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# Sun Control Window Films

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# Sun Control Window Films

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Presented by: 3M Corporate Headquarters  
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**Description:** Provides an overview of the significant role solar control window film can play in energy savings, occupant comfort, and daylighting strategies for architectural applications.

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# Purpose and Learning Objectives

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**Purpose:** Provides an overview of the significant role solar control window film can play in energy savings, occupant comfort, and daylighting strategies for architectural applications.

## **Learning Objectives:**

At the end of this program, participants will be able to:

- discuss the history and basics of window film materials and applications, including how and why they work
- demonstrate increased energy savings and proof of performance for solar control window films in a variety of applications
- discuss the benefits of solar control window films to building occupants and the interior environment, and
- identify how solar control window films contribute to a variety of daylighting strategies for commercial, retail, and residential building applications.



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## Introduction to Window Films



# Introduction

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Window films have been employed in building projects for nearly 50 years to help solve a variety of needs. Originally developed to reduce solar heat gain from entering through a pane of glass, window films in today's market provide UV protection, reduce glare, reduce fading, increase occupant comfort, offer safety and security, and yield energy savings.

In 1966, the original solar control window film patent was granted. It was a highly reflective, silver colored window film that is still very popular today. A few short years later, safety and security window film was developed in response to terrorist bombings in Europe. In 2009, the window film industry received global recognition when the National Fenestration Rating Council (NFRC) agreed to certify window films.

Since then, there have been a number of significant technological innovations, including a recent release of metal-free infrared (IR) rejecting films for both interior and exterior applications, and a light redirecting film that is designed to redirect light hitting transom windows deeper into the building, thus helping to reduce the need for electrical lighting.

# Timeline of Window Films

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- 1966 • original sun control window film patent
- 1969 • safety/security window films developed in response to terrorist bombings in Europe
- 1979 • low emissivity (Low-E) films are introduced
- 1984 • abrasion-resistant coatings for durability
- 1995 • microlayered tear-resistant security window films
- 2002 • color-stable film process patented
- 2003 • low interior reflectivity films introduced
- 2006 • virtually clear, metal-free IR blocking films
- 2009 • NFRC certification for window films
- 2011 • virtually clear, metal-free IR blocking films for outdoor use
- 2014 • daylight redirecting film introduced

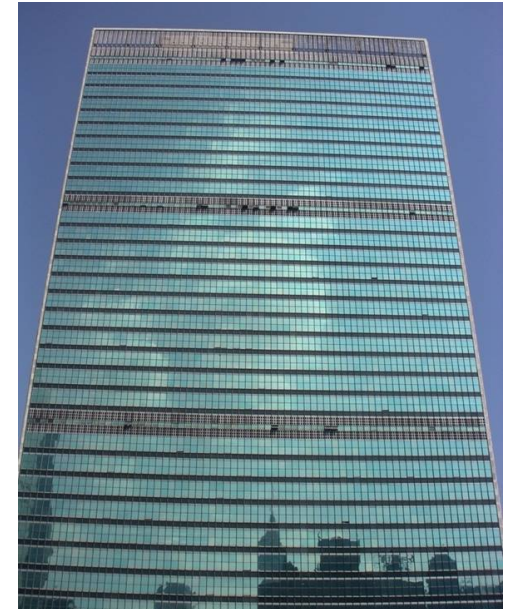
# Categories of Window Films

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Today, window films are classified into three categories:

## 1. Sun/energy control films

- Used for building energy savings, occupant comfort, building heat load reduction, fade protection for furnishings/coverings, privacy, and aesthetics.



# Categories of Window Films

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## 2. Safety and security films

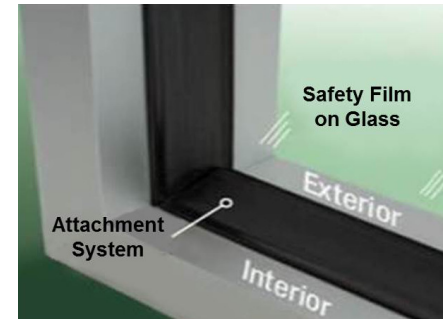
- Used for blast and windstorm mitigation, seismic glass breakage mitigation, theft prevention, and anti-graffiti.
- Some may also offer the benefits of sun/energy control films.



Breakage mitigation



Anti-graffiti



Attachment systems



Blast mitigation



Anti-theft



Windstorm mitigation



Safety glazing



# Categories of Window Films

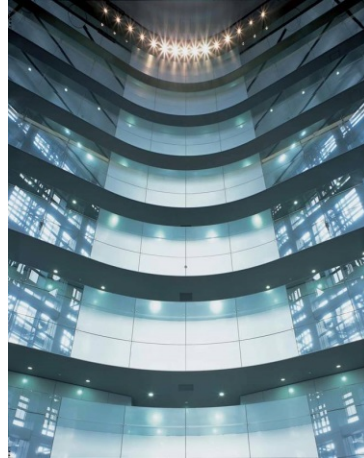
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## 3. Decorative and light-managing films

- Used to add decorative design and/or privacy to an architectural space.
- Dichroic films change color depending on the angle of view.
- Redirecting daylighting films direct daylight away from the floor and toward the ceiling.



Redirecting  
daylighting film



Decorative and light-  
managing film



Dichroic film



Privacy film

# Application of Window Films

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The application of window film may offer a solution to many areas of concern within a building, be it high energy costs, occupant comfort, fading of the furnishings, the safety and security of people and property, or building aesthetics.

Window films are a passive system: they function on their own. They can be used in commercial buildings, retail storefronts, residential homes, and government facilities.

The remainder of this course focuses on the features and performance benefits of solar control window films and their contribution to daylighting and energy savings strategies for architectural applications.







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## How Solar Control Window Films Work

# Window Film vs. Replacing Windows

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Solar control window films are typically used to upgrade the performance of windows in existing buildings. Their installation is significantly more cost effective than replacing the windows themselves, and the safety concerns associated with a hole in the side of a building are eliminated.

In addition, the installation of window film is less disruptive to the building occupants and the daily operations of the facility, and at the end of the day, no glass or window frames are sent to landfill.



# Window Film vs. Replacing Windows

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Window films are also used on sites requiring historic preservation because they do not change the look of the original window or the building's exterior.

Non-metallized IR rejecting films maintain the historic integrity of the structure while rejecting as much as 97% of the IR energy and 99% of the sun's harmful UV (ultraviolet) rays.

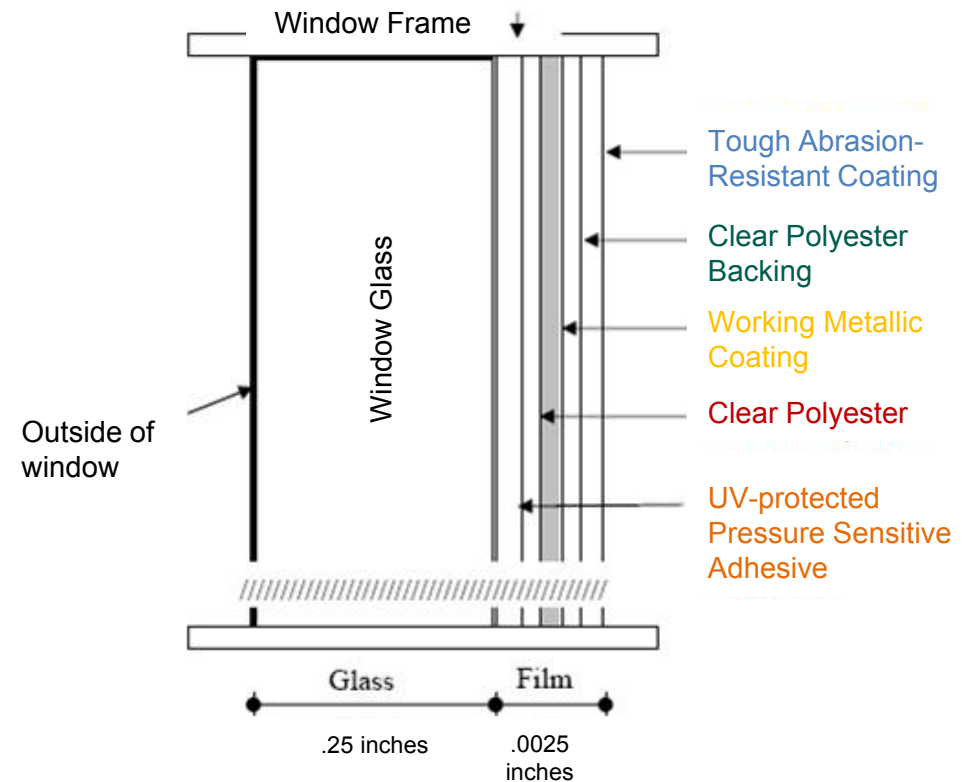




# Metalized Sun Control Window Film

A metalized sun control window film comprises several layers and coatings, including an optically clear UV rejecting adhesive, a metalized PET, and a durable abrasion-resistant hardcoat.

