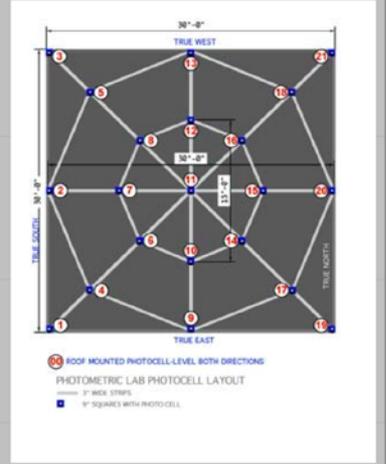
May 27, 2009

**AVERAGES of  
THREE READINGS (9:00, 12:00 & 3:00)**

**Orion 22" Tube (CLR Transp. ovr CLR Prismatic)  
vs.  
Sunoptics 22" LightCube (CLR Prismatic ovr CLR Prismatic)**

Average Foot Candles of Three Readings  
(9:00 AM, 12:00 PM & 3:00 PM)

Orion 22" Tube - 9.82 fc  
Sunoptics 22" LightCube - 10.01 fc (2% MORE Light than Bubble)



■ Orion 22" Tube     
 ■ Sunoptics 22" LightCube     
 — Orion 22" Tube     
 — Sunoptics 22" LightCube



## Public Review Draft

ASHRAE® Standard

**Proposed Addenda d and e  
to Standard 90.1-2007,  
*Energy Standard for  
Buildings Except Low-Rise  
Residential Buildings***

**First Public Review (March 2007)  
(Draft Shows Proposed Changes to  
Current Standard)**

This draft has been recommended for public review by the responsible project committee. To submit a comment on this proposed addendum, use the comment form and instructions provided with this draft. The draft is subject to modification until it is approved for publication by the Board of Directors and ANSI. Until this time, the current edition of the standard (as modified by any published addenda on the ASHRAE web site) remains in effect. The current edition of any standard may be purchased from the ASHRAE Bookstore @ <http://www.ashrae.org> or by calling 404-636-8400 or 1-800-727-4723 (for orders in the U.S. or Canada).

This standard is under continuous maintenance. To propose a change to the current standard, use the change submittal form available on the ASHRAE web site @ <http://www.ashrae.org>.

The appearance of any technical data or editorial

**ASHRAE 90.1  
- 2007  
Addenda D**

**High VLT  
>90% Diffuse  
+  
Light Control  
=  
Zero SHGC  
from  
Daylighting**

# Commercial Building Toplighting: Energy Saving Potential and Potential Paths Forward

Final Report

Prepared by

TIAX LLC

For

U.S. Department of Energy



**BUILDING** TECHNOLOGIES  
PROGRAM

Bringing you a prosperous future where energy is clean, abundant, and affordable.

June 2008

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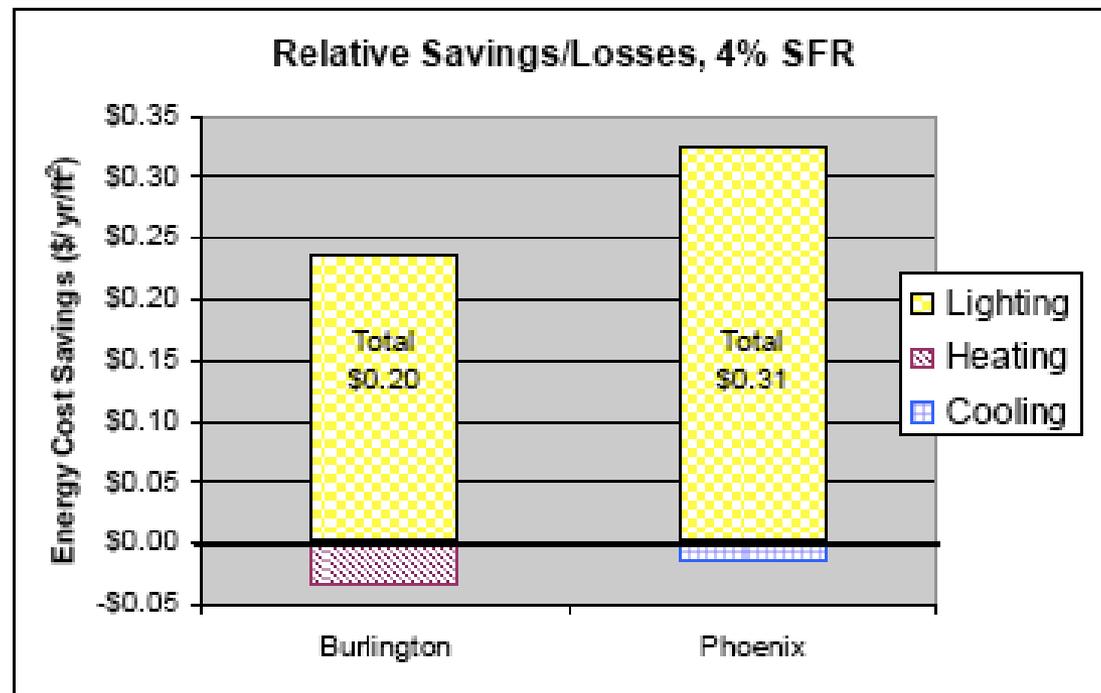


