

The Business Case for Using the InFlector See Through Radiant Barrier Window Insulator Technology in the California Public Utilities Energy Efficiency and Conservation Programs

By: Albert R. Barnes, CEO, cSBA

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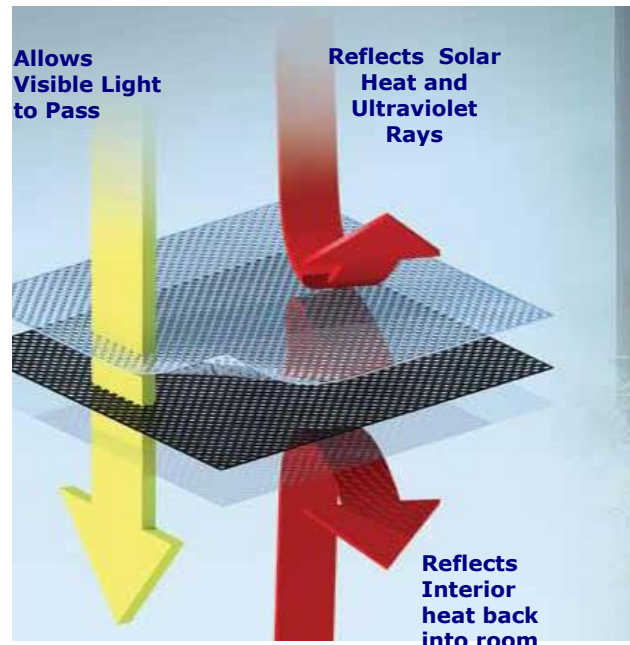
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Executive Summary

Although windows are necessary for light, ventilation, and a view, they are the most inefficient part of the building envelope and a primary cause of thermal discomfort in homes and buildings. A single pane window loses 20 times as much heat as the same area in an adjacent well insulated wall, and a double-glazed window loses ten times as much. In reality, windows are thermal sink holes.

Control of solar gain and nighttime thermal heat loss is not only necessary in current highly glazed, poorly insulated buildings, but is critical in the design of new energy efficient residential and commercial green buildings.



The InFlector® See Through Radiant Barrier Window Insulator Technology gets right to the root of the problem. InFlector® See Through Radiant Barrier Window Insulator maintains interior comfort in the building by reflecting the transfer of heat back into the room before it can be lost through the window during winter, and reflects the heat back out through the window during the summer (acts as a heat mirror).

The InFlector® See Through Radiant Barrier Window Insulator provides multiple benefits of heat reflectivity, solar absorption, plus the ability to re-radiate the absorbed solar energy as radiant heat through the perforated pattern (openness factor). The triple benefits are the multiplying factors for energy efficiency in the winter to reduce heating loads and in the summer to reduce cooling loads. The ability to multiply the solar gain through absorption and re-radiation of infrared heat is like having a convection heater at every window.

In addition, installing the InFlector® in homes and offices will improve energy efficiency with high return on investments (ROI) through the implementation of a low-risk, low-cost, and cost effective option that is more economical than replacement windows.

The purpose of this paper is to introduce the InFlector® See Through Radiant Barrier window insulator technology to you and your organization.

The Business Challenge

Solar gain through glazing is the largest and most variable gain and has major implications on energy consumption and peak heating and cooling loads. The peak electricity demand is dominated by space heating and cooling of residential and commercial properties.

The **challenge for the utilities** has been to find an alternative to replacement windows that is the least cost, most reliable, and most environmentally sensitive resource, and minimizes their contribution to climate change.

The appropriate use of window shading devices can reduce heating and cooling energy consumption and substantially lower the peak heating and cooling loads. The potential for reducing the electricity demand on peak summer days is especially significant as the cost to construct and maintain the power distribution grid and generating capacity is directly related to the peak demand.

The shift toward better insulated and air-tight building envelopes, combined with the architectural trend of highly glazed facades, is resulting in new buildings that are even more sensitive to solar gain and nighttime thermal heat loss. However, without appropriate solar gain and night-time thermal heat loss control strategies, building peak heating and cooling loads, increased heating and cooling energy and occupant discomfort can offset any benefit from thermally benign envelopes and passive solar heating.

Energy loss through glazing (windows) is the largest and most variable loss in buildings and has major implications on energy consumption and peak heating and cooling loads

“2009 Buildings Industry Data Book”



The Solution

Inflectors® are uniquely engineered, solar filtering, reflective thermal shades

The InFlector® See Through Radiant Barrier Window Insulator is an interior mounted window insulator that addresses heat transfer at the weakest part of the building envelope, the windows.

Our See-Through Radiant Barrier Window and Skylight Insulator Technology is the most effective system available today to address the least energy efficient part of your building the Windows, among all window coverings, because the InFlector® is the only proven system that addresses all four window weaknesses:

- **Infiltration**
- **Solar Heat Gain**
- **Heat Transfer**
- **Humidity**
- **Reduces the Green House Gas Effect in Buildings**
- **And increases energy efficiency and comfort every day of the year**

During hot months, heat gain occurs through windows via ultraviolet (UV), visible light (sunlight) and the absorption of infrared radiation. The highly reflective layers of metals reject UV, visible light (sunlight and the heat we feel) and radiant heat back through the window, reducing the electrical consumption required for air conditioning.

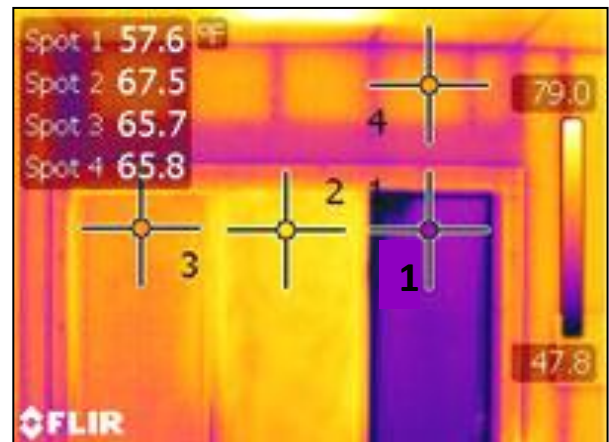


The library staff were amazed how effectively the InFlector® stopped the solar heat gain problems while allowing natural light in. Camden Library InFlector® roller blind installation Sydney, Australia.

The Solution

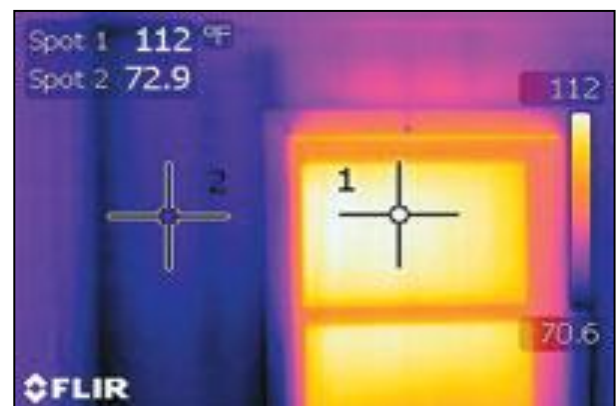
During cold months, the dual-sided InFlectors® are reversed so the reflective side faces inward. Heat loss through windows is reduced as the reflective coatings reflect the heat back into the room before the heat transfer can occur at the glass surface. Reducing heat loss at the glass surface reduces the number of times the heating system engages, saving the consumer on their utility bill. Heating requirements are further reduced during the sunny days of winter due to the absorptive side of the InFlector® which absorbs UV, visible light, and radiation. The absorbed heat is radiated into the room through the perforations in the material.

This infrared image of the window was taken on a day when the outside temperature was 48°. The right side (point 1) shows the cold 57° glass, (point 2 & 3) shows the inside temperature of the inflector® material, (point 4) shows the inside wall temperature at 65°. The inside thermostat was set at 69°. Notice how the inflector® material temperature is slightly above the inside temperature of the insulated wall, demonstrating the extraordinary thermal barrier performance.



This infrared image of the window shows the Inflector® material installed on a double hung window that the sun is shining on. Notice the wall temperature on the left side (point 2) at 72.9° and the solar gain temperature on the inside of the Inflector (point 1) is 112°, providing 39° of added heat to this room.

The outside temperature on this day was 24°



images provided by Monroe Infrared technology. Kennebunk, Maine.

The convection and conduction properties of the window are significantly increased because the InFlector®, being positioned behind the glass which creates an insulating air cavity, is between the glass and the InFlector® material itself. Under nighttime winter thermal conditions the inflector reduces the thermal transmittance coefficient (nighttime heat loss through the windows) by as much as 37%.