The overall thickness of a metalized sun control window film can be as little as .0025 of an inch.

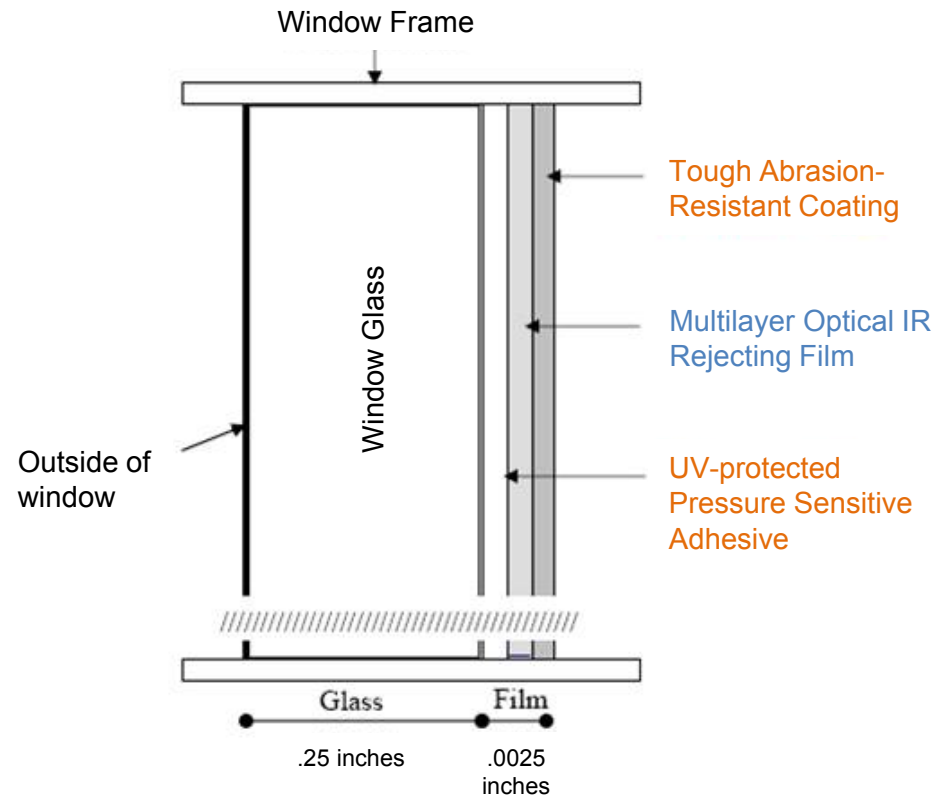


# Non-Metalized Sun Control Window Film

Non-metalized, IR rejecting sun control window films comprise a multilayer optical film, a pressure sensitive adhesive, and an abrasion-resistant coating. This type of film is also very thin, as little as .0025 of an inch.

Some manufacturers utilize tinted hardcoats to reduce iridescence, providing excellent views during the night as well.

Non-metalized IR rejecting films are ideal for historic preservation projects.



# Typical Metalized Sun Control Film

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One additional point to emphasize is that there are two types of adhesives that are typically used on a window film.

- CDA, or clear dry adhesives, chemically bond to the glass.
- PSA, or pressure sensitive adhesives, physically bond to the glass.

Before choosing a window film, it is important to understand the total life cycle cost of the product. CDA is extremely difficult to remove when the film reaches the end of life, and in some cases requires the use of chemicals to remove it.

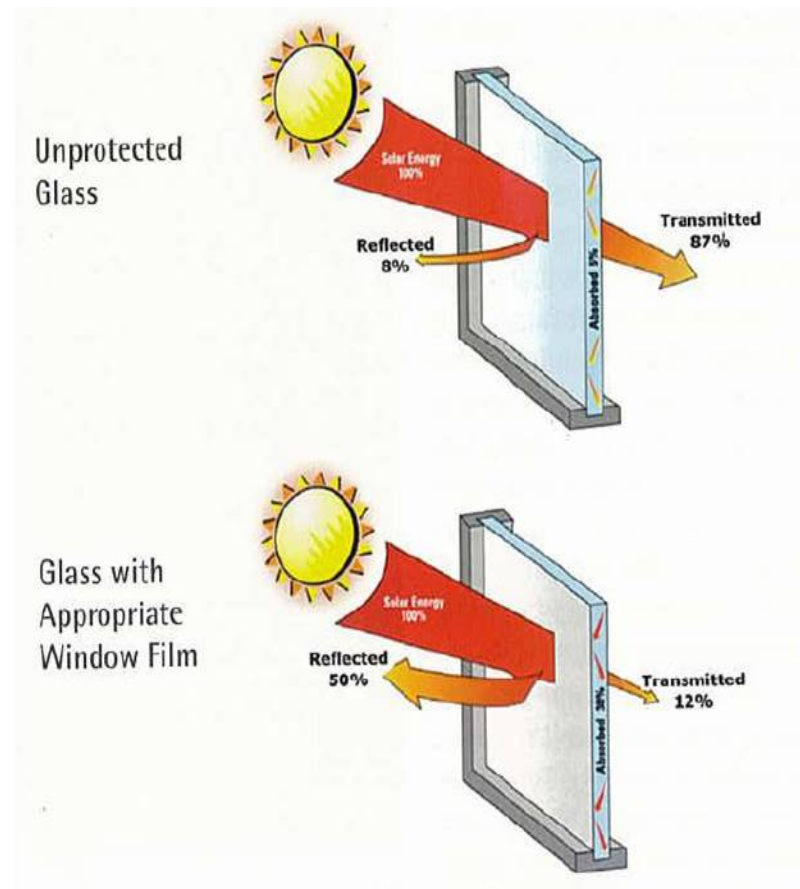




# How Do Solar Control Films Work?

Sun control window films work primarily by reflecting the sun's heat away from the building's interior, while allowing visibility through the window from the inside. The film is so effective that it can reduce solar heat gain into the building as much as 79%.

The top window is allowing 87% of total solar energy into the building, but with window film, this can be reduced to 12%, as shown in the illustration below.