Figure 4-8: Relative Savings/Losses from Lighting and HVAC, Big Box Retail, Phoenix

Reduced lighting energy use ranks as, by far, the greatest factor in the annual savings at economically optimum SFRs. The reduction in lighting energy use is directly related to VT, i.e. the higher the VT, the lower the total skylight area needed to achieve a given lighting energy savings. Lower total skylight area reduces cost and energy losses. To further minimize energy losses, in most climates, the SHGC and U-value of the skylight should be as low as possible<sup>3</sup>. However, because heating and cooling energy losses are small relative to lighting energy savings, if reducing SHGC or U-Value results in any significant reduction in VT it is generally not a beneficial tradeoff at SFRs in the range expected to be economically optimal, i.e., below 5%.

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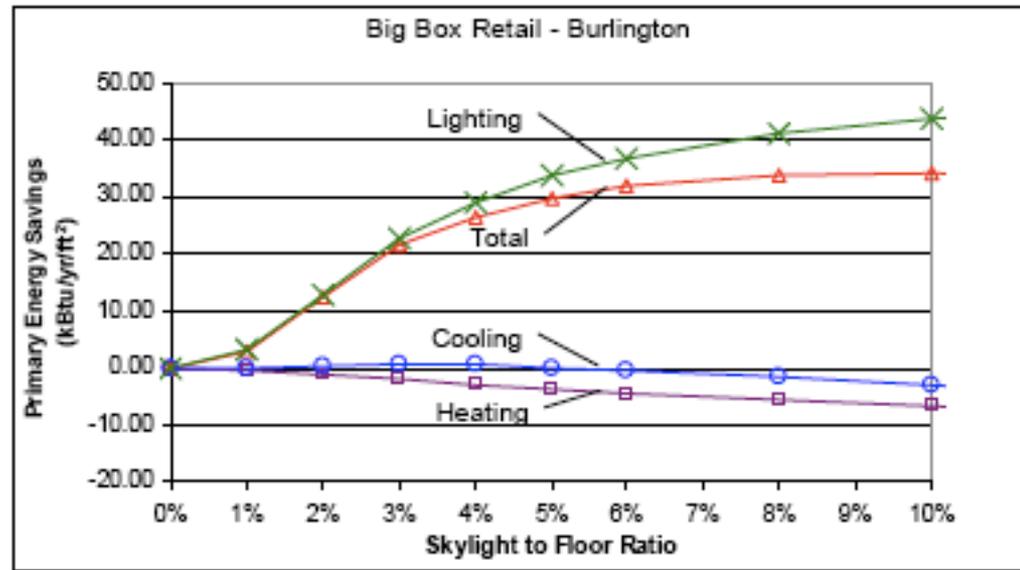


Figure 5-2: Annual Primary Energy Savings by End Use (lighting, cooling, heating) as a Function of SFR, Burlington

