

Presented by: Michael Sather

The World's Most Advanced Tubular Daylighting Devices (TDD's)



Everybody Deserves Daylight









Solatube International, Inc. Vista, CA

Agenda

- Solatube International, Inc.
- Human Performance
- Daylighting Strategies
- The Solatube Advantage
- Solatube Products
- Solatube Design Resources
- ICE Showcase
- Technology Appendix: Total System Performance





Solatube International, Inc.

- Established North America HQ in 1992
- Worldwide leader in design, manufacture, and application of Tubular Daylighting Devices for over 20 years
- Creators of the TDD category
- Innovators pioneering advanced optics and photometry in TDD's
- Most recognized and trusted name in daylighting





Daylighting Drives Human Performance

- Increased staff productivity
- Reduced absenteeism
- Employee retention
- Improved student performance
- Improved quality control
- Increased retail sales
- Improved healing time
- Improved mood
- Greater occupant well-being & satisfaction





Typical classroom with fluorescent lighting.

Same classroom with Solatube Daylighting Systems.

Daylighting Strategies



Optical TDDs

Benefits:

- Highly consistent and controllable daylight
- Daylight any space in nearly any climate
- Minimal roof structure impact (<2%)
- Superior thermal performance
- Endless possibilities with highly flexible, modular system
- Leak-proof design
- Cost-effective

Challenges:

• Only your imagination...

The Solatube Advantage





Capture

The Solatube Advantage

Raybender and LightTracker Technologies

- Passive optics
- Maximizes light capture
- Improves low angle light collection
- Controls high angle light
- Minimizes heat gain

Minimize roof area required for daylighting Impact resistant and UV inhibiting domes Leak-proof flashings and curb caps Thermal breaks to minimize heat transfer





Transfer

The Solatube Advantage

Spectralight Infinity Tubing

Light Transfer Efficiency (LTE)

- Highest specular reflectance for visible light 99.7%
- Multi-story installations with minimal light loss
- Extremely long tube runs
- Angular capability: multiple 90 degree turns Light to Solar Heat Gain (LSG)
- InfraReduction Technology minimizes heat gain Color Temperature Maintenance (CTM)
- No color shift

Percentage of light delivered after 20 bounces









Deliver+Control

The Solatube Advantage

Diffusers, Decorative Fixtures, Dimmers

- Stylish and functional interior options
- Engineered lens optics for consistent distribution patterns
- Daylight Dimmer for total control











Solatube Products



SkyVault Series Big tubes for big spaces.



M74 DS Core Unit



M74 DS with Amplifier





M74 DS with Collector & Amplifier







Macy's Fulfillment Center Goodyear, AZ





Trantronics Irvine, CA

SkyVault: Capture



Core Unit

- Maximizes light collection using large aperture
- Prevents entry of air & moisture
- Exceptional thermal efficiency
- Optional: inner dome and security guard





Collector

- Raybender HD
- LightTracker Technology





SkyVault: Transfer



Spectralight Infinity Tubing

- Patented connection system
 - Tab lock system, tube belts, pre-punched holes for rivets
- 29" diameter tubing
- Maximum recommend tube length of 100'







SkyVault: Deliver+Control



- Increase illumination on high wall and ceiling planes
- Deliver superior diffusion with no light shift
- For floor to diffuser heights of ~18'-26'

Amplifier

- Focus light downward to visual task plane
- Reduce loss of light at ceiling plane and high up on walls
- For floor to diffuser heights of ~26' and up









Stance San Clemente, CA



"We have been using Solatube products for over a decade and continue to be impressed with the quality and performance, especially the new SkyVault Series. The amount of light delivered is truly incredible, allowing us the opportunity to turn off our electric lights and reduce our peak demand load. More importantly, the natural light creates a better work environment for our most important asset – our people."

- Kermit Ferrer, VP of Distribution Planning, Capital and Properties Macy's, Inc.



Macy's Fulfillment Center Goodyear, AZ

SolaMaster Series

Powered by the sun. Built for versatility.





330 DS & 750 DS Open Ceiling

330 DS & 750 DS Closed Ceiling







DPR Construction / SDGBC San Diego, CA

SolaMaster: Capture



Raybender 3000 (750 DS)

- Redirects low-angle sunlight for maximum capture
- Rejects overpowering summer midday sunlight
- Provides consistent daylighting throughout the day



LightTracker Reflector (330 DS)

- Redirects low-angle sunlight for maximum capture
- Increases light input for greater light output
- Maximizes midday sunlight



SolaMaster: Transfer



Spectralight Infinity Tubing

- Telescoping system for easy field adjustment
- Angular adjustability for 0-90 degree turns
- 21" diameter tubing
- Maximum recommended tube length of 50'





SolaMaster: Deliver+Control



Diffusers

- Prismatic & OptiView diffuser lens options
- Addresses both ceiling and open ceiling designs



Daylight Dimmer

• Butterfly baffle design provides total control of daylight entering space from 2% to 100%







Allegheny College Meadville, PA





Philip S. Miller Library Castle Rock, CO





Spodak Dental Group Delray Beach, FL



"Solatube products are more effective, brighter and resilient, but also give the sense of being connected to the outside. In fact, they not only improve the learning environment and morale of the students and staff, they also save significant funds as far as our utility budget, and that money goes back into the classroom."

Richard Cosgrove, Director of Planning & Construction Douglas County School District



Douglas County Schools Colorado

Brighten Up Series

A big idea for small spaces.



160 DS

290 DS







DPR Construction Phoenix, AZ

Brighten Up: Capture



Raybender 3000

- Redirects low-angle sunlight for maximum capture
- Rejects overpowering summer midday sunlight
- Provides consistent daylighting throughout the day

LightTracker Reflector

- Redirects low-angle sunlight for maximum capture
- Increases light input for greater light output
- Maximizes midday sunlight



Brighten Up: Transfer



Spectralight Infinity Tubing

- Telescoping system for easy field adjustment
- Angular adjustability for 0-90 degree turns
- 160 DS: 10" diameter: Max. length 20'
- 290 DS: 14" diameter: Max. length 30'



Brighten Up: Deliver+Control









Decorative Fixtures & Diffusers

- Fixtures with tempered glass offer variety to match any interior
- Diffusers offer durability and simplicity
- Options for closed and open ceiling applications
- Effect lens options to alter light color and/or intensity

Daylight Dimmer

 Butterfly baffle design provides total control of daylight entering space from 2% to 100%

Add-ons

- Light add-on kits universal and dedicated CFL
- Ventilation add-on kit (160 DS)
















Bal Seal Engineering Colorado Springs CO





Sedalia Elementary School Sedalia, CO



"As lighting designers we were especially particular about the quality of light within our own office, and we found that the layout of 45 Solatube Daylighting Systems provided an even, natural light that larger conventional skylights could not provide."

- Paul Gregory, President Focus Lighting



Focus Lighting New York, NY





Alan Rich & Associates Carlsbad, CA

Solatube Design Resources

- Specifications
- Cut sheets
- CAD & BIM
- Installation instructions
- Photometry
- LEED information
- CEU courses
- Material safety data sheets

- Codes & approvals
- Case studies
- Daylighting facts & figures
- Product literature
- Product technology
- Solution center
 - Fire rated applications
 - Integrated lighting applications



Product Selection Guides

SkyVault Series

Product Selection Guide

Visit Technical Resources for specifications, CAD drawings, BIM, installation instructions, cut sheets, approvals and other useful information



SolaMaster Series

Product Selection Guide

Visit Technical Resources for specifications, CAD drawings, BIM, installation instructions, cut sheets, approvals and other useful information



Brighten Up Series

Product Selection Guide

Visit Technical Resources for specifications, CAD drawings, BIM, installation instructions, cut sheets, approvals and other useful information.



Solatube Design Calculator

Proprietary software

Creates light studies

Deliver accurate layouts and spacing for Solatube systems

Achieve desired light levels

- Photometry for all Solatube product configurations
- Single point in time and annualized calculations
- Accounts for tube length and 90 degree turns
- Weather data for thousands of sites around the world
- Options for verifying LEED daylighting requirements







Summary

- The worldwide leader in tubular daylighting devices
- Innovation is our differentiator
- Daylight drives human performance
- Designed for both new construction and retrofits
- Variety of models and options to daylight any space
- Tools and resources available to take the guesswork out of daylighting
- Network of certified representatives ready to assist from design to installation



ICE Showcase Inspired Creative Excellence









"The difference in using Solatube products is dramatic because of the reflectivity rate. We tried fiber optic lighting, but Solatube systems, with their specialized tubing and dome system is the best solution on the market today."

- Geronimos Dimitrelos, President Algae to Omega



Algae to Omega Oakland Park, FL



"As you can see, that plant has been hanging in my kitchen window for over 10 years. After we installed the Solatube (about 18 months ago) the plant decided that was the place to be. I have actually had to pry the new leaves our from under the trim ring a few times. I think it would grow all the way to the dome if I let it.

 Lynn Hoadley, Design Project Manager Group 7 Design Franklin, MA



Photosynthesis





Campbell's Soup Company Camden, NJ



"I chose Solatube systems for the entry of El Monte Sagrado because it was the only company that could meet my specific design requirements. The product arrived exactly when promised, was easy to assemble and has been one of the key focal elements of the resort since opening. I could not be happier with the quality of the product and the splendid service we continue to receive from Solatube International on current projects."

- David Sargert, Architect



El Monte Sagrado Resort Taos, NM





UW Credit Union West Allis, WI





SolaDots Solatube International, Inc. Vista, CA





Luminous Walls Solatube International, Inc. Vista, CA





REI Boulder, CO





Pewaukee, WI





La Palmera Mall Corpus Christi, TX



Korea Institute for Environmental Research South Korea





"The use of Solatube Daylighting Systems is an integral part of our energy management system providing natural light which is very conducive to the learning environment. Solatube products are a cost efficient solution to provide lighting to classroom and office space. The District is currently looking into using Solatube Daylighting Systems in existing buildings."

- Jim Philp, Superintendent Lenawee Intermediate School District

Lenawee Intermediate School District Center for a Sustainable Future LEED Platinum, Net Zero Adrian, MI







The Vine Irvine, CA





Hangzhou JNHY Underground Parking China

Solatube Daylighting Systems

The most visible and effective green feature you can add to any space





Technology Appendix Total System Performance



Low Angle Light Collection

• Raybender and LightTracker Technologies both improve input angle of low angle light entering the system



Specular Reflectance



- Specular Reflectance is the key factor in determining a TDDs optical efficiency in transferring light
- Diffuse Reflectance consists of light scattered in every direction
- Total Reflectance consists of both Specular Reflectance and Diffuse Reflectance and is not a good indicator of a TDDs efficiency in transferring light to interior spaces
- 99.7% specular reflectance for visible wavelengths of light



Light Transfer Efficiency (LTE)



- Indicates the percentage of light that travels through the tubing daily, seasonally, and between multiple floors
- High LTE is desirable for maximizing light throughput and minimizing daily and seasonal variances in efficiency
- Key factors:
 - Input angle of light rays
 - Specular reflectance of tubing
 - Aspect Ratio (tube diameter/tube length)



Light Transfer Efficiency (LTE)

- Due to the high specular reflectance of Spectralight Infinity, Solatube products are capable of:
 - Extremely long tube runs
 - Multiple 90 degree turns
 - Multi-story installations





Percentage of light delivered after 20 bounces

Total System Performance Light Transfer Efficiency (LTE)



 Enhanced Silver produces a 36% swing in light output between Winter and Summer

Aspect Ratio: 5.1

Product: 14"/290DS



Total System Performance Light Transfer Efficiency (LTE)





Color Temperature Maintenance (CTM)



- A measure of how well a system can deliver reflected light without a color shift
- A high CTM indicates a product that produces minimal color/spectral shift of the light
- L*a*b color model is the best performance parameter for color consistency of light transferred through a TDD
- Spectralight Infinity is spectrally neutral for visible light and produces virtually no color shift.
 - Perfect color rendition interior colors are truer, brighter
 - No major color shifts over the course of the day or changes in season
 - Color: a* and b* (defined by CIE L*a*b* color model) shall not exceed plus 2 or be less than minus 2 as determined in accordance to ASTM E 308



Light to Solar Heat Gain Ratio (LSG)

- Defined as the ratio between Visible Transmittance (VT) and Solar Heat Gain Coefficient (SHGC)
- Indicates how well a fenestration product transmits useful visible daylight while filtering out unwanted heat
- The higher the LSG value, the more efficient the system is at delivering daylight and minimizing unwanted heat
- Solatube Daylighting Systems minimize heat gain through a combination of:
 - Thermal breaks between the flashing and tubing
 - Raybender 3000 Technology at the top of the dome rejecting high angle sunlight (and heat)
 - Spectralight Infinity with Cool Tube Technology
 - Spectrally selective, focused on delivering the visible spectrum of light
 - Minimizes transfer of Infrared wavelengths (heat) to interior spaces



Light to Solar Heat Gain Ratio (LSG)

Fenestration product	Visible Transmission (Vt)	Solar Heat Gain (SHGC)	Day	Daylighting Energy Performance Ratio (Vt/SHGC)		
Triple Glazed Low-e Window Clear glass, suspended low-e Heat mirror film	22%	0.16		1.38		
Triple Glazed Window Clear glass, suspended low e Heat mirror film, clear glass	63%	0.36			1.75	
Double glazed Window Clear glass, low-e glass)	71%	0.49		1.45		
Double Glazed Prismatic Skylight Clear outside, prism inside	71%	0.51		1.39		
Solatube [®] 750 DS Daylighting System	60%†	0.20 [†]				3.00
Source: NERC Spectral Weighting Function Research Project, Draft 2 0, March 2007			0.0	1.0	2.0	3.0


Total System Performance Ultraviolet Light (UV)



- UV light can have a detrimental effect on interior building materials and occupants
- Solatube Daylighting Systems have UV inhibitors at the dome level to block harmful UV from entering the system