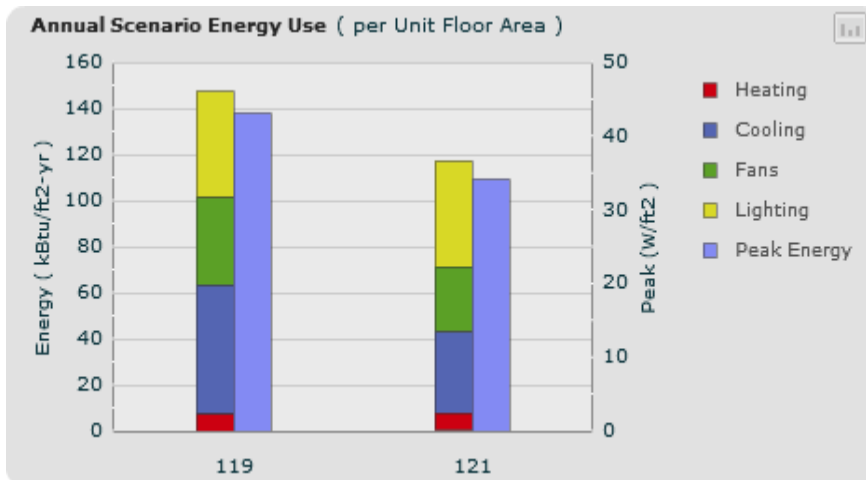
Solution Benefits

Installing the InFlector® will:

- ✓ **Improve energy efficiency with high returns through the implementation of low-risk, low-cost and cost effective strategies**

InFlector® Insulators are more economical than replacement windows. Our window insulators make any window more energy efficient by at least 50%. In addition InFlector® offers a higher ROI and shorter payback period when compared to both windows and other interior window attachments.

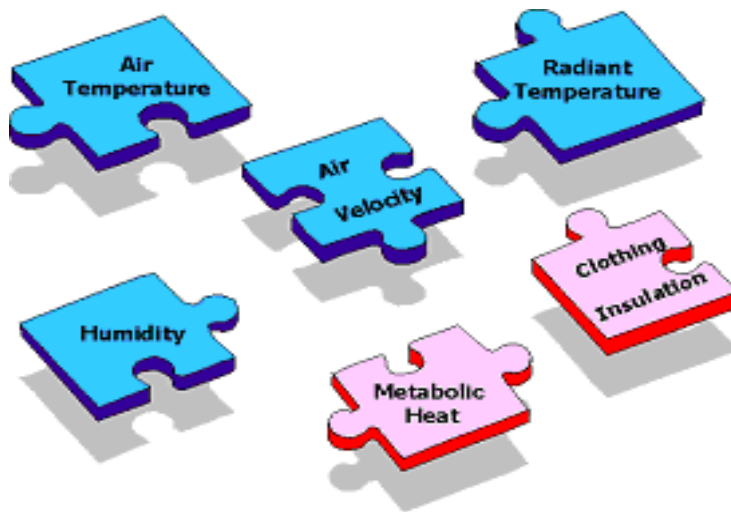
- ✓ **Save energy costs and lower overall occupancy costs in your buildings**



This Chart Illustrates the energy use intensities before and after installing InFlectors® on the south facing wall of an office building located in Santa Clara, CA. Number 119 represents the facility's energy use without the InFlector®. Number 121 represents the building after the InFlector® installation. The results of the simulation revealed that the InFlector® would reduce the energy use at the facility by 20.33% and result in demand load reductions of 20.88 %.

Solution Benefits

- ✓ Improve Occupants comfort and satisfaction with better building temperature control
- ✓ Allows natural day lighting, reducing the need for additional lighting
- ✓ Lower absenteeism and increased productivity



Factors of thermal comfort

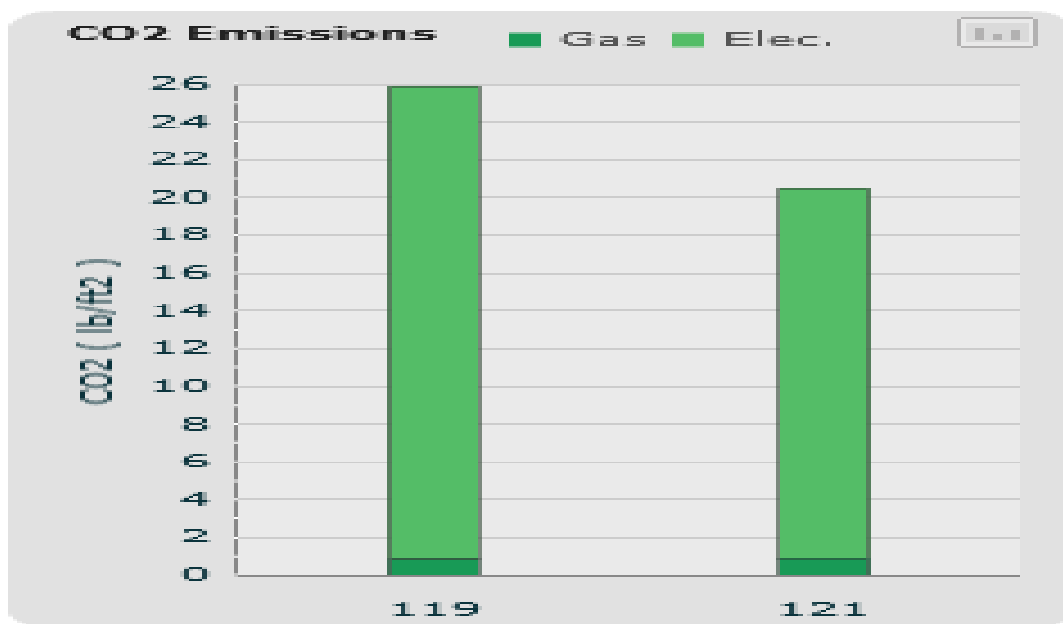
See Through Radiant Barrier Window Insulator Technology alleviates thermal discomfort by reducing heat loss and/or heat gain and can lower heating, cooling and electric lighting costs. They also exhibit inside surface temperatures that are closer to the room dry bulb temperature, resulting in less thermal discomfort for the occupants. Reducing heating and cooling loads lessens the amount of air pollutants entering the conditioned space through the heating and cooling systems, improving the indoor air quality, reducing building related illnesses, and increasing productivity.

Solution Benefits

- ✓ Extends equipment life by reducing the number of times the heating and cooling systems engage.
- ✓ Reduces Green House Effect in buildings

Heat caused by infrared radiation is absorbed by all of the interior surfaces of the building (furniture, floors, walls, office equipment etc.) and absorbed by the greenhouse gases such as water vapor, carbon dioxide, ozone and methane, which slows its (the heat), escape into the atmosphere.

- ✓ The Inflector® reduces the Green House effect by rejecting 74% of the infrared radiation back through the window.
- ✓ Significantly reducing the amount of infrared radiation entering the building, and;
- ✓ The number of times the HVAC system cycles, reducing the amount of Green House Gases entering the conditioned space



This Chart Illustrates the energy use intensities before and after installing Inflectors on the south facing wall of an office building located in Santa Clara, CA. Chart legend 119 represents the facility's CO2 emissions w/o the InFlector®. Chart legend 121 represents the reduction in CO2 emissions after the InFlector® Installation. The results of the simulation revealed that the Inflector would reduce the CO2 emissions at the facility by 20.81%.

Testimonials

May 5, 2011
Ron San Miguel

Communications Director, Sun Energy Dear Ron:

My husband and I really appreciate the value and comfort of the InFlector shades versus having to install new windows. It turned out to be an excellent short stop measure for us. We have a room that had become difficult to enjoy when the sun's overpowering light poured through the windows several times each day. Now we can sit at any time of the day, sun or no sun. We just pull down the shades or roll them up. They are easy to use and do not look out of place.

Thanks for coming out and making the installation so easy. V Gonzales, longtime property owner in Oakland



"Replacing windows is rarely cost effective, solely based on energy savings. Replacing all the windows of building 2000 with new more efficient windows would be extremely expensive and the demolition/installation would disrupt the tenant's mission.

For this reason, the InFlector window insulators were the right solution for building 2000 and the cost was much less than window replacement. Lackland awarded a 488K project to install these insulators. The installation is relatively simple and will cause little disruption to the building occupants. We anticipate reduced heating, ventilation and air conditioning loads with energy cost saving. Once energy savings are verified, we will use the data to justify replicating the project at other appropriate buildings across the base."



Frank Thomas, CEM/CSDP
Resource Efficiency Manager
802 CES/CEAOE
Lackland AF, TX
DSN: 473-7221 Com: 210-671-7221
July 2010

Lackland Air Force Base Gateway Club

Testimonials

Sent: Tue, October 11, 2011 10:42:24 AM

Subject: Re: Proudly on display

Congratulations, Dennis!

You have a great product that can and does save energy cost effectively. I include mention of your InFlector to customers when offering a lower cost alternative to window replacement energy conservation measure options.

Best Wishes!

Brian

Brian J. Lally, P.E., CEM
President
Lally Energy Savings Solutions, (LESS), Inc.
Alexandria, VA 22304

From: Gene Swier <gene@liteline.co>

To: Albert Barnes <albertbarnesiii@yahoo.com>

Sent: Thu, August 25, 2011 5:05:06 AM

Subject: Re: Santa Clara COMFEN files

Hi Al,

Regarding impressions about your tools:

Two very useful tools that you use that I am aware of include the COMFEN software program developed by LBNL for modeling the energy efficiency of windows and the interactive spread sheet developed by you to give clients a quick and simple view of how their windows perform with and without the InFlector. In particular, this spread sheet has been sought after once being introduced to it by both the private and public sector. It could be more useful initially if it were accompanied by a one page definition and explanation of how it is used, but; this is tweaking and does not diminish its effectiveness in displaying comparative results for analysis.

Best regards,

Gene Swier, President
Lite Line Companies, Inc.
310.789.1066
<http://www.liteline.co>

Technical Specifications

InFlectors® solar filtering, reflective thermal shades

Thermal and Optical Factors

InFlector®	Ts	Rs	As	Tv
Silver Side	0.253	0.496	0.251	0.22
Black Side	0.253	0.083	0.664	0.22

SOLAR PROTECTION AND LIGHT CONTROL INDICATORS ARE LABORATORY-TESTED. THE MOST RELEVANT AND WIDELY-USED FACTORS ARE AS FOLLOWS:

THERMAL FACTORS

Solar Transmittance-Ts

This factor measures the proportion of solar radiation transmitted through the Radiant Barrier. A low percentage means the fabric performs well at reducing solar energy.

Solar Reflectance-Rs

This factor measures the proportion of solar radiation reflected by the fabric. A high percentage means the radiant barrier performs well at reflecting solar energy.

Solar Absorbance - As

This factor measures the proportion of solar radiation absorbed by the radiant barrier. A low percentage means the fabric absorbs little solar energy

Solar radiation is always partially transmitted through, absorbed or reflected by the radiant barrier. The sum of all 3 equals 100. $Ts + Rs + As = 100\%$ of solar energy

OPTICAL FACTORS

Visible Transmittance

This factor measures the percentage of visible light coming through the fabric that can be seen by the naked eye. It is related to the amount of light(brightness) a person receives through a glazing system. A low figure shows a very efficient fabric.

Additional Information:

The Product

InFlector® material was invented in America, but developed as a window insulator in Canada. The InFlector® optimizes micro thin layers of dielectric coatings with high and low refractive indexes combined with micro thin layers of other highly reflective metals. The metals are coated to a polyethylene sheet that is then perforated, embossed, and laminated to a sheet of clear 1 mil polyester.

The Supplier

Energy Efficiency Done Right (EEDR) is a United States Corporation based in San Antonio, Texas. EEDR now has a global network with InFlector® manufacturers and dealers across the US, Canada, U.K., Australia, and China.

The Manufacturer

InFlector® material is manufactured exclusively for EEDR by Flexcon, a Fortune 500 Company. The material is made in America using our perforator.

Fire Code

Fire Code Title 19 (State of California, 1237.1).

Third Party Testing:

“There are many solar screen products on the market today but few offer detailed performance testing data like the InFlector.®”

Brian J. Lally, P.E. CEM

Here is what laboratory monitored testing, documented evaluations, and energy professionals have proven:

“Specifically, the U-Factor of the glazing improved by an average of 54% for the winter condition and 50% for the summer condition.”

Keith Sylvester, PhD, Associate AIA, Texas A&M University, The Department of Construction Science

“A four foot square window (with InFlector® Insulators in the winter configuration) would have a heat gain of 2096 Btu/hr, which is equivalent to a 600 watt electric heater.”

Tested under ASHRAE Standard Number 74-73; Yellot Solar Laboratories, Solar Collection

“Under daytime summer solar gain conditions the InFlector® panel had the effect of reducing the solar heat gain coefficient (SHGC) of the window by 49%. Under nighttime winter thermal conditions the InFlector® insulator panels had the effect of reducing the thermal transmittance coefficient of the window by 37%.”

Ortech Laboratories Thermal Transmittance Performance

InFlector Radiant Barrier Window Insulators in a controlled Test “Substantially reduced air leakage through the windows by 64.8% to 71%. InFlector® provides a good air seal.”

Scanada Consultants Limited with Senior Engineer Aril Parekh; Air Leakage / Infiltration

About Us

Headquartered in Oakland CA, SunEnergy is the Manufacturing and Distribution Partner of the InFlector® See Through Radiant Barrier Window Insulator for the State of California

SunEnergy received its Certification as an MBE from the CPUC's Utility Supplier Diversity Program Clearing House on August 18, 2009; CHS VON: 9DN00054.

The Company was selected to be a Presenter at the California Utilities Emerging Technologies Open Forum held in October 2010.

More Information

For additional information about our product and services, please see the following resources:

<http://www.callnFlector.info>

Phone: (800) 385-0560



Articles

30 Down and Dirty Tricks for Big DIY Savings #21 of 32; By: John Morell, This Old House magazine

http://www.thisoldhouse.com/toh/photos/0,,20447746_20886414,00.html

Project Reduces Energy Consumption and Cost, By Mike Joseph Staff Writer: Tail Spinner Magazine

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2010

Technology Corner; Radiant Barrier Window Insulators, The Holes in Our Walls (Windows)

Frank Thomas, CEM/CSDP Resource Efficiency Manager 802 CES/CEAOE Lackland AFB, TX DSN: 473- 7221 COM: 210-1671-722

Appendix

How the InFlector® Window Insulator helps earn LEED Credits

Energy usage baseline %	10	71	73	74	75	76	77	78	79	80	81	82	83	85	87	89	91	93	95
LEED points earned	Required	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18

Table 1. LEED points earned through energy efficiency improvements

Below are three categories within the standard where the InFlector® See Through Window Insulator can be applied towards meeting the criteria for earning LEED credits:

The energy saving benefits of the InFlector® can help companies to achieve the initial rating of 60, and it also can provide additional LEED credits once the baselines are met. Solar energy saving window insulators are covered by LEED for Existing Buildings Certification.

1. Energy Performance Credits

Buildings that exceed the EPA ENERGY STAR® rating of 60 required for certification can receive up to 10 LEED credits through additional energy efficiency improvements (LEED E&A Credit #1). The table below shows the LEED points that can be earned for an existing building based on additional energy efficiency improvements. The InFlector® alone can provide from one to four LEED points in energy efficiency improvements, depending on the environment and the type of InFlector® installed.

5. Thermal Comfort

Improving and maintaining thermal comfort for one LEED Credit is an option under section EQ 7.1 of the certification program. The performance measurements are the same as those for the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) Standard 55-2004. ASHRAE 55-2004 is a thermal comfort standard that outlines requirements for documenting a space as appropriately thermally comfortable for the occupants. The credit can be met by demonstrating compliance with data logging temperatures (#7.6.2.2), or by survey, where at least 80% of building occupants must consider themselves comfortable in the building climate (#7.6.2.1). This includes mitigating “local discomfort” (#5.2.4) and reducing temperature variations with time (#5.2.5).

Solar heat transmitted through untreated windows is often the cause of local discomfort. Occupant complaints about excessive heat or hotspots can be mitigated by installing the InFlector® Window Insulators with the Silver side facing the outdoors. The InFlector® reflects 50% of the solar heat and transmits only 25%. The InFlector® excels at moderating temperature variations over time, greatly improving thermal comfort.

How the InFlector® Window Insulator helps earn LEED Credits

Energy usage baseline %	10	71	73	74	75	76	77	78	79	80	81	82	83	85	87	89	91	93	95
LEED points earned	Required	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18

Table 1. LEED points earned through energy efficiency improvements

In winter months, reversing the InFlector® to position the dark side facing outdoors can improve comfort by utilizing the solar loading capabilities of the product. In effect, the InFlector® produces free heat from the sun. A four-foot square portion of a window that contained the InFlector® provided a heat gain of 2096 BTU/hour which is equivalent to a 600-watt electric heater. ASHRAE Standard Number 74-73, Yellot Solar Energy Laboratory. **(Source: Solar Collection Testing, Yellot Solar)**

6. Innovation Credits

There is also an innovation category for up to four extra LEED credits that you can apply for by making a case that a chosen building upgrade, not currently covered under the LEED for Existing Buildings standard, has improved the environment of the building.

There are two ways that the InFlector® window insulating system can be used to apply for the innovation credits. One way is to apply for a credit based on the environmental benefits provided by blocking ultraviolet radiation through the InFlector®. The window Insulator blocks nearly 89% of harmful UVA and UVB rays, which contribute to skin damage and skin cancer, and; are the leading factor which causes fading to interiors. A second eligible credit could be earned if fade reduction can be applied to reducing waste or improved building maintenance as specified in the Materials and Resources section of the standard.