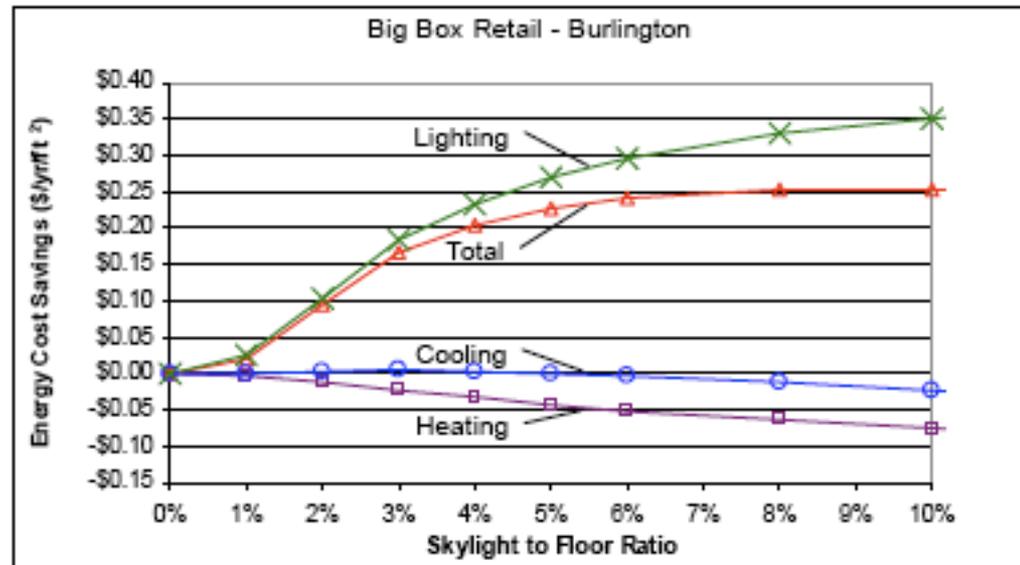


Figure 5-3: Annual Energy Cost Savings by End Use (lighting, cooling, heating) as a Function of SFR, Burlington

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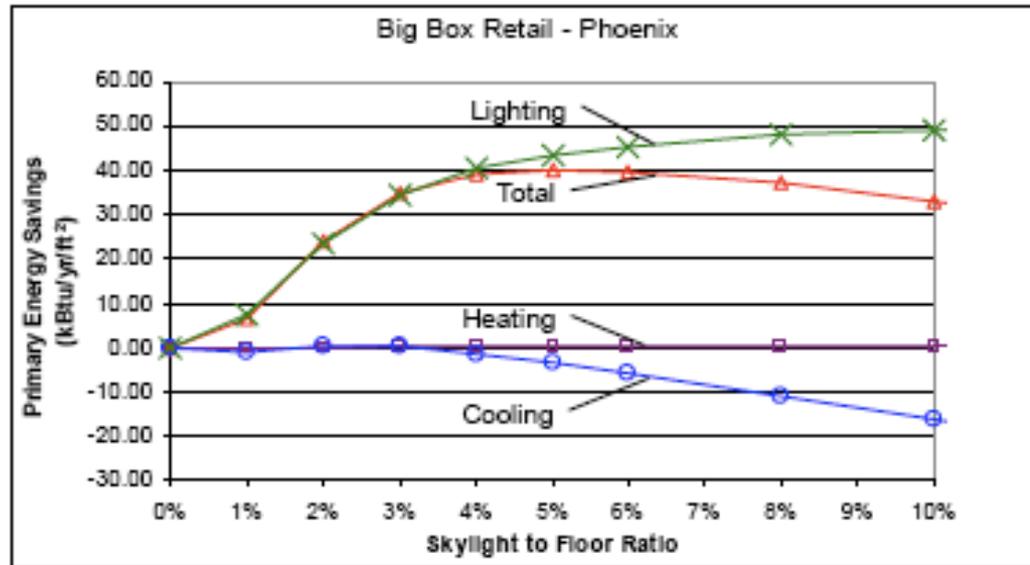


Figure 5-4: Annual Primary Energy Savings by End Use (lighting, cooling, heating) as a Function of SFR, Phoenix

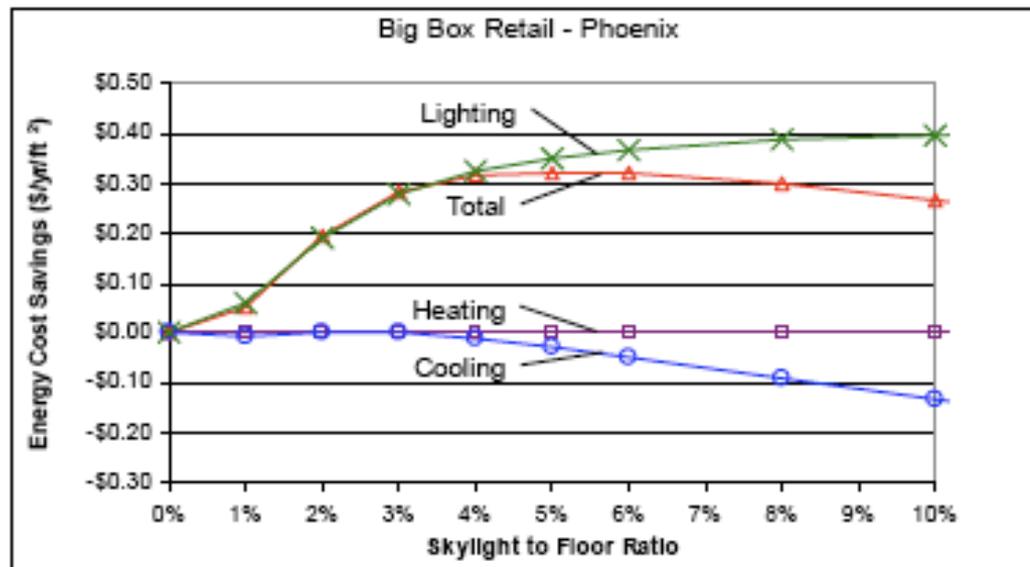


Figure 5-5: Annual Energy Cost Savings by End Use (lighting, cooling, heating) as a Function of SFR, Phoenix

Final Report

Prepared by

TIAX LLC

For

U.S. Department of Energy



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June 2008

# Lighting Controls Are The KEY!

Without lighting controls, skylights or any daylighting products are not energy efficient for the building envelope no matter their design or lighting output... PERIOD!

- 3-Level Staging / Switching Most Efficient!
- Dimming will add cost but pinch off energy at the ends of daylight hours and decrease abrupt changes in lighting.
- Simple On/Off switching leaves money on the table in energy savings!