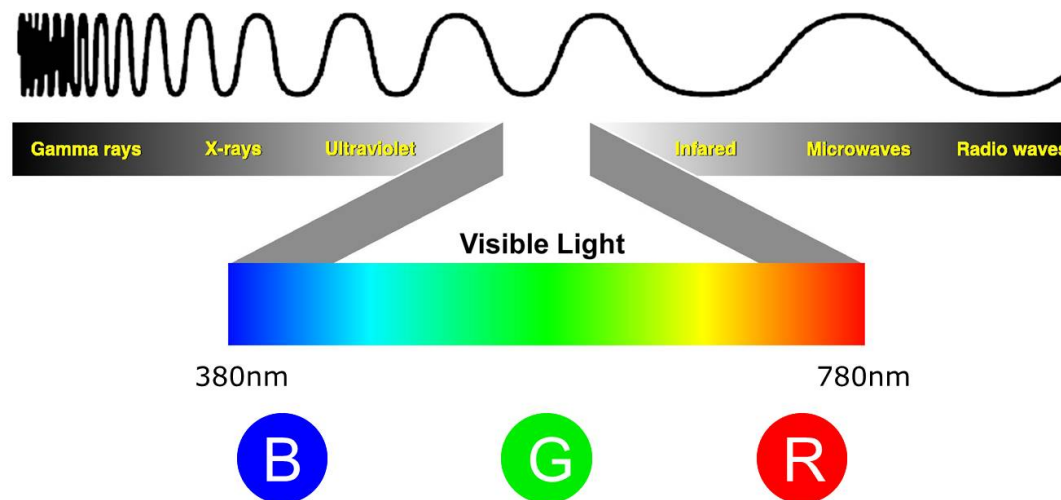


# How Do Solar Control Films Work?

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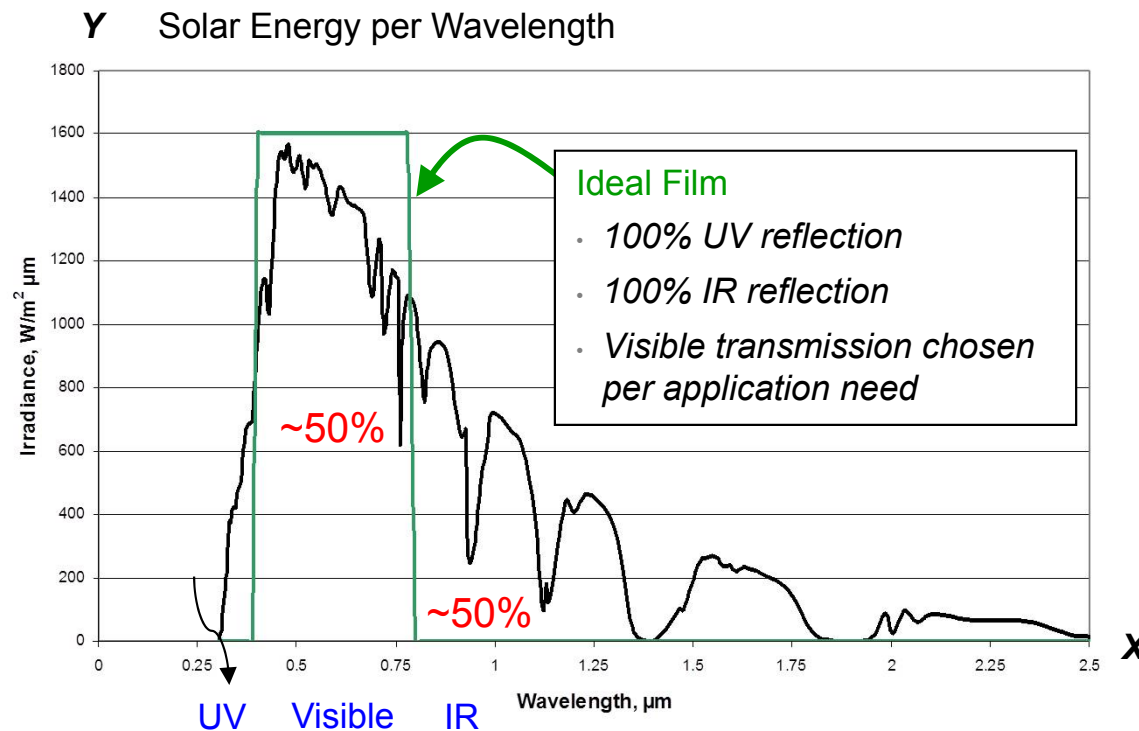
Of the total amount of solar heat entering a building, roughly half is infrared (IR) and roughly half is visible light. Conventional window films lower both to provide good sun control performance.

Metal-free multilayer optical films are designed to reject up to 97% of the IR energy while remaining virtually clear. These films are often referred to as spectrally selective, as they are able to reject IR heat without reducing the light transmission of the window.



# Window Film Basics

This graph shows the amount of energy, by wavelength of light, that comes from the sun. The Y axis represents the amount of energy, while the X axis represents the wavelength of light. The area in the green box denotes visible light, the area to the left of the green box is UV, and the area to the right is IR energy.



# Window Film Basics

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The main takeaway from the graph on the previous slide is that roughly 50% of the solar energy that causes heat in our buildings is due to IR energy, while the other approximately 50% is due to visible light.

This is an important point, as it suggests there is a trade-off between the amount of solar energy that can be rejected and the visible light transmission of a window.

Ideally, a window film would reject 100% of UV radiation and 100% of the IR energy, while at the same time transmitting the desired amount of visible light, based on the design need. Multilayer optical films are able to reject up to 97% of the IR energy, while also rejecting 99.9% of the UV radiation—a near ideal film.

# FAQs & Common Window Film Myths

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## 1. Window films will break my windows.

- This is incorrect; millions of square feet of window film are installed every year and have been installed on buildings for nearly 50 years. Credible manufacturers train and educate their dealers to assess the conditions of a window and determine the applicability of different films. In addition, the window film manufacturer may offer a warranty to cover the existing window. Consult individual manufacturers for more information.

## 2. Window films are dark or look purple.

- Purple films are films that have failed and are poorly designed, low-quality window films. Credible manufacturers will warrant color change, in some cases for as long as 15 years.

# FAQs & Common Window Film Myths

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## 3. Where is window film installed on the glass or window?

- Window films are commonly installed on the inside surface of the window. Typically, this leads to easier access to the window and therefore a lower installation cost. However, there are occasions, e.g., skylights, where access may be easier from the outside. When considering exterior applied films, it is important to select solar window films that do not contain metals, since metallized film may corrode after being exposed to the elements. If a metallized film is installed on the exterior, it is also necessary to ensure perfect edge sealing to make sure water does not reach the metallized layer.



# Solar Performance Terminology

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## **Solar Heat Gain Coefficient (SHGC)**

- This is the fraction of incident solar radiation that actually enters a building through the entire window assembly as heat gain. It is expressed as a number between zero (0) and one (1). The lower the SHGC, the better the window film performs at reducing solar heat. A lower SHGC also means that less heat needs to be removed from the interior space by the HVAC (heating, ventilation, and air conditioning) system.

## **Total Solar Energy Rejected (TSER)**

- This is the percentage of total solar energy (heat) rejected by the window film/glass system. The higher the number, the more total solar energy (heat) is rejected. Therefore,  $TSER = 1 - SHGC$

# Solar Performance Terminology

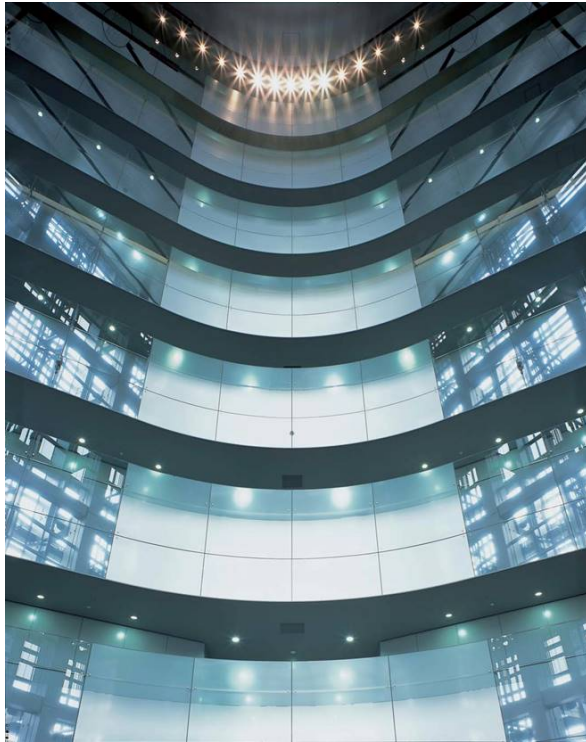
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## **Shading Coefficient (SC)**

- SC is the ratio of solar heat entering through a window to the solar heat gain, under the same conditions, through a window that is made of clear, 1/8" double-strength sheet glass. The lower the SC, the better the window film performance is to reduce solar heat.

## **Visible Light Transmittance (VLT)**

- VLT is the percentage of total visible light that is transmitted (from 380 to 780 nanometers) through the window film/glass system. The lower the number, the less visible light transmitted.



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# Features & Benefits of Solar Control Window Films

# What Sun Control Window Film Can Do

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Sun control window films save valuable energy and yield high energy cost savings. With the variety of sun control window films available today, it is possible to reject anywhere from 20% to 75% of the heat that would normally enter a building through the glass. This means HVAC systems can be used more efficiently and will require fewer hours of energy to pump out the excessive heat gain, helping the HVAC system to keep the interior cooled as designed.

In addition, solar control window films reduce ongoing maintenance and replacement costs for furnishings that are often damaged by penetrating UV and IR rays.





# Skylights

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One design element of a building that invites excessive solar heat gain and glare is overhead skylights. Being overhead, they can be in the sun all day long, especially during the summer months. The application of solar control window films is a solution to this problem.



# Improved Curb Appeal

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The variety of tints available in window films can also add design flexibility to a project and help to improve the curb appeal of a building. While some films will not change the appearance of a building, some provide a clean, crisp, uniform look that enhances the building's design and image.



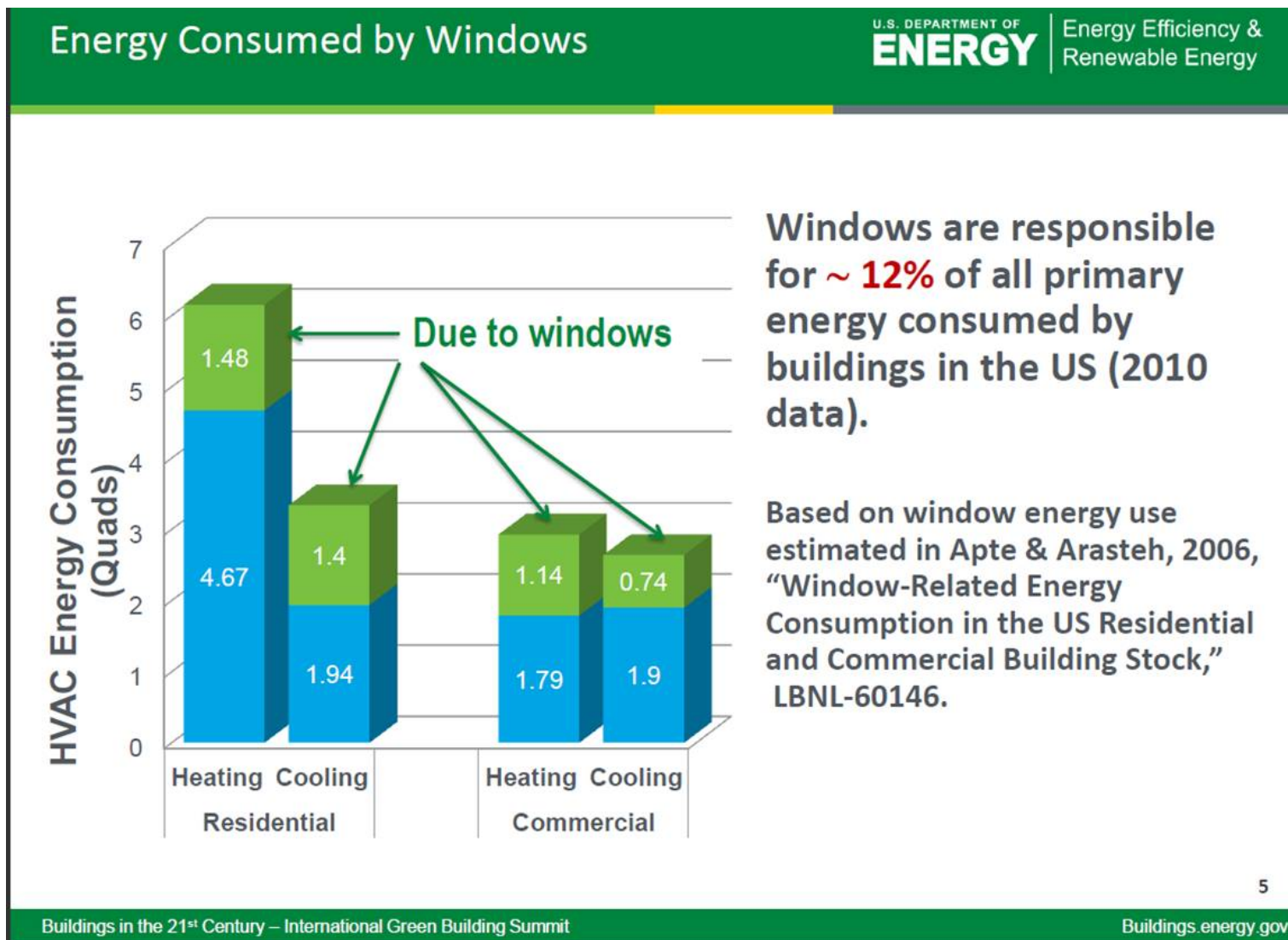
# Energy Savings

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Why is it necessary to talk about windows when we are concerned with energy savings?

- According to a study completed by the U.S. Department of Energy (DOE), windows account for a staggering 12% of all energy consumed by buildings in the U.S.
- If we look at only the cooling load for residential buildings, windows account for a staggering 42% of the cooling load for an average house in the U.S.
- Commercially, windows account for 28% of the entire cooling load of the commercial building stock, according to this study.

# Energy Savings





# Energy Savings: Third-Party Studies

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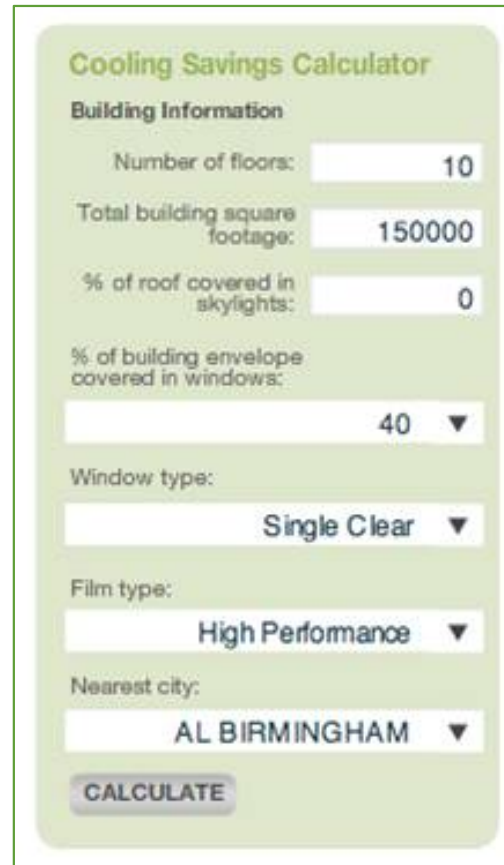
When it was established that windows accounted for as much as 28% of the cooling load for commercial buildings, additional studies were run to understand the effectiveness of window films in reducing cooling loads. An overview of two such studies is shown here.

- The U.S. Department of Energy (DOE) Federal Energy Management Program (FEMP) studied 50 commercially available energy savings technologies. Window films were rated:
  - one of six top-tier technologies with a maximum cost effectiveness rating (which suggests typical paybacks less than three years), and
  - one of four top-tier technologies with a maximum probability of success and the shortest payback period.
- CONSOL Energy suggested that window films typically pay back in less than three years, and could save as much as 19 kwh/sq. ft. on single-pane glass, or 12 kwh/sq. ft. on double-pane glass.

# Simple Energy Savings Calculations

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Today, there are many simple calculators available that can help to estimate the potential energy savings that an installation of solar control window films can provide. Some also provide an estimate of how long it will take to see a return on investment (ROI).



**Cooling Savings Calculator**

**Building Information**

Number of floors:

Total building square footage:

% of roof covered in skylights:

% of building envelope covered in windows:

Window type:

Film type:

Nearest city:

**CALCULATE**



**Potential Savings:**

Heat reduction through windows: **75%**

Approximate payback period (years): **0.89**

% annual savings of total utilities: **11%**

Annual CO<sub>2</sub> emission savings (in lbs.): **390162**

# Energy Analysis Simulation

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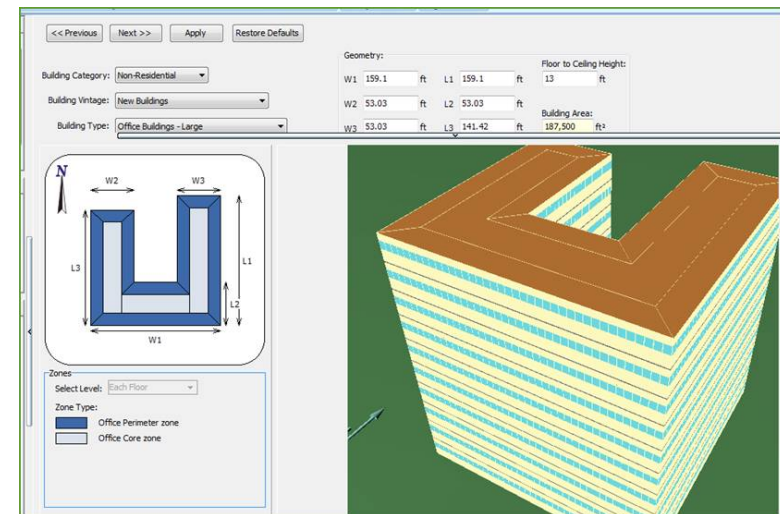
There are many tools that help to identify the energy savings that could be expected by installing a product. The DOE suggests using EnergyPlus, a sophisticated algorithm that calculates the energy use of a building. In order to comply with this recommendation, the window film industry developed a user interface to EnergyPlus called EFilm.

The software is designed to:

- calculate the estimated energy savings when using sun control window films, and
- assist in ensuring that a building's operations qualify for incentives that may be offered by local utility companies.

The software also projects the potential:

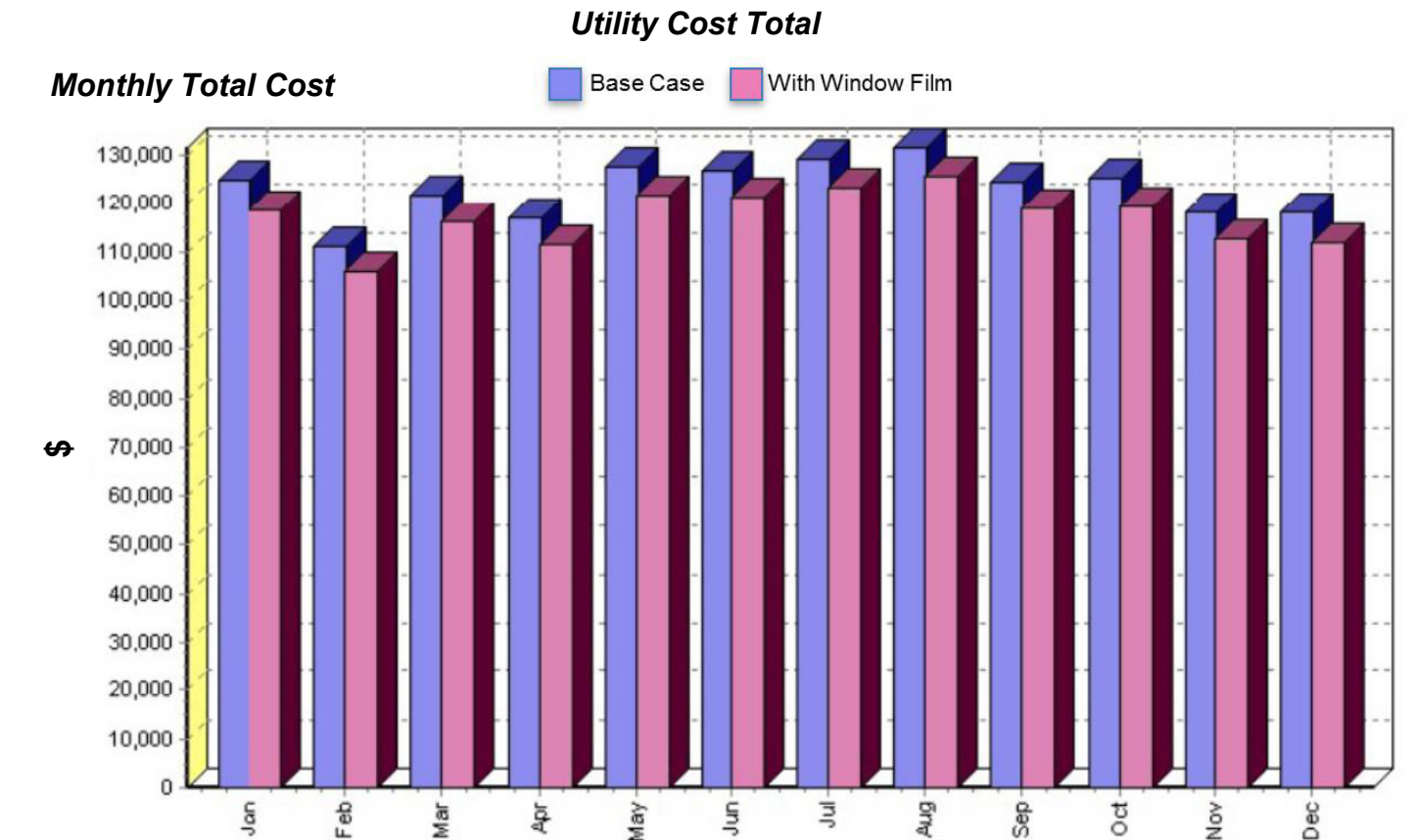
- energy peak demand reduction
- ROI or simple payback, and
- carbon emissions reduction.



# Energy Savings Estimates

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In this example of a calculation of the ROI for sun control window film, cost is amortized across as little as two to five years; after that, savings go right to the bottom line, reducing operational costs.



# Reduce Emissions & Operating Costs

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Every KW (kilowatt) saved means fewer carbon emissions are released; this is very good for the environment and the air we breathe. The amount of carbon emissions can vary depending upon the energy source, but window films can become carbon neutral in as short a period of time as six months.





# LEED® Credit Opportunities

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The performance and durability of solar control window film promotes a sustainably designed and built environment. As such, the installation of solar control window film may contribute to a building project earning points under the LEED® certification program, as listed below. Consult individual manufacturers for more information.

- **Sustainable Sites** (SS), Credit 8, Light Pollution Reduction
- **Energy and Atmosphere** (EA), Credit 1, Optimized Energy Performance
- **Materials and Resources** (MR), Credits 1.1 and 1.2, Retain 75–95% (based on surface area) of Existing Walls, Floors and Roof
- MR Credits 5.1 and 5.2 Extracted, Processed, and Manufactured Regionally
- **Indoor Environmental Quality** (IEQ), Credit 7.1, Thermal Comfort
- IEQ Credit 7.2, Thermal Comfort Verification
- IEQ Credits 8.1 and 8.2, Daylight 75–95% of Spaces
- **Innovation in Design** (ID) Credit, Environmental Quality, UV rejection
- ID Credit, Materials Reuse

# Energy Savings: Building Envelope

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Below are a few rules of thumb in terms of how much you can expect to save by utilizing a solar control window film. For any size building, the savings can certainly add up.

- Solar control window films save up to 19 kwh/sq. ft. on single-pane glass, and up to 12 kwh per sq. ft. on double-pane glass.
- Solar control window films can save \$1–\$2 per sq. ft.
- Installing solar control window film could save as much as 2–8% of the total energy bill.
- Solar control window films can become carbon negative in as short a time period as six months.

# Occupant Comfort: Interior Temperature

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Another factor to consider when selecting solar control window films is occupant comfort.

Window films keep the sunny side of the building cooler. This provides a more comfortable interior environment for all of the occupants—one side is not overheating while the other side is too cool.

Solar control window films reduce:

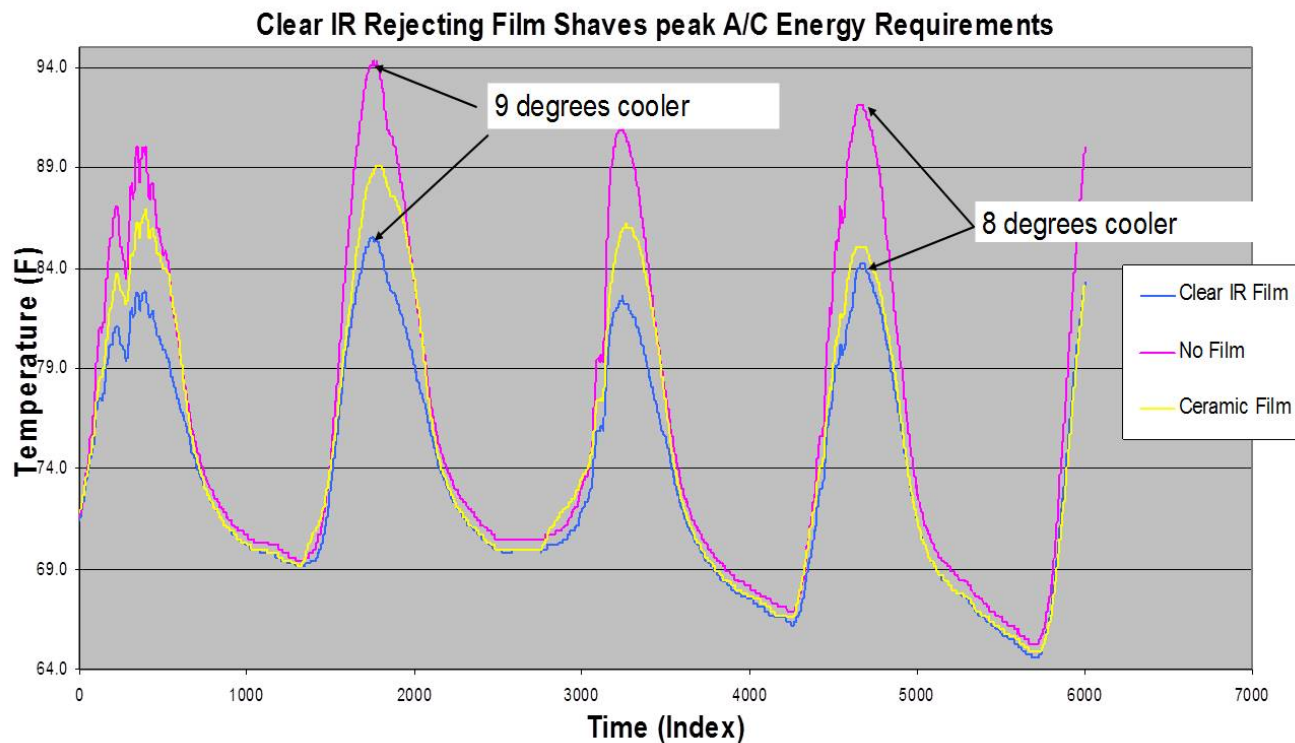
- interior temperatures
- temperature imbalances
- hot spots and cold spots
- glare, and
- UV radiation.

Improved occupant comfort means fewer occupant complaints.



# Reduced Temperatures: Proof of Performance

Simple, yet effective, tools such as temperature loggers can demonstrate proof of performance for solar control window film by using straightforward side-by-side comparisons. As shown in this chart, over a four-day period, there was as much as a nine-degree Fahrenheit (9°F) difference in temperature between one room with no film on the window and one with a window on which a sun control film was applied.



# Occupant Comfort: Glare

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The second most common concern in terms of occupant comfort that relates to windows is glare, and the way we see buildings deal with glare is to install blinds or drapes. However, that always leads to the question, “Why was a window installed in the first place?”

Windows, in general, are not nearly as energy efficient as their surrounding insulated walls, but windows are included in a building design to provide natural light and views to the outside. These views, in many cases, are linked to the value of a floor space and are often one of the main reasons a tenant leases a space in a specific building.



# Occupant Comfort: Glare

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While blinds and drapes are installed to manage or reduce glare, they commonly limit or completely eliminate the light and/or the views that the window was originally installed for. In addition, they must be adjusted throughout the day and are often left in the open position when they should be closed, or vice versa. They may also cause what is known as a “patched quilt” exterior look.

A benefit of some blinds and drapes is that they are operable by the occupant of the space.



# Occupant Comfort: Glare

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Window films address issues associated with occupant comfort and glare. Rather than obstructing the view, a window film can be chosen to optimize the light transmission of the window for each unique situation.

A commercial building or residence may use a solar control window film that is virtually clear if there are no issues with glare, or utilize films that transmit as little as 9% of the visible light.

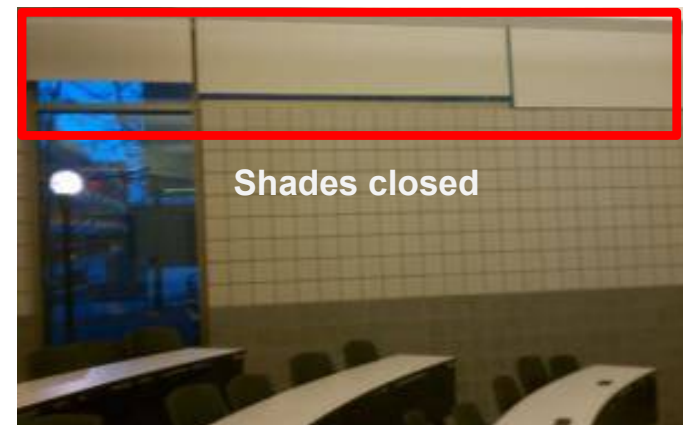
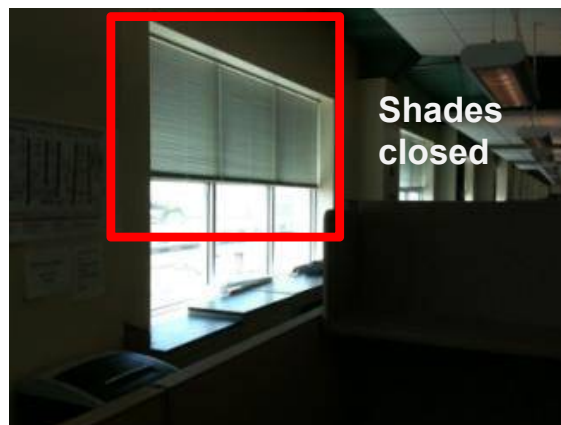
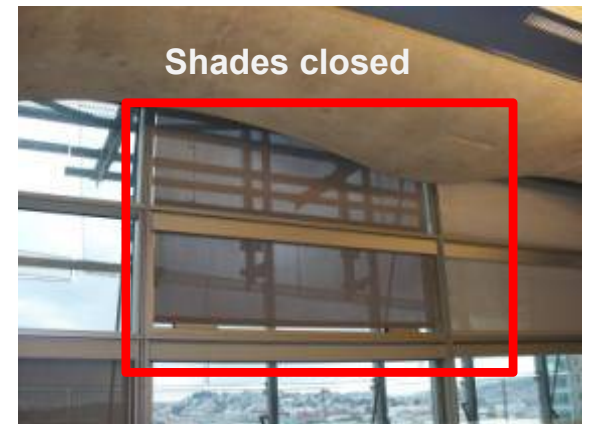
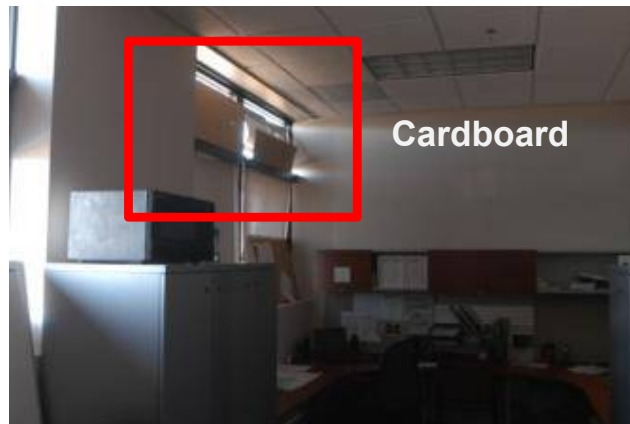
The ability to reduce glare with window films provides significant benefits, such as less eye strain on work surfaces, including computer screens; better productivity and comfort; and improved light management.



# Occupant Comfort: Glare

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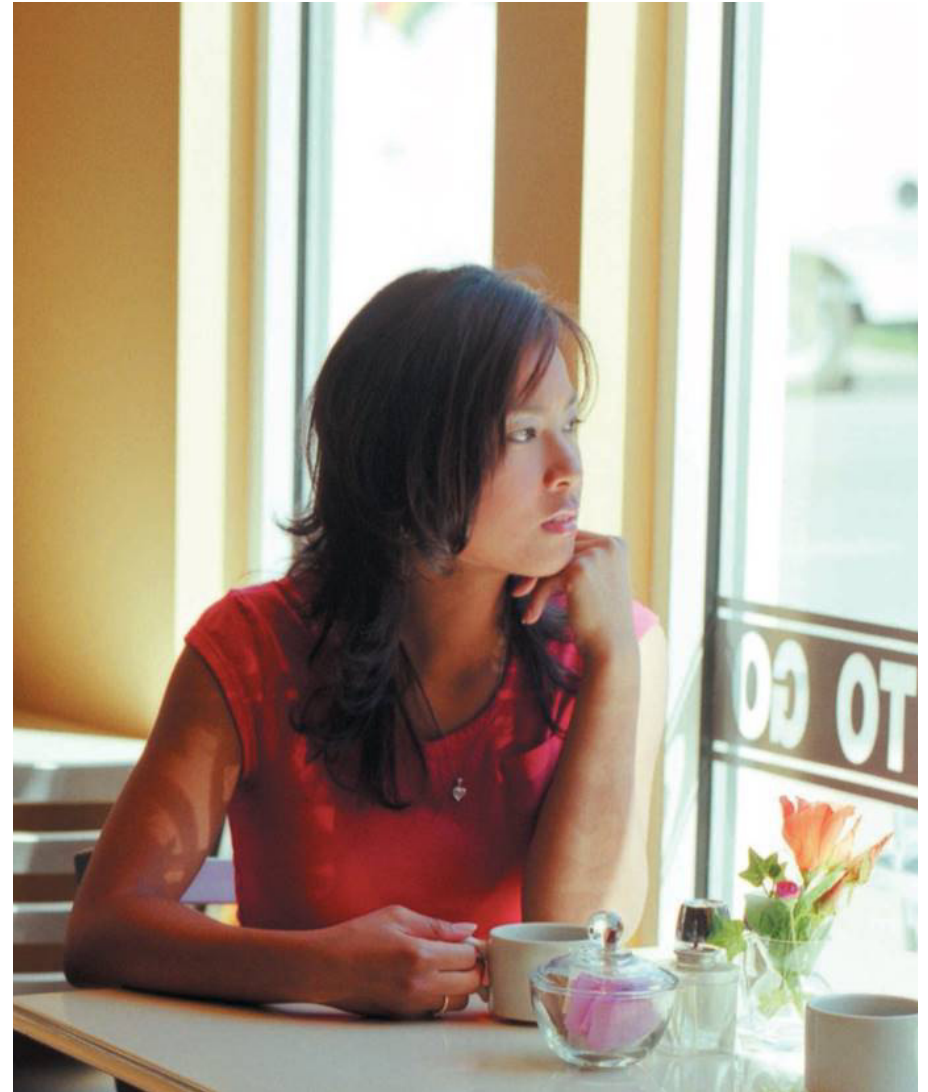
Window glare issues are not hard to find. A look at a variety of commercial buildings will show blinds closed, tarps hung, cardboard covering the glass, or sometimes, even trash bags taped up to eliminate sunlight.



# Occupant Health: UV Protection

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Some window film manufacturers are recommended by the Skin Cancer Foundation, as the films reject 99% of damaging UV rays. You can find which manufacturers are recommended here: [www.skincancer.org](http://www.skincancer.org).





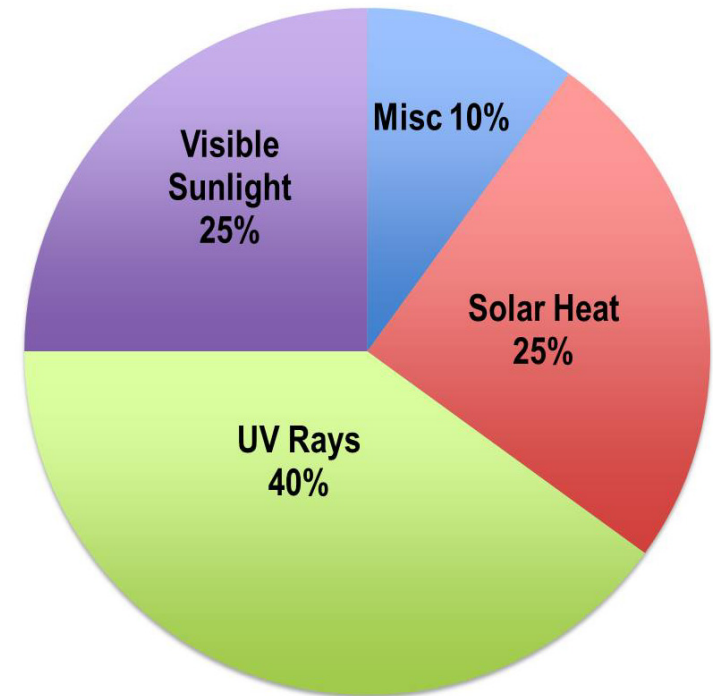
# Fading of Furnishings: UV Protection

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One big concern to both home and business owners alike is the fading that can occur when indoor objects, coverings, and furnishings are placed in direct sunlight.

Ultraviolet (UV) light is responsible for approximately 40% of the fading, visible light about 25%, and heat about 25%. The remaining 10% can be attributed to humidity, pollutants, interior lights, dye anchorage, and more.

Window films will typically reject 99% of the UV radiation, and depending on the film chosen, can reject as much as 79% of the solar heat, as well as 91% of the visible light. Installing window films has a significant impact on the rate at which fading occurs.





# Fading of Furnishings: UV Protection

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Interior furnishings are particularly vulnerable to UV light, visible light, and solar heat. Unfortunately, window films cannot stop furnishings from fading altogether, but they can be very effective at delaying the effects and prolonging the life of your furnishings, as much as two to five times longer.



# Fading of Furnishings: UV Protection

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For example, if the articles in question have a predicted lifetime of five years, it is possible to easily extend their lifespan to ten years or longer depending upon the performance of the film selected. However, if the predicted lifespan of the item is just two to three weeks, then the expectation should be expressed in terms of months.





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## Privacy & Aesthetics

# Aesthetics

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Often when considering a window film for the shell of the building, the primary concern may be with light reflectivity and transmission, but the aesthetics of the interior space may be an important consideration, too. With window films, adding frost or decorative looks to the glass is possible.

Unfortunately, when it comes to considering window films, many preconceived notions on what a window film looks like still exist. For example, the dark tint that appears on car windows, or some of the shiny metal films that are on many large commercial buildings come to mind. These dark or metal films were in fact the only options available when window films were invented nearly 50 years ago, but today's window films can vary between being dark or highly reflective to virtually clear.

 Please remember the **exam password TINT**. You will be required to enter it in order to proceed with the online examination.



# Aesthetics

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Metal-free IR reflecting films, like multilayer optical films, can provide heat rejection without significantly changing the look of the building. Note that each of the four windows below, as indicated by the arrows, has a window film with a different aesthetic. Window films are chosen to meet the privacy and aesthetic needs of each individual application.





# Exterior Aesthetics

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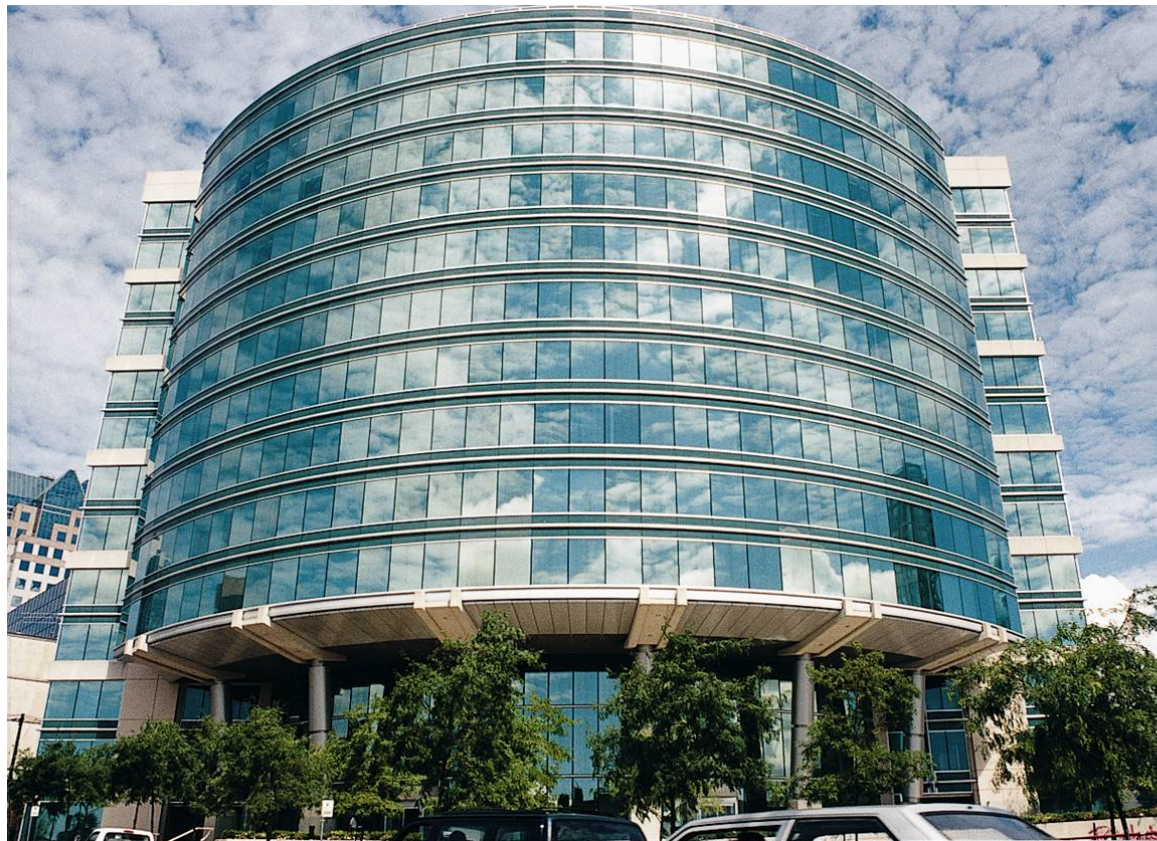
Window films can also improve a building's exterior aesthetics by providing a uniform and polished look to the façade. Buildings with a reflective type of window film look updated and newer. The building occupants and tenants of a commercial facility are visually aware of their surroundings and may appreciate any effort to keep their building looking current.



# Exterior Aesthetics

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Window films also vary in their exterior appearance, which adds some design flexibility to the selection process. It is possible to match the reflective appearance to the existing exterior materials.





# Privacy & Decorative Films

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In addition to aesthetics, another common benefit of window films is that they can address privacy concerns. Privacy can be obtained in two ways: by utilizing highly reflective films, as previously discussed, or by adding patterns or frost to the film, thereby giving the glass an etched look. Decorative privacy films are often used in conference rooms, lobbies, retail environments, verandas, glass partitions, private offices, exterior windows, and residential settings.



# Privacy & Decorative Films

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In retail and office applications, window films provide aesthetics, privacy, and design opportunities. They maintain daylight and provide a cost-effective alternative to etched or frosted glass.



# Retail & Residential Spaces

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Much of this presentation has focused on the benefits of solar control window films for large commercial buildings, but they can also be an important part of residential and retail spaces, both inside and out. From slowing the rate of fading, to creating visual appeal, window films offer many daylighting solutions.





# Retail Spaces: High Levels of Natural Light

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By allowing a high volume of visible light into a retail space and restricting the amount of IR and UV light, there is less of a demand for interior lighting, and a brighter, more cheerful appearance is created.



# Retail Spaces: Two-Way Visibility

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Maintaining two-way visibility is very important for retail shops. Not only does it improve sightlines, but it provides the critical “open for business” appearance.



# Warranties & Maintenance

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Proper care and maintenance is important to keep window film looking good and any warranties valid. Window film warranties for commercial and retail applications are usually ten years or longer, and for residential applications, many are limited lifetime warranties.

The care and maintenance of window films is simple. The film may be washed 30 days after installation with a common window cleaning solution such as ammonia. Synthetic sponges or soft cloths are recommended for washing the film, and a soft squeegee is recommended for removal of cleaning solution from the film. Bristle brushes or abrasive cleaners/cleaning materials should not be used.

Please consult individual manufacturers for specific details regarding the care and maintenance of window film products.



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## Case Studies



# Century Plaza Towers, Los Angeles, CA

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The landmark Century Plaza Towers, two 44-story towers and 2.3 million square feet of class “A” office space, was completed in 1974. Both towers use aluminum for the façade, and they have been pictured in countless movies and television shows over the years. Their unique, three-sided configuration and the steady supply of California sunshine made consistent heating and cooling a challenge. When the property management company CB Richard Ellis looked at options for solving the temperature imbalance and making the towers more energy efficient, one of the ideas they considered was window film.

*“We’ve taken a number of steps to enhance sustainability at Century Plaza Towers,” said Renee Watkinson, Vice President and Director of CB Richard Ellis. “We’ve installed an irrigation management system and waterless urinals to reduce water use, along with lighting retrofits to reduce energy use. We saw window film as another way to improve our sustainability.”*

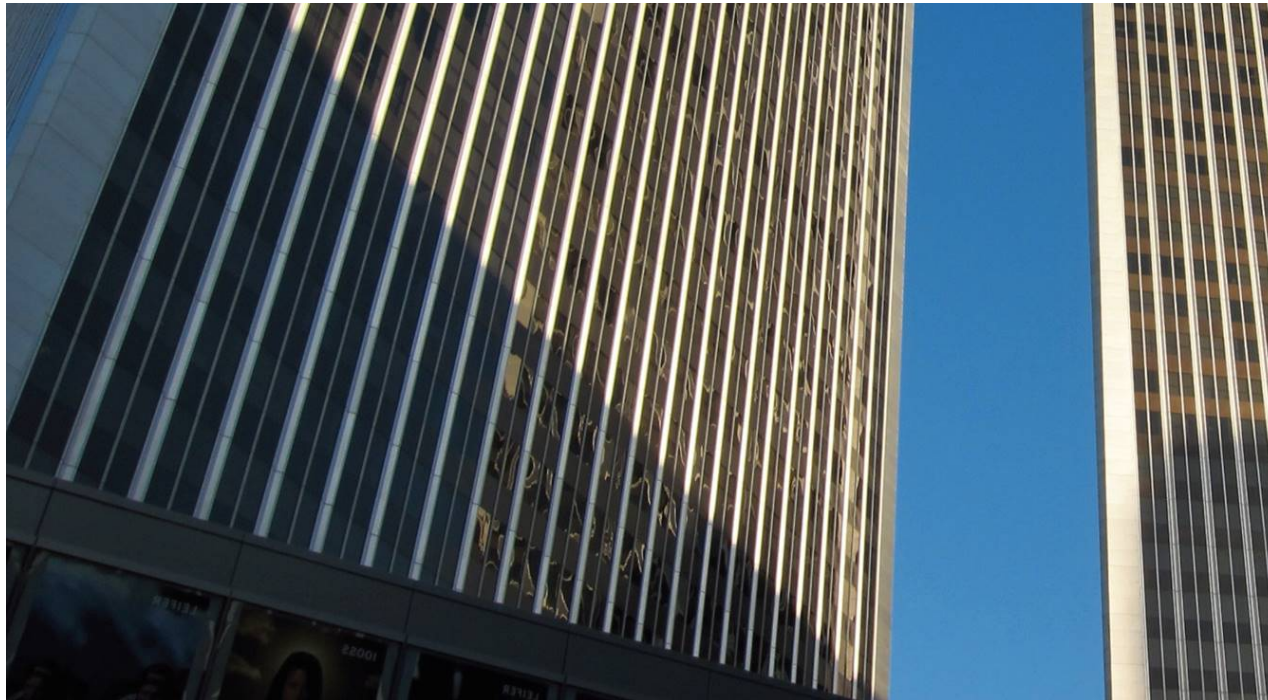




# Century Plaza Towers, Los Angeles, CA

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Keeping in mind the historical nature of Century Plaza Towers, the group decided on a window film not only for its high heat rejection qualities, but for its neutral light appearance, since it would not drastically change the look of the buildings. When more consistent temperatures were maintained throughout the towers, utility bills began to drop. The project had a payback period of less than a year, and energy costs were significantly reduced while providing building management with a utility rebate of more than \$100,000.



# Caribe Resort, Orange Beach, AL

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Caribe Resort is an exclusive condominium address in Orange Beach, Alabama. The 14-story contemporary condominium towers with dramatic, 14-story sky-lit atriums, are surrounded by lush natural landscaping and water on all sides. The \$1 million-plus privately owned condominiums boast 9- to 11-foot ceilings and feature floor-to-ceiling, full-view windows and glass doors, overlooking the oversized, curvilinear balconies.



# Caribe Resort, Orange Beach, AL

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The unobstructed views of unspoiled beaches and storybook sunsets attracted buyers, but at the same time, concerns were expressed about protecting high-end furnishings and antiques from the damaging effects of the sun. With the massive walls of windows that allow daylight to flood into their unit, the Marto cousins knew there was a high risk that the sun would fade and ruin their valuable items. Maintaining optimum comfort levