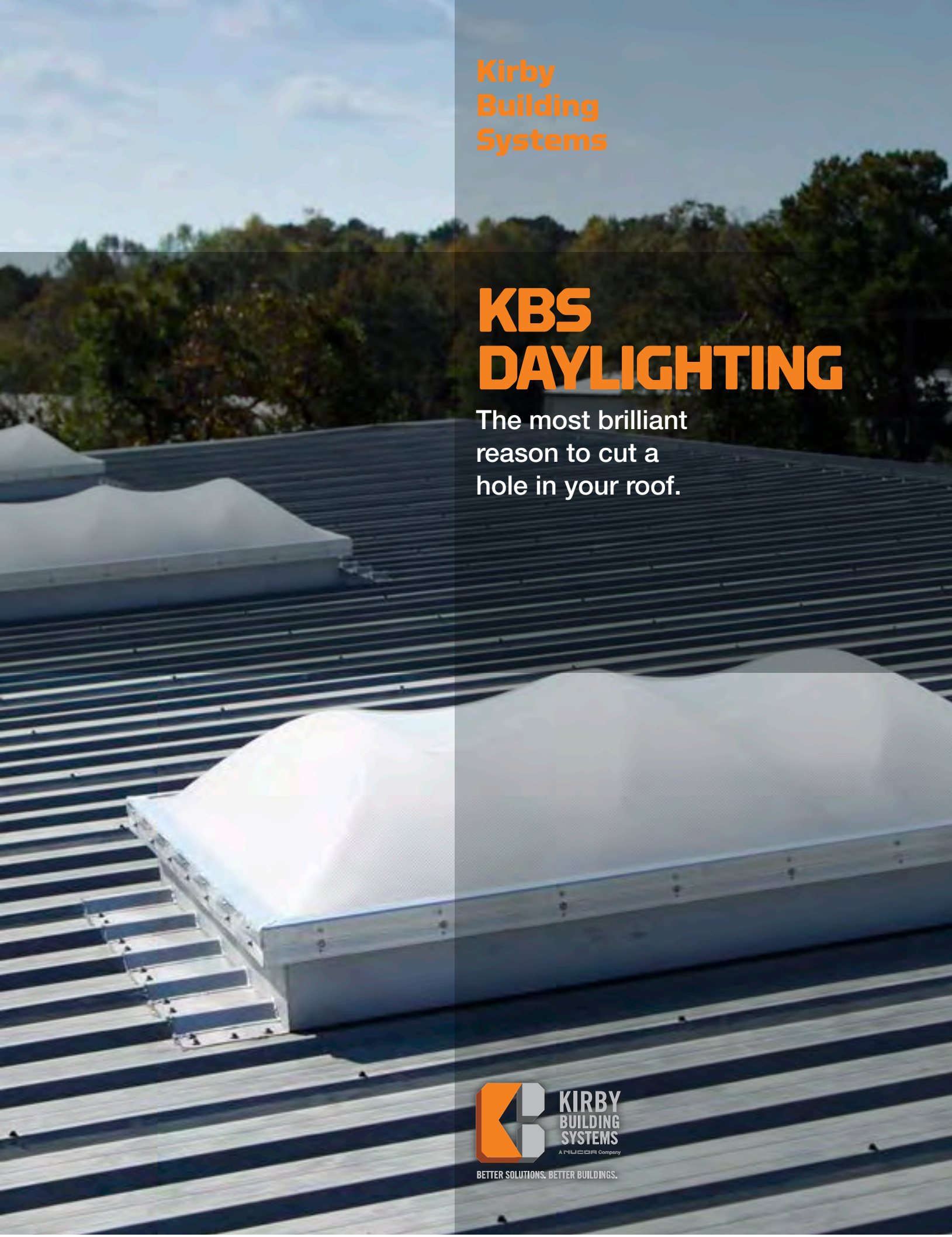

Kirby
Building
Systems

KBS DAYLIGHTING

The most brilliant reason to cut a hole in your roof.

KIRBY BUILDING SYSTEMS
A NUCOR Company

BETTER SOLUTIONS. BETTER BUILDINGS.

What is Daylighting?

Daylighting is the controlled admission of natural sunlight into a building via diffused skylights or windows.

Done correctly, it can save energy and money by reducing the need for electric lighting during daylight hours without causing heating or cooling problems.

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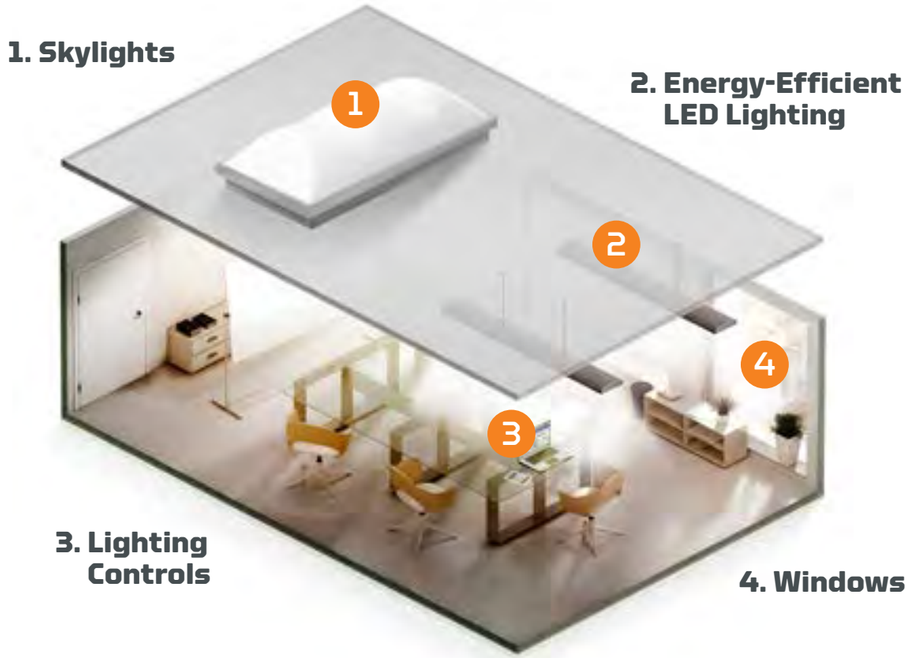
Daylighting is more than just skylights.

Daylighting integrates energy-efficient lighting and a daylight-responsive lighting-control system.



Harness the sun. Harvest the savings.
Electric lighting accounts for 30 to 60 percent of the total electrical energy consumption in commercial buildings. For many institutional and commercial buildings, strategic daylighting can reduce total energy costs by as much as one-third. By generating waste heat, electric lighting adds to the loads imposed on a building's mechanical cooling equipment, all while producing greenhouse gases.

Electrical lighting accounts for
30-60%
of total electrical energy consumption

Daylighting can reduce energy cost
≥33%

No matter the environment, daylighting brightens the outcome.

Education
A study initiated by the Pacific Gas and Electric Company (PG&E) shows that students with the most daylighting in their classrooms progressed 20 percent faster on math tests and 26 percent faster on reading tests in one year than those without daylighting. The study found a uniformly positive and statistically significant correlation between the presence of daylighting and better student test scores.