Final Report

Prepared by  
TIAX LLC  
For  
U.S. Department of Energy



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June 2008

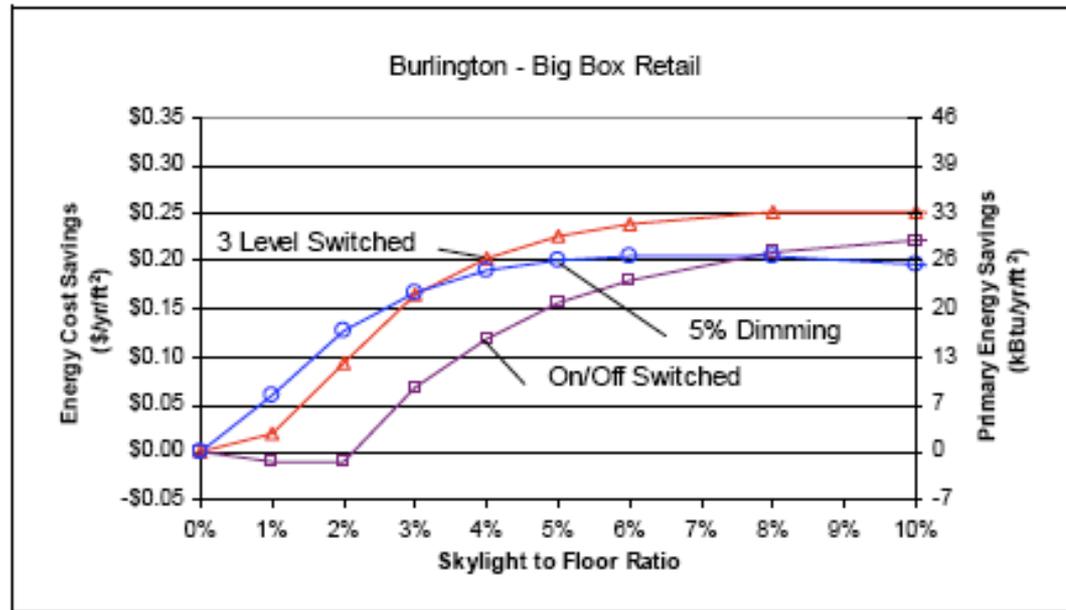


Figure 4-6: Effect of Lighting Control Type on Energy and Cost Savings, Big Box Retail, Burlington

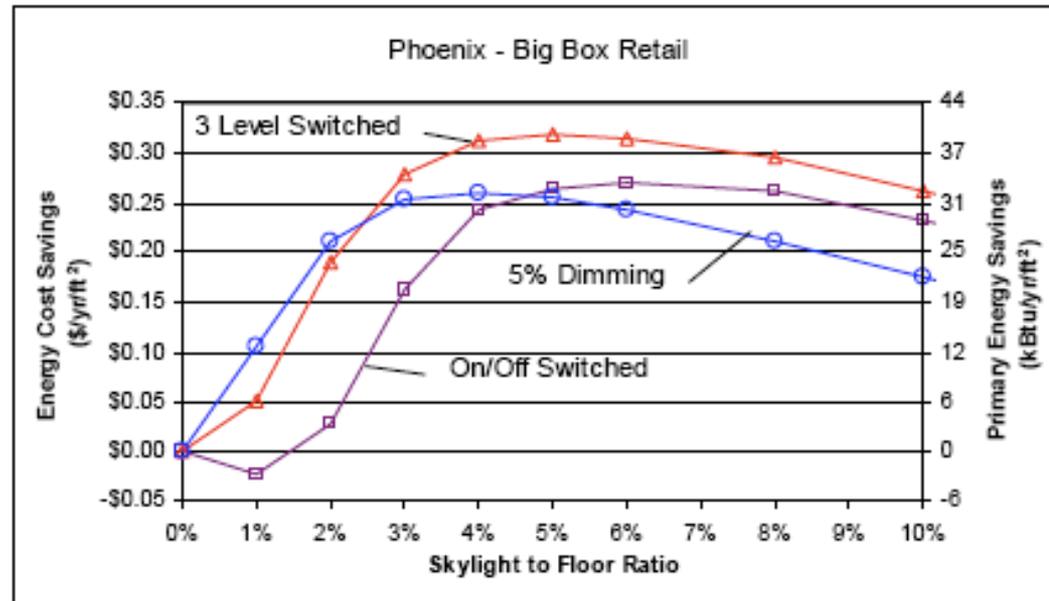


Figure 4-7: Effect of Lighting Control Type on Energy and Cost Savings, Big Box Retail, Phoenix

**2008 BUILDING ENERGY  
EFFICIENCY STANDARDS  
FOR RESIDENTIAL AND  
NONRESIDENTIAL BUILDINGS**

CALIFORNIA  
ENERGY  
COMMISSION

**REGULATIONS / STANDARDS**



# *Major Code Changes Around Daylighting*

*Must Daylight if...  
8,000 sq.ft.  
& 15' + ceilings*

*>90% Diffusion  
+*

*Light Controls  
For minimum 50% of  
Building*

December 2008  
CEC-400-2008-001-CMF

Arnold Schwarzenegger  
Governor



**TABLE 143-A – PRESCRIPTIVE ENVELOPE CRITERIA FOR NONRESIDENTIAL BUILDINGS (INCLUDING RELOCATABLE PUBLIC SCHOOL BUILDINGS WHERE MANUFACTURER CERTIFIES USE ONLY IN SPECIFIC CLIMATE ZONE; NOT INCLUDING HIGH-RISE RESIDENTIAL BUILDINGS AND GUEST ROOMS OF HOTEL/MOTEL BUILDINGS)**

			Climate Zone															
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Roofs/Ceilings	Metal Building		0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065
	Wood Framed and Other		0.040	0.030	0.030	0.030	0.040	0.075	0.067	0.067	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030
Roofing Products	Low-sloped	Aged Reflectance	NR	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	NR
		Emissance	NR	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	NR
	Steep Sloped (less than 5 lb/ft <sup>2</sup> )	Aged Reflectance	NR	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
		Emissance	NR	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75
	Steep Sloped (5 lb/ft <sup>2</sup> or more)	Aged Reflectance	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15
		Emissance	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75
Walls	Metal Building		0.113	0.061	0.113	0.061	0.061	0.113	0.113	0.061	0.061	0.061	0.061	0.061	0.061	0.057	0.061	
	Metal-framed		0.098	0.062	0.082	0.062	0.062	0.098	0.098	0.062	0.062	0.062	0.062	0.062	0.062	0.062	0.062	0.062
	Mass Light		0.196	0.170	0.278	0.227	0.44	0.44	0.44	0.44	0.170	0.170	0.170	0.170	0.170	0.170	0.170	0.170
	Mass Heavy		0.253	0.650	0.650	0.650	0.650	0.690	0.690	0.690	0.690	0.650	0.184	0.253	0.211	0.184	0.184	0.160
	Wood-framed and Other		0.102	0.050	0.110	0.050	0.102	0.110	0.110	0.102	0.050	0.050	0.050	0.050	0.050	0.050	0.042	0.050
	Other		0.092	0.092	0.269	0.269	0.269	0.269	0.269	0.269	0.269	0.269	0.092	0.092	0.092	0.092	0.092	0.058
Floors/Soffits	Mass		0.048	0.039	0.071	0.071	0.071	0.071	0.071	0.071	0.071	0.039	0.071	0.039	0.039	0.039	0.039	
Windows	U-factor		0.47	0.47	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.47	0.47	0.47	0.47	0.47	0.47	
	RSHG North	0-10% WWR	0.72	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.72
		10-20% WWR	0.49	0.51	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.51	0.51	0.51	0.51	0.51	0.49
		20-30% WWR	0.47	0.47	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.47	0.47	0.47	0.47	0.47	0.47
		30-40% WWR	0.47	0.47	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.47	0.47	0.47	0.47	0.40	0.47
	RSHG Non-North	0-10% WWR	0.49	0.47	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.47	0.47	0.47	0.47	0.46	0.49
		10-20% WWR	0.43	0.36	0.55	0.55	0.55	0.61	0.61	0.61	0.61	0.36	0.36	0.36	0.36	0.36	0.36	0.43
		20-30% WWR	0.43	0.36	0.41	0.41	0.41	0.39	0.39	0.39	0.39	0.36	0.36	0.36	0.36	0.36	0.36	0.43
		30-40% WWR	0.43	0.31	0.41	0.41	0.41	0.34	0.34	0.34	0.34	0.31	0.31	0.31	0.31	0.31	0.31	0.43
	Doors, U-factor	Non-Swinging		0.50	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	0.50
Swinging		0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70		
Skylight	U-factor	Glass, curb	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	
		Glass, no curb	0.68	0.68	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.68	0.68	0.68	0.68	0.68	0.68	
		Plastic	1.04	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.04
	SHGC	Glass, 0-2%	NR	0.46	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.46	0.46	0.46	0.46	0.46	0.46	NR
		Glass, 2.1-5%	NR	0.36	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.36	0.36	0.36	0.36	0.36	0.36	NR
		Plastic, 0-2%	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69
		Plastic, 2.1-5%	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57

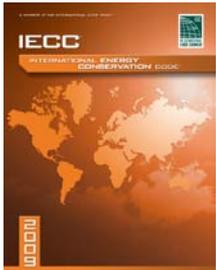
**NOTE:**

1. Mass, Light walls are defined as having a heat capacity greater than or equal to 7.0 Btu/h-ft<sup>2</sup> and less than 15.0 Btu/h-ft<sup>2</sup>. Heavy mass walls are defined as having a heat capacity greater than or equal to 15.0 Btu/h-ft<sup>2</sup>.
2. No skylight SHGC requirements are defined for climate zones 1 and 16. A climate zone without a requirement is designated as "NR".

# Building Codes & Daylighting ... THEY ARE CHANGING FAST



- ASHRAE 90.1 – 2010 (voting June 2010) – Mandate for daylighting and lighting controls for certain building types (i.e. – Logistics and retail. Implementation in 2011.



- IECC – 2009 Amendments – Increase from 3% to 5% for daylighting with higher VLT skylights and lighting controls. Mandate for certain building types. Implementation in 2011.



- IGCC – ICC's International Green Construction Code. Merging of ASHRAE 189.1, ICC Standards & LEED. Mandate for daylighting in certain building types. Implementation in 2011.



- California Title 24 and Green Building Mandate. Rules for height go away and any building over 8,000 sq.ft. will be required to daylight to get permits.



- LEED 2009 – Rolls into mainstream with inclusion into the IGCC in 2011. Can't achieve 10 points in EA without Daylighting.



**ZERO  
LIGHT  
ENERGY  
USAGE**

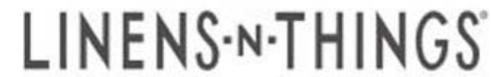
**ZERO  
CARBON  
EMISSION**

***There's No  
Greater  
Efficiency  
Than Off!***

# RETAIL IS LARGE USER OF PRISMATIC DAYLIGHTING



Neighborhood Market



**WAL\*MART SOLE SPECIFIES  
SUNOPTICS PRISMATIC SKYLIGHTS  
17 YEARS – 2,900+ Properties - Hundreds of Millions of Sq. Ft.**



**WAL\*MART SOLE SPECIFIES  
SUNOPTICS PRISMATIC SKYLIGHTS  
17+ YEARS – 2,900+ Properties - Hundreds of Millions of Sq. Ft.**



# *Logistical Facilities*



*Lot's of lights,  
not many  
people.  
Controls for  
daylighting  
and motion  
can cut 70% -  
80% of  
Electric Light  
Usage!*

*Put Your  
Roof To  
Work For  
You!*

# *There's No Greater Efficiency Than OFF!*



*Turn Off Your  
Lights And  
Let The  
Power Of  
Prismatic  
Daylighting  
Light Your  
Facility!*

*Put Your  
Roof To  
Work For  
You!*

SUNOPTICS  
PRISMA TIC  
SKYLIGHTS

# *There's No Greater Efficiency Than OFF!*



*Turn Off Your  
Lights And  
Let The  
Power Of  
Sunoptics  
Light Your  
Facility!*

*Put Your  
Roof To  
Work For  
You!*

# *Quantify It*

- *Lockheed Martin – 15% increase in productivity*
- *Heshong Mahone/PG&E – 20% in Math, 26% in Reading*
- *Toyota – 50% energy reduction-25% productivity increase*
- *Verifone – 45% reduction in absenteeism*
- *Interface – 2000% decrease in worker's comp cases (20-1)*
- *PG&E Study– 40% increase in sales, 80% decrease returns.*

*Businesses Who Utilize Productivity Focused  
Energy Efficiency Measures View Them  
As A Distinct Competitive Advantage!*

*“Whoever best uses energy efficiency and pollution prevention to lower costs and increase productivity— whoever is the most proactive— will achieve a unique competitive advantage and dramatically lower greenhouse gas emissions as well.”*

*Excerpt from the book “Cool Companies” published in 1999 by Dr. Joseph J. Romm  
Former Assistant Secretary for the U.S. Department of Energy  
Director-Office of Energy Efficiency and Renewable Energy*

## *HE ALSO WROTE...*

*“...daylight is the most cost-effective and least polluting way to both light and heat a building”*

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**THANK YOU!**