Offices
The study initiated by PG&E shows that the daylighting features incorporated into a 15,000-square-foot office building reduced the need for electrical lighting during normal operating hours, which in turn reduced the cooling requirements and allowed the building designers to downsize the heating, ventilating and air conditioning (HVAC) systems. Extensive monitoring of this building demonstrated that annual lighting energy (kWh) consumption was reduced by 32 percent. The study shows office workers performed 10 to 25 percent better on tests and recall when natural light was available. This also improved employee morale and satisfaction with their work environment. Numerous studies link daylight and views of the outside to higher levels of satisfaction and productivity. Businesses that utilize productivity-focused energy-efficiency measures view them as a distinct competitive advantage.

Warehouses
Daylighting created a bright and airy work environment for a 635,000-square-foot distribution center in Romeoville, Illinois with connected light loads of .535 watt/square foot and 2 percent effective skylight-to-floor ratio (1 unit per 1,600 sq. ft.). The distribution center averaged 3,094 daylighting hours per year.

Retail
The largest bill for retailers is lighting. A study initiated by PG&E shows daylighting dramatically increased sales in a retail setting. One study shows a 40 percent increase in sales in daylit stores when compared to identical non-daylit stores.

Properly daylit buildings can repay installation costs quickly – often in fewer than five years. Daylighting can be installed in buildings to replace electric lighting for 1/20th of the cost to install solar PV panels in order to generate an equivalent amount of electricity using the same sun at the same high energy demand times of the day.

Environmental impact of daylight harvesting on one distribution center:

- 593,120 kWh annual reduction
- 426 metric tons CO^2 reduction
- Equal the electric use of 59 homes/year
- Equal to emissions from 78 cars/year
- Equal to planting 97 acres of pine trees

Daylighting PG&E case study: Walmart - 200,000+ sq. ft.

- Connected light load – 1.2 watts/sq. ft. = 240 kW
- Average hours daylighting per year = 2,800
- Published average annual per-store savings = $100,000
- Bottom-line impact of 2,500 stores = $250 million per year

Environmental impact through daylight harvesting:

- 672,000 kWh annual reduction per store
- 483 metric tons CO^2 reduction per store
- Equal to electric use of 67 homes/year
- Equal to emissions from 89 cars/year
- Equal to planting 110 acres of pine trees

Daylighting has been shown to increase productivity and grades while reducing absenteeism.

How much daylighting is enough?

Many factors are used to determine how much daylighting is needed to maximize your energy savings.

U-Factors, SHGC and R-Values
Windows, doors and skylights can gain and lose heat by means of direct conduction through the glazing, frame and/or doors, the radiation of heat into a building (typically from the sun) and out of a building from room-temperature objects, including people, furniture, machinery and interior walls and also air leakage through and around them.

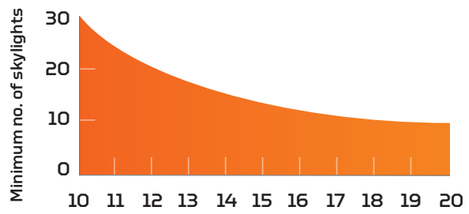
When windows and skylights are rated for energy efficiency, the rate of non-solar heat that passes through is quantified as the U-factor, as opposed to SHGC, which quantifies the rate of solar heat that passes through the windows. SHGC and U-factor ratings are specific to windows and skylights and measure properties differently from insulation R-values. R-values are used to quantify the insulating capabilities of building materials used elsewhere in a building, such as insulation behind walls, under floors, in the roof, etc. These different values are each designed to measure very specific properties. This measurement is helpful when examining the individual factors that can all be addressed in order to improve the energy efficiency of an entire building.

U-factor is the rate at which a window, door or skylight conducts non-solar heat flow. It is usually expressed in units of BTU/hr-ft2-oF.

For windows, skylights and glass doors, a U-factor may refer to just the glass or glazing alone. NFRC U-factor ratings, however, represent the entire window or skylight performance, including frame and spacer material. The lower the U-factor, the more energy efficient the window, door or skylight will be.

SHGC is the fraction of solar radiation admitted through a window, door or skylight — either transmitted directly and/or absorbed or subsequently released as heat inside a building. The lower the SHGC, the less solar heat it transmits and the greater its shading capability. A product with a high SHGC rating is more effective at collecting solar heat during the winter. A product with a low SHGC rating is more effective at reducing cooling loads in the summer by blocking heat gain from the sun.

Impact of Ceiling Height



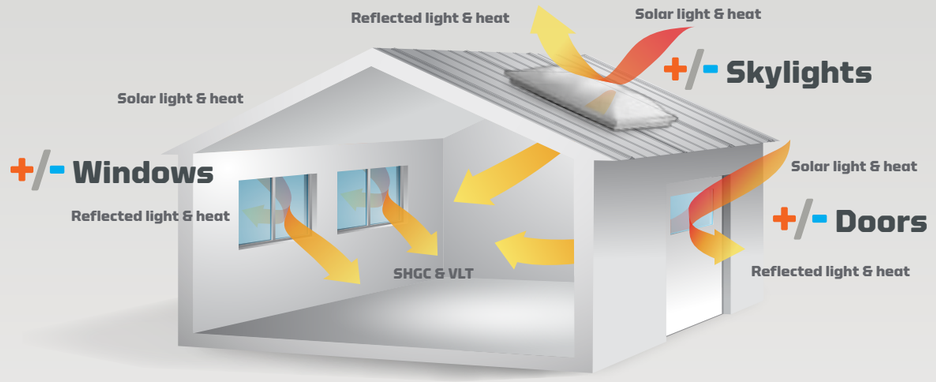
Ceiling height has a major impact on the economics of a toplighting solution because a higher ceiling enables fewer, larger skylights to be used to achieve similar lighting levels. Effective toplighting requires that light from skylights be reasonably even across a space, as is required for light from electric fixtures. A higher ceiling allows skylights to be spaced farther apart because the additional height provides more distance for the light to spread horizontally outward from each skylight. (U.S. Department of Energy)

Daylighting roof area percentage per building use
Most building codes will require between 2% and 5% of roof area to be used for daylighting. Dark spots are often created below 2 percent, and the cost benefit advantages decline above 5 percent where electric light savings peak. Although local codes or design requirements vary, there are rules of thumb for all building types.

Warehouse Logistics	Manufacturing	School Office	Retail	Overall
2-3%	3-4%	4-5%	4-5%	5%

Sunlight transmittance

The ability of glazing in a window, door or skylight to transmit sunlight into a building can be measured and rated according to three energy performance characteristics.



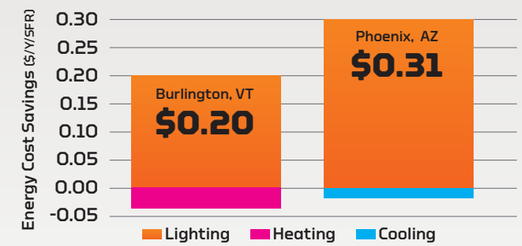
Visible Light Transmission (VLT)
VLT is a fraction of the visible spectrum of sunlight (380 to 720 nanometers) weighted by the sensitivity of the human eye and is transmitted through the glazing of a window, door or skylight. A product with a higher VLT transmits more visible light. VLT is expressed as a number between 0 and 1. The VLT you need for a window, door or skylight should be determined by your building's daylighting requirements and/or whether you need to reduce interior glare in a space.

Light-to-Solar Gain (LSG)
LSG is the ratio between the SHGC and VLT. It provides a gauge of the relative efficiency of different glass or glazing types in transmitting daylight while blocking heat gains. The higher the number, the more light transmitted without adding excessive amounts of heat. This energy performance rating isn't always provided.

Reduced Heat Gain
Reduced lighting energy use ranks by far as the greatest factor in annual savings at economically optimum skylight-to-floor ratios (SFR). The reduction in lighting energy use is directly related to VLT, i.e., the higher the VLT, the lower the total skylight area needed to achieve a given lighting energy savings. Because heating and cooling energy losses are small in relation to lighting energy savings, if reducing U-Value results in any significant reduction in VLT, it is generally not a beneficial trade-off at SFRs in the range expected to be economically optimal, i.e., below 5 percent.

(DOE Top-lighting Report June 2008)

Relative Cost Savings/Losses, 4% SFR



How are SHGC Ratings Determined?
The procedure for testing window products and assigning SHGC ratings is performed by the National Fenestration Rating Council (NFRC) and was started in 1993. The NFRC is a nonprofit organization that administers the only independent rating and labeling system for the energy performance of windows, skylights, doors and attachment products.

SHGC ratings are documented on labels affixed to products that are part of the NFRC's certification program. Also noted on the label are the product's U-factor, air leakage characteristics, visible light transmittance, and condensation resistance. These factors add up to determine a window or skylight's overall energy performance. The labels provided by the NFRC help guide owners and the design community in selecting windows and skylights that are best suited to specific applications and installations.

Hailstone damage

Annually, hail causes more than $1 billion in damage to crops and property.

Hail is a form of solid precipitation. It is distinct from sleet; although, the two are often confused for one another. It consists of irregular pellets or balls of ice; each of which is called a hailstone. Sleet falls generally in cold weather while the size of hail is greatly inhibited at colder temperatures.

Hailstones larger than .80 inch (2 cm) are usually considered large enough to cause damage. The U.S. National Weather Service has a 1-inch (2.5 cm) or greater in diameter threshold in effect as of January 2010. The Meteorological Service of Canada will issue severe thunderstorm warnings when hail .80 inch or above is expected. Other countries will have different thresholds according to local sensitivity to hail. For instance, grape-growing areas could be adversely impacted by smaller hailstones.

Hail is Rarely Life Threatening, but it Can Cause Major Damage.
According to the National Oceanic and Atmospheric Association, hail causes more than $1 billion in damages to crops and property in the United States annually. In 2012, there were more than 7,000 hail events nationwide.

From 2009 through 2011, hail caused $3 billion in insured damage in Colorado according to the RMIIA. In June 2012, hail hammered parts of Colorado, causing $321 million in damages.

In states like Colorado, hail is “our most common catastrophe,” says Carole Walker, executive director of the Rocky Mountain Insurance Information Association (RMIIA).

“That was almost as expensive as the destruction associated with the Waldo Canyon fire,” said Walker. “Although hail damage is less expensive per claim than fire losses, hail damage is more widespread. A large hailstone falling from the sky can reach speeds of 100 miles per hour before it makes impact. It can batter thousands of roofs, cars and homes in a short amount of time.”

Tanya Brown, a research engineer with the Insurance Institute for Business and Home Safety, says her organization examined data collected between 2000 and 2009 that underscore the danger in areas outside the “hail belt.”

Preventing Hail Damage
The best way to prevent hail damage is to make sure your building’s roof and roof components are as impact resistant as possible.

Today’s roofing materials are rated and divided into four classes. Each class is defined by how well the products withstand hailstones of various diameters:

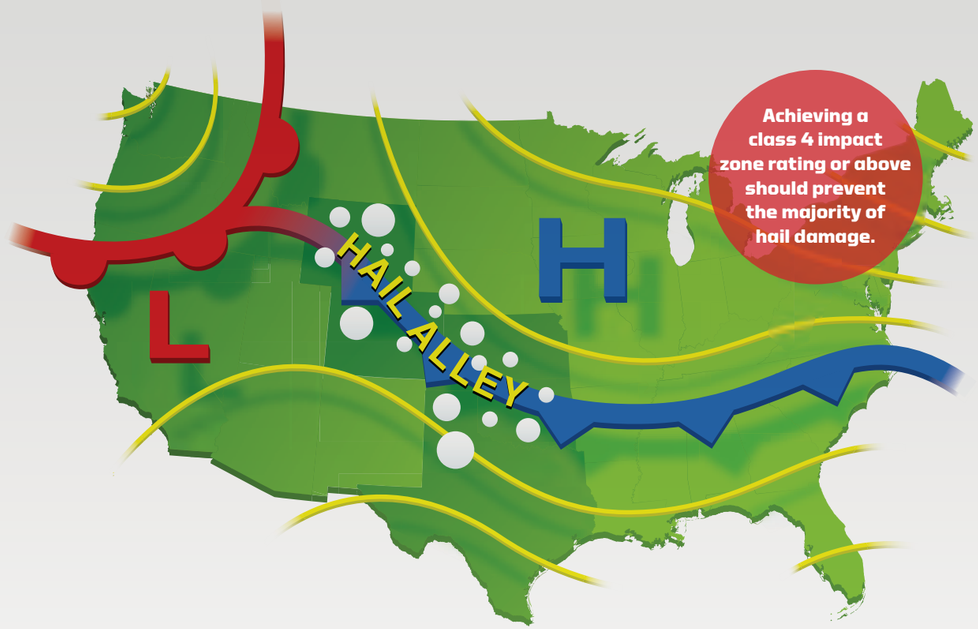
- Class 1: 1.25 inches
- Class 2: 1.5 inches
- Class 3: 1.75 inches
- Class 4: 2 inches

KBS SS 360 panels meet a Class 4 impact rating as standard. KBS Curb Mounted Prismatic Skylights meet a Class 4 impact rating as standard.

Hailstone Classification (actual size).

States most at risk

Hail storms themselves are most common in certain states in the so-called “hail belt” also known as “hail alley”.



As one might expect, State Farm Insurance’s data indicate states with bigger populations tend to report more claims. But, hail storms themselves are most common in certain states that are in the so-called “hail belt”. These includes the states of Colorado, Kansas, Missouri, Oklahoma, Texas and Wyoming according to the Insurance Information Institute.

In a study, Daniel Munson and Gloria Molina of CDS Business Mapping LLC, IIC tracked hail events for 20 years (1990-2010). The chart summarizes a distribution of hail sizes found.

Distribution of Hail Sizes Found (1990-2010)

Range Size (inches)	Number of Events	Percentage of Total	Cumulative Percentage
< .75"	316	0.14%	0.14%
.75"< 1"	110,104	49.50%	49.64%
1"< 2"	101,018	45.43%	95.06%
2"< 3"	9,185	4.13%	99.19%
3"< 4"	841	0.37%	99.57%
4"- 8"	952	0.43%	100.00%
TOTAL	**222,446**	**100.00%**	

Advanced Prismatic Daylighting

As one might expect, modern prismatic skylights transmit more light than conventional skylights while diffusing 100% of the incoming rays.

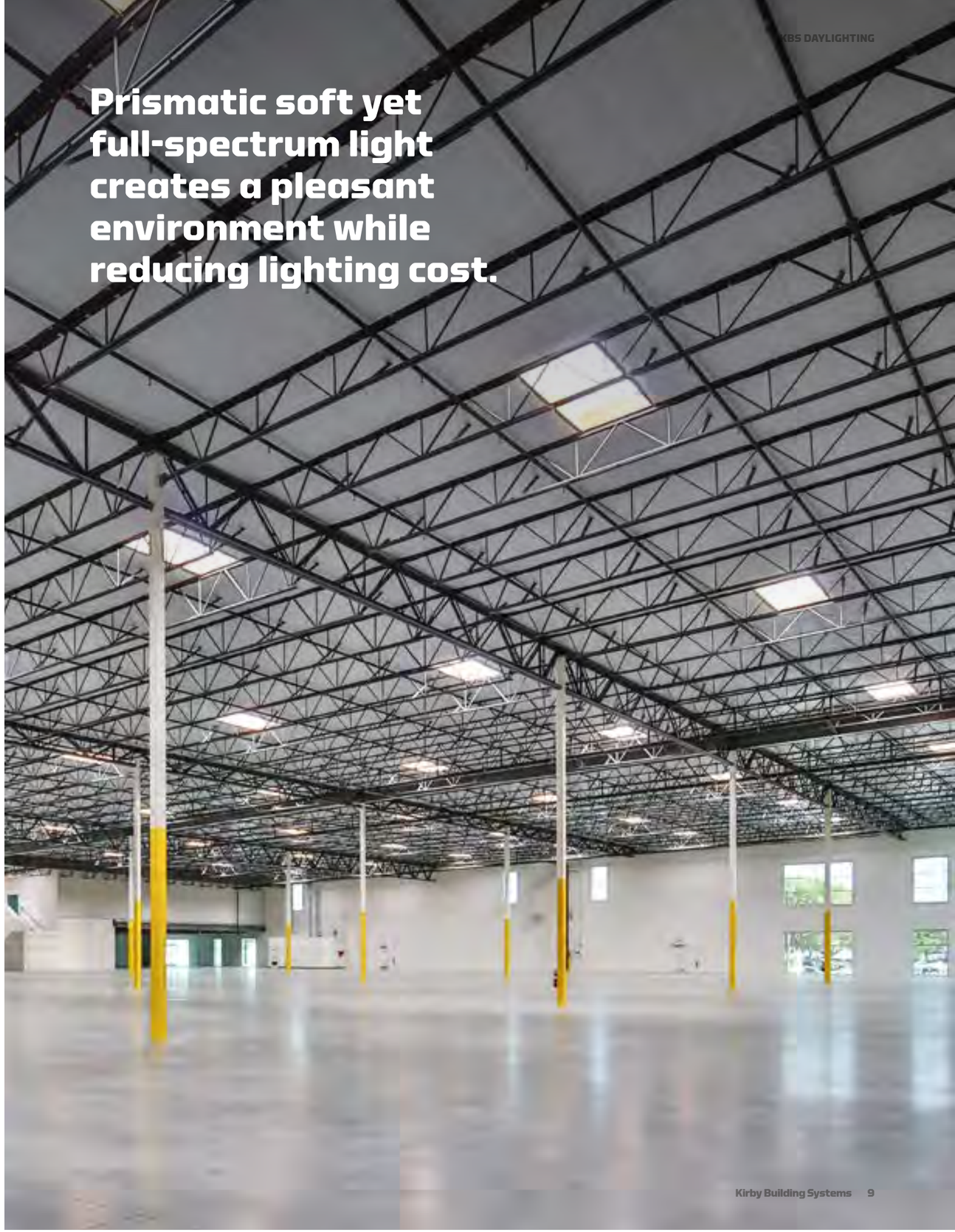
Traditional skylights often do a poor job of dispersing the sun's rays, causing hot spots, glare, UV damage and uncontrolled heat. By completely diffusing incoming sunlight, prismatic skylights refract the light into microlight beams, spreading the sun's bright, natural light throughout the space. This reduces the sun's intensity without compromising daylighting effectiveness. Prismatic skylights also maintain Visible Light Transmission (VLT) for more years of light compared to other products.

Prismatic skylights have a minimum of 4,000 tiny prisms per square foot of glazing layer. Prismatic skylights provide 100 percent diffusion and transmit 35 percent more light than conventional skylights while producing:

- No hot spots
- No glare
- No UV damage to merchandise or furnishings

The high-performance design has no moving parts, catches up to 20 percent more light at low angles than standard shapes and is 50 percent stronger than required by any building code.

Metal building application



Curb Mounted Prismatic Skylight

The patented Quasar Prismatic Triarch Dome Skylight shape is designed to optimize lighting performance even at low angles – with no moving parts.

The resulting performance provides better quality light for the maximum hours per day, thus maximizing energy savings by greatly reducing electric lighting use.

The Quasar Triarch Skylight uses the highest UV-resistant materials available. This ensures high visible light transmission for the life of the product. Based upon scientific data from ASTM testing, this skylight will not reach a Y-20 on the yellowing scale during its life. Any yellowing below Y-20 is not visible to the naked eye.

The lens is double glazed with polycarbonate and acrylic. The prismatic dome is sealed with a silicone and urethane seal between the prismatic lenses before it is fully welded with encapsulating and insulated thermal break. With no exposed metal, there is minimal condensation from thermal bridging through the frame. The pre-installed foam curb gasket and curb weather sweep mitigate condensation concerns. This frame then sits on a curb and is screwed in with stainless steel screws and rubber washers.

Specification Summary

Material	
Top Lens	Polycarbonate
Bottom Lens	Acrylic

Ratings	
Solar Heat Gain Coefficient (SHGC)	0.39
Visible Light Transmission (VLT)	0.68
U-Factor	0.71
Impact Zone Rating for Hail	Class 4
Rate of Burn	CC1

Warranty

20-year limited warranty due to manufacturer defect
10-year hail limited warranty

Standard Sizes
Curb Mounted Prismatic Skylights

Size	ID Frame Call-Out
6072	64 1/4" x 76 1/4"
4896	52 1/4" x 100 1/4"
24120	28 1/4" x 124 1/4"
4848	52 1/4" x 52 1/4"

CC1 Fire Rating
The KBS Quasar achieves a CC1 fire rating. This refers to plastic materials that have a burning rate of 1" (25mm) or less when tested in nominal 0.060" (1.5mm) thickness.

Class 4 IMPACT Rating Standard
Engineered to withstand severe weather conditions, a KBS's Curb Mounted Prismatic Skylight features a double-glazed prismatic lens that achieves a Class 4 impact zone glazing rating.

FM Approved or High Velocity Hurricane Zone (HVHZ) skylights are available upon request.

Cutaway of the Quasar Prismatic Triarch Dome Skylight

1. Glazing Sealant
50 year UL Listed sealing material.

2. Santoprene Thermoplastic
Our santoprene thermoplastic engineered labyrinth seal eliminates noise, has seven labyrinth fingers for absolute water control, not only making it impenetrable, but it is also 50-year UL Listed.

3. Thermally Broken
AAMA compliant "poured and debridged" thermal break with non-thermally conductive, high tensile urethane.

4. Curb Seal Tape
Ethylene Propylene Diene Monomer (EPDM) curb seal tape eliminates the need for roof caulking between curb top and skylight frame.

Smoke and heat vent skylights

Open rooftop venting systems are automatic and typically used in manufacturing and industrial buildings, warehouses and retail stores. They release heat, smoke, and noxious fumes during a fire.*

Smoke vents help firefighters extinguishing a building fire, and they greatly improve visibility during and after a fire, which is crucial for search and rescue. By preventing heat from mushrooming over the fire area and heating other materials to the point of ignition, fire venting has a marked effect on reducing the lateral spread of fire.

Smoke vents are UL and/or Factory Mutual Rated (curb-mounted design) and are fully glazed and ready for installation. Smoke vent frames are fabricated from 6063-T5 aluminum with a natural mill finish.

Frames have integral condensation and weepage gutters, which drain interior moisture to the outside.

Smoke vents operate by a fusible link with a minimum temperature rating of 165 degrees. The fusible link mechanism with gas shocks includes an exterior manual release cable for testing. Smoke vent skylights open to a minimum angle greater than 90 degrees.

Standard smoke vent skylights have a 10 psf opening capability. For higher psf rating, contact your company representative.

**Required by international building code section 910*

Quasar Prismatic UL Listed Smoke Vent: aluminum curb mounted with single triarch domes.

Specification Summary

Material	
Top Lens	Polycarbonate
Bottom Lens	Acrylic

Ratings	
Solar Heat Gain Coefficient (SHGC)	0.39
Visible Light Transmission (VLT)	0.68
Impact Zone Rating for Hail	Class 4
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Smoke Vent Curb Mounted Prismatic Skylights

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FM Approved or High Velocity Hurricane Zone (HVHZ) skylights are available upon request.

Roof Curb System

All roof curbs are not created equal. It is important that a roof curb be designed for a specific type of roof.

Roof curbs that are effective for flat built-up or flat single-ply roofs can be a disaster when used with standing seam metal roof panels. In fact, even when working with standing seam metal roofing, a roof curb should be designed for the manufacturer's specific roof profile. "One curb fits all metal roofs" can be a prescription for trouble.

Roof Curb versus a Roof Curb System
Although choosing a Roof Curb specially designed for a specific metal roof profile is critical, it is only part of a successful Roof Curb System.

The definition of a system is "a collection of interacting, interrelated components that result in predictable, consistent, positive performance." For a successful curbed skylight installation, it is essential that every Roof Curb component has been selected to withstand severe weather conditions over a long period of time.

Even substandard products can perform in the short term. The key is to select high-quality components that will stand the test of time. Put simply, a quality Roof Curb System is one of the key barriers against the outside elements for any building.

Roof Curb & Framing
The lightweight framing system reduces curb installation weight and allows for the Roof Curb to be installed in retrofit situations with no additional secondary framing to the structure or after the roof is in place in new construction. The elimination of secondary framing between the purlin or joist members results in significant savings not only in material but also in engineering, detailing costs and erection labor.

Curb exteriors are either painted to match roof panel colors or are primed with galvanized paint.

Roof curb components

Over the past 30 years, we have chosen the following quality components based upon our experience in field performance.

1. Roof Curb and Lightweight Framing

Roof Curbs are specially designed for KBS's specific metal roof profile and exteriors are either painted to match roof panel colors or are primed with galvanized paint. The lightweight framing system reduces curb installation weight.

2. Internal Fastening Along Curb Sides

By fastening our roof curbs securely on the inside, we improve weather tightness and appearance – so your building will perform better and look better in any environment.

3. Safety/Security Frame

We developed a unique Safety/Security Frame where, instead of using separate clips, the grids are welded directly to a frame, making installation immediate and safety consistent. The welded safety/security frame assures proper placement of security grids as well as a method of accepting the top of the insulation board.

4. Insulation

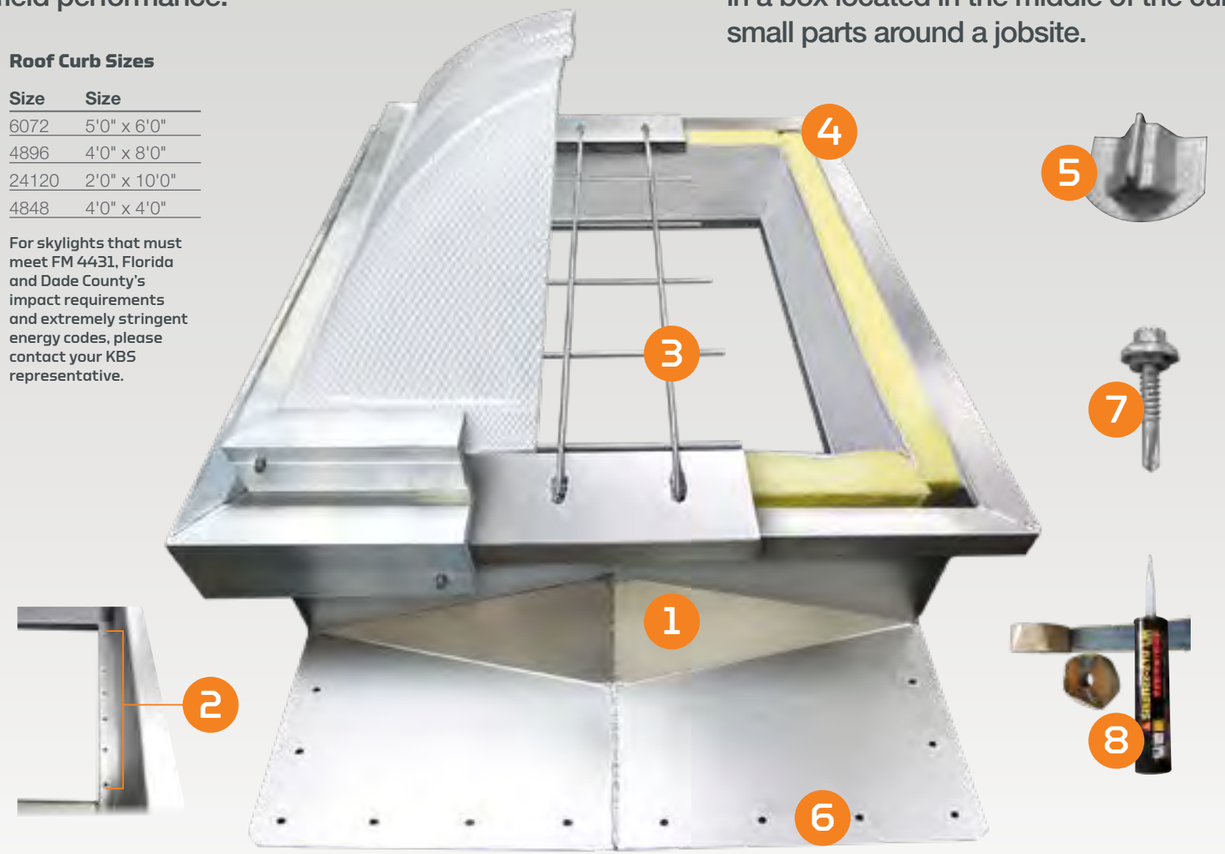
Roof Curb insulation is relatively inexpensive when installed with the curb. Installing it at a later date is difficult, creates safety risks working at heights and is expensive if equipment must be rented to get the job done. There is a special groove designed into the bottom of our Roof Curbs and at the top of the Safety/Security Frame to accept the insulation, giving it a clean, professional appearance.

1" thick, 3-pound density, white-faced fiberglass board with an R-Value of 6.5 is standard.

Roof Curb Sizes

Size	Size
6072	5'0" x 6'0"
4896	4'0" x 8'0"
24120	2'0" x 10'0"
4848	4'0" x 4'0"

For skylights that must meet FM 4431, Florida and Dade County's impact requirements and extremely stringent energy codes, please contact your KBS representative.



Packaging

All parts and pieces for a successful Roof Curb installation are contained in a box located in the middle of the curb. No time is wasted looking for small parts around a jobsite.

5. Rib Cover

Few products related to Roof Curbs stir up more debate than Rib Covers. These Rib Covers are produced as a seamless single piece to the exact profile of our panels.

6. Prepunched Holes

Prepunched holes assure proper fastener placement, eliminating measuring mishaps and making installation easier on you.

7. Fasteners

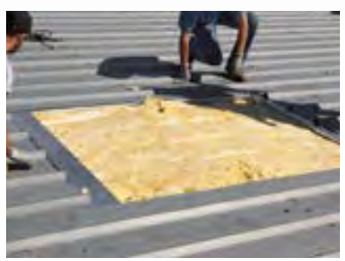
Fasteners take the brunt of all severe weather, often resulting in rust and corrosion if the wrong product is installed. The cast zinc head on the screws we provide has a lifetime warranty against red rust.

8. Mastic and Tube Sealant

The premium mastic tape sealant used in our Roof Curb System is formulated for high performance, permanent elasticity and superior tack, affording tenacious adhesion even at low temperatures to a wide variety of substrates without pre-wiping the surface. Only premium tube sealant is included with the curb system.

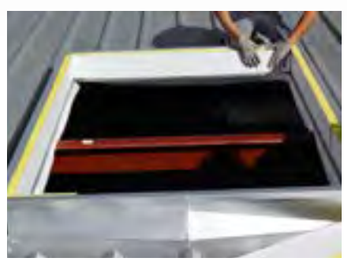
Retrofit Skylight Installation The lightweight framing system reduces curb installation weight and allows for the Roof Curb to be installed in retrofit situations with no additional secondary framing to the structure with this 6 step process.

1. Cut out roof.

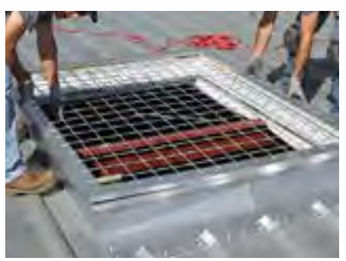


2. Install sub-frame.

3. Install roof curb.



4. Place insulation into curb slots. Provides a clean appearance and improves energy efficiency.



5. Lay safety frame on top of curb.

6. Welded safety frame is ready for Prismatic Skylight.

Energy-efficient LED lighting

New light sources are finding their way into all aspects of indoor and outdoor lighting applications and creating energy savings through higher efficiencies, longer source life and smaller form factors.

LED (Light Emitting Diode) is the most efficient lighting technology available today. It is estimated that switching to LED lighting could save the country $250 billion in energy costs over the next two decades, reduce the electricity consumption for lighting by nearly one half, and avoid 1,800 million metric tons of carbon emission. Because of the compelling benefits of LED lighting, it is here to stay and will be an important part of the lighting industry for years to come.

LED lighting is gaining popularity due to the growing energy conservation movement and advances in technology making LED lighting a cost-effective alternative in lighting projects. LEDs are light sources with extremely long lifetimes, intense colors and high energy efficiencies.

In fact, this big leap in technology can be seen as much as an upgrade from analog to digital was seen. LED is digital light, and compared to conventional “analog” lighting the advantages are huge and benefit both the users of this “technology of digital light” as well as our planet.

The benefits to our nation will be even more dramatic. By 2030, solid-state lighting could potentially reduce national lighting electricity use by one-fourth, the annual equivalent to saving:

- 190 terawatt-hours
- $250 billion (in today’s dollars)
- Output of 24 (1,000-megawatt) power plants
- Greenhouse gas emissions equivalent to 21 million cars

Energy-efficient solid-state lighting is a smart strategy for reducing our nation’s carbon footprint. It will save money for individuals and businesses and deliver superior performance while reducing consumption of fossil fuels.

By combining lighting fixtures and digital controls, we are able to maximize the potential of these technologies to create the most efficient lighting for every environment.

Energy-efficient digital lighting also has the potential to send and receive data like never before; integrate with other building systems such as daylighting; or connect to other elements in a room, building system, campus or power grid. This integration of lighting, controls and daylighting presents meaningful and practical benefits for the future.

Advantages of LED Lighting

Typical LED luminaires used in non-residential construction are rated at 50,000 to 100,000 hours. That is 6 to 12 years if burned 24/7. There is a greater chance of the technology becoming obsolete before the product needs to be replaced.

70% Useful life for LEDs is defined as the point at which light output has declined to 70 percent of the initial lumens (abbreviated as L70).

Hg No mercury is used to produce LEDs, which means no additional costs are associated with disposal.

Energy savings improve at a non-linear rate with dimming, making it an optimal lighting technology for daylighting harvesting solutions.

LEDs are more “directional” light sources, pointing light where it is needed. There is less light loss within the lamp source compared to an incandescent or fluorescent source.

LED light sources are not negatively affected by lower ambient temperatures like traditional fluorescent systems. This allows them to be used in a wider variety of areas. There is no warm-up time needed. They achieve full color and 100 percent light instantly upon powering the LED.

The LED light source produces more lumens per watt. This requires a lower wattage lamp/fixture to produce the same light output, which results in lower energy consumption.

Lighting controls

Lighting systems in nonresidential buildings operate at full output regardless of outdoor conditions. On most days, however, daylight (sunlight through skylights and windows) can provide sufficient light levels for most activities.

Not dimming electric lights can cause problems, including occupant eye strain due to excessive light levels and unnecessarily high electricity use for lighting and air conditioning. Experience has shown that in commercial buildings, the manual operation of lights is unreliable; thus, an automatic system is required.

There are two types of daylighting control systems: switching and dimming.

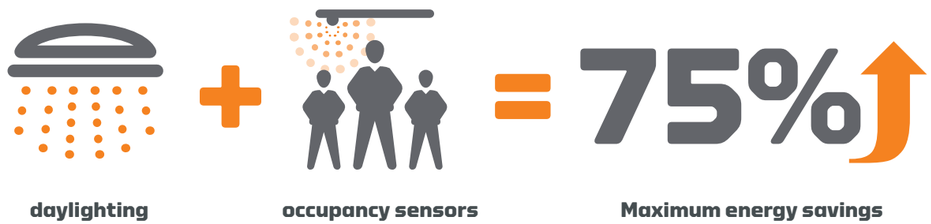
- Switching controls turn individual lamps off or on as required.
- Dimming controls, the best solution, varies the light output over a wide range to provide the desired light level.

In a conventional two-lamp fixture, there are three settings: both lamps off, one lamp on, both lamps on. The same strategy can be used with three- and four-lamp fixtures. Dimming systems require electronic dimmable ballasts and are more expensive than switching systems. However, they achieve the largest savings and do not have the abrupt changes in light levels that are characteristic of switching systems.

In addition to energy savings, electric light dimming systems offer two other advantages over conventional lighting systems. First, conventional lighting systems are typically designed to over-illuminate rooms to account for the 30 percent drop in lighting output over time. Electric light dimming systems automatically compensate for this reduced output to give a constant light level over time. Second, daylighting controls can be adjusted to give the desired light level for any space—when floor plans change, light levels can be easily modified to meet the lighting needs of each area (provided the system is zoned properly and has sufficient lighting capacity).

Lighting systems, skylights, windows and HVAC systems need to be designed to take maximum advantage of daylighting. When solar gains are at their highest, the building's cooling system can be reduced in size because lights are dimmed to the minimum. Daylighting works best with indirect lighting because occupants are less likely to notice changes in electric light output. Conversely, daylighting control does not work well with spot lighting.

Maximum energy savings (up to 75%) are achieved when the lighting system is controlled by both daylighting and occupancy sensors.



Xeleum Lighting products

A North American market leader and one of the leading providers of LED lighting solutions for both indoor and outdoor applications.

Industrial | E0S LED High Bay

For unforgiving climates and demanding areas, the EOS LED high bay is the high-performance, LED solution for heavy industrial applications. This die-cast luminaire, built to withstand dust, moisture and airborne contaminants, is a DLC Premium listed and IP65 rated high bay for use in interior and exterior applications. It's available at power levels ranging from 100 watts to 240 watts and can be surface mounted, suspended by chain or suspended by pole. The 60° (90° optional) distribution of light creates a uniform, consistent light level throughout the space being illuminated.

The EOS is enabled with Xi-Fi Wireless Lighting Controls.

Manufacturing and Warehouse | Hyperion LED High Bay

Ideal one-for-one replacement of conventional high bay systems such as HID and fluorescent. Applications include manufacturing, warehousing and other large indoor spaces with mounting heights up to 60'.

The Hyperion is enabled with Xi-Fi Wireless Lighting Controls.

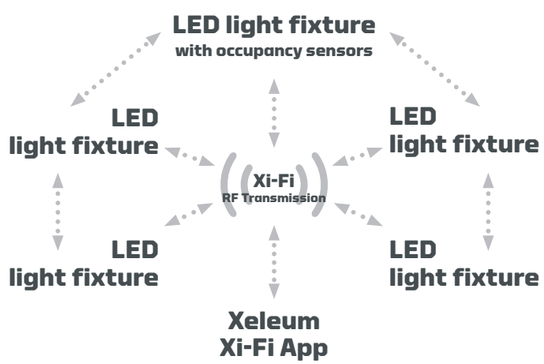
Retail and Commercial | POSEIDON G2 Linear LED Luminaire

The POSEIDON G2 professional-grade LED solution was built from the ground up, utilizing the most current LED electronics, precision optics and unique accessories to solve vertical and horizontal illumination and application challenges that have existed for decades. This is an ideal LED lighting solution for suspended or surface mounting applications where quality lighting and architectural form is valued. These fixtures can be used alone or in a continuous-row application.

The Poseidon G2 is enabled with Xi-Fi Wireless Lighting Controls.

Fixture-Integrated Wireless Controls for High-Performance, Facility-Wide | Lighting Management

Xeleum's Xi-Fi technology was developed to fill the need for a powerful, highly reliable, yet easy to commission wireless lighting control system that can reduce energy usage by up to 85%. It features an intuitive user interface that enables a quick and easy installation using a simple to operate App. Xi-Fi enables users to remotely create groups of fixtures, adjust light levels, control illumination and manage time-out settings, all without making any physical adjustments at the fixtures. Xi-Fi control also incorporates daylight harvesting as well as microwave motion sensing. This results in the adjustment of fixture illumination in accordance with changes in ambient light and/or because of sensor activity within the fixture or groups of fixtures.



SkyCalc™

A simple spreadsheet tool that helps building designers determine the optimum skylighting strategy that will achieve maximum lighting and HVAC energy savings for a building.

Skylights can reduce electric lighting and energy consumption, but only if they are used correctly.

SkyCalc uses simple data inputs to describe a building, including the glazing systems, building design and geographic location of the building, to analyze possible skylighting strategies. It predicts the lighting and energy outputs of a given skylighting system over a range of skylight-to-floor-area ratios. It graphs the overall energy and cost savings for lighting, heating and cooling. This helps a designer to quickly pinpoint the optimal sizing of skylights to maximize energy or cost savings.

SkyCalc: Skylight Design Assistant - Graphic Results

Company Name: Company KBS, Inc.
Project Description: Skylighting Project

Dome Skylight Effective Aperture = 1.25% Skylight to Floor Ratio (SFR) = 4.17%

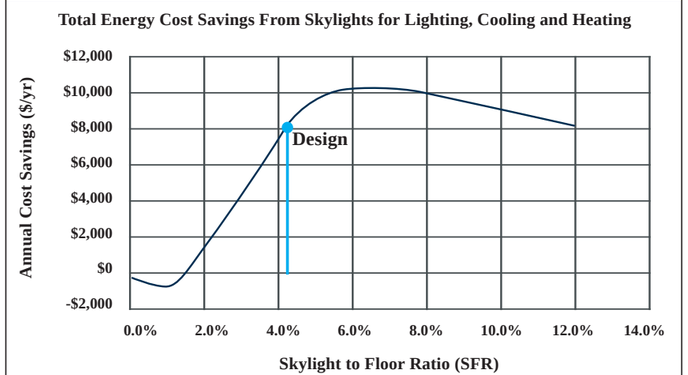
Average daylight footcandles (fc)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Jan	0	0	0	0	0	0	0	8	26	43	55	61	60	51	37	18	3	3	0	0	0	0	0	0
Feb	0	0	0	0	0	0	1	14	34	52	63	67	65	57	44	27	8	0	0	0	0	0	0	0
Mar	0	0	0	0	0	0	7	27	49	65	75	80	78	71	58	39	17	2	0	0	0	0	0	0
Apr	0	0	0	0	0	2	19	43	64	81	91	95	92	81	64	46	24	6	0	0	0	0	0	0
May	0	0	0	0	0	8	27	48	65	78	85	87	85	77	62	45	26	10	0	0	0	0	0	0
Jun	0	0	0	0	0	11	32	54	73	89	97	100	97	89	76	57	36	14	1	0	0	0	0	0
Jul	0	0	0	0	0	7	23	42	56	71	84	92	93	86	73	55	34	14	1	0	0	0	0	0
Aug	0	0	0	0	0	3	19	43	64	79	89	93	90	83	68	50	28	10	0	0	0	0	0	0
Sep	0	0	0	0	0	2	15	36	57	72	82	85	82	72	57	37	16	2	0	0	0	0	0	0
Oct	0	0	0	0	0	0	8	27	49	63	71	73	69	58	41	21	6	0	0	0	0	0	0	0
Nov	0	0	0	0	0	0	2	17	36	50	57	58	53	43	28	11	0	0	0	0	0	0	0	0
Dec	0	0	0	0	0	0	0	8	23	37	45	49	45	38	25	10	0	0	0	0	0	0	0	0

Design illuminance = 65fc

< 1 fc; < 33 fc; < 65 fc; > 65 fc;

Update SFR



Daylighting Building Model - Case Study

KBS has gathered statistical data from various geographical locations to demonstrate energy savings.

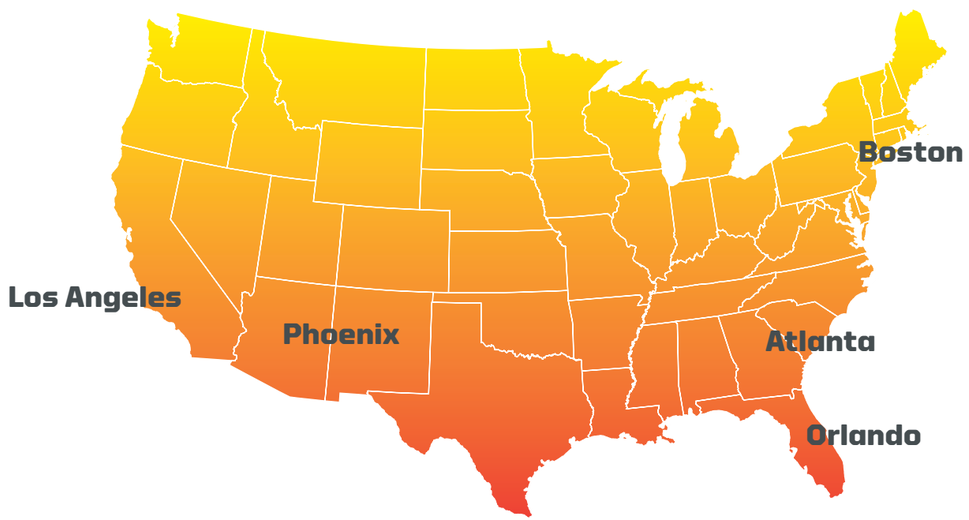
In order to demonstrate potential energy savings in various cities, we chose a 72,000-square-foot warehouse and made the following assumptions to model potential lighting energy savings:

- Base building lighting system: T5 Fluorescents
- Building use time: 8:00 a.m. – 5:00 p.m.
- Daylighting level: 3 percent of total roof sq ft
- Skylights/LED Lighting/Lighting Controls Incremental Cost: $135,000 over T5 Fluorescents
- No assumptions have been made for increased energy costs over time
- Location energy rates are based upon SkyCalc™
- Percent of energy reduction lighting on skylights is calculated by SkyCalc™

Lighting energy-saving models shown here have been developed using industry-accepted, independent third-party energy modeling software. Although every effort has been made for this to be a realistic representation of potential energy savings, there is no guarantee that a specific building will realize the same savings described in these models.

Factors that impact potential lighting energy savings include:

- Geographic location concerning weather
- Geographic location concerning energy costs
- Hours of building use
- Specific LED Lighting & Lighting Controls performance
- Type of skylight



Energy Saving Modeling / Skylights + LED Lighting + Lighting Controls

	Base Electricity Rate ($/KW)	Base Electricity Use (KW/YR)	Electricity Use (KW/YR)	% Energy Reduction Lighting Use	Energy Savings Total (KW/Hr)	Modeled Operating Cost ($/YR)	Modeled Annual Operating Savings ($)	Additional Impact on HVAC System: Modeled Add. HVAC Savings (KW/YR)	Modeled Add. HVAC Savings ($/YR)	Modeled Annual Operating Savings ($ Incl. HVAC)	ROI Payback (YRS)
Atlanta											
Base	$ 0.093	270,984	-	-	-	$ 25,202	$				
Skylights Only	$ 0.093	270,984	110,247	59%	160,737	$ 10,253	$ 14,949	26,788	$2,491	$22,752	5.9
Skylights/ LED/Controls	$ 0.093	270,984	53,122	80%	217,862	$ 4,940	**$ 20,261**				
Boston											
Base	$ 0.138	270,984	-	-	-	$ 37,396	$				
Skylights Only	$ 0.138	270,984	117,562	57%	153,422	$ 16,224	$ 21,172	24.195	$3,339	$33,560	4.0
Skylights/ LED/Controls	$ 0.138	270,984	51,992	81%	218,992	$ 7,175	**$ 30,221**				
Phoenix											
Base	$ 0.102	270,984	-	-	-	$ 27,695	$				
Skylights Only	$ 0.102	270,984	104,108	62%	166,876	$ 10,640	$ 17,055	43,864	$4,483	$26,633	5.1
Skylights/ LED/Controls	$ 0.102	270,984	54,252	80%	216,732	$ 5,545	**$ 22,150**				
Los Angeles											
Base	$ 0.127	270,984	-	-	-	$ 34,523	$				
Skylights Only	$ 0.127	270,984	103,742	62%	167,242	$ 13,217	$ 21,307	21,940	$2,795	$30,839	4.4
Skylights/ LED/Controls	$ 0.127	270,984	50,861	81%	220,123	$ 6,480	**$ 28,044**				
Orlando											
Base	$ 0.094	270,984	-	-	-	$ 25,472	$				
Skylights Only	$ 0.094	270,984	102,024	62%	168,960	$ 9,590	$ 15,882	32,798	$3,083	$23,668	5.7
Skylights/ LED/Controls	$ 0.094	270,984	51,992	81%	218,992	$ 4,887	**$ 20,585**				

Base = T5 Fluorescent Lighting
Skylights Only = Assumes lighting is turned off when daylighting is bright enough.
Skylights/LED/Controls = Skylights + LED Lighting + Dimming Lighting Controls.

Annual Modeled Lighting Cost Reductions

	Base Building	Skylights Added*	Skylight+ LED/ Controls
Atlanta	0%	59%	80%
Boston	0%	57%	81%
Phoenix	0%	62%	80%
Los Angeles	0%	62%	81%
Orlando	0%	62%	81%

* Assumes electric lights are turned off or dimmed during the day.

Annual Modeled Lighting Cost Savings w/HVAC Impact

	1 Year	5 Years	10 Years	15 Years	20 Years
Atlanta	$22,752	$113,762	$227,525	$341,287	$455,049
Boston	$33,560	$167,799	$335,598	$503,397	$671,196
Phoenix	$26,663	$133,165	$266,329	$399,494	$532,658
Los Angeles	$30,839	$154,194	$308,388	$462,582	$616,777
Orlando	$23,668	$118,341	$236,683	$355,024	$473,365

Note: Assumes the use of Prismatic Skylights, LED Lighting & Lighting Controls.

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LEED®, or Leadership in Energy & Environmental Design, is a green building certification program that recognizes best-in-class building strategies and practices.

The use of Prismatic Skylights, LED Lighting and Lighting Controls in building design provides opportunities for a project to earn credit toward Leadership in Energy and Environmental Design (LEED®) points. The LEED® green building certification program is the nationally accepted benchmark for the design, construction and operation of green buildings.

LEED® provides a complete framework for assessing building performance and meeting sustainability goals. Based on well-founded scientific standards, LEED® emphasizes state-of-the-art strategies for sustainable site development, water savings, energy efficiency, materials selection and indoor environmental quality.

It is advantageous to design the building envelope, HVAC, lighting and other systems to maximize energy performance. Installing Prismatic Skylights, LED Lighting and Lighting Controls to maximize energy efficiency through reduced electric lighting use can easily help designers in achieving and exceeding minimum energy-efficiency standards.

To receive LEED® certification, building projects satisfy prerequisites and earn points to achieve different levels of certification.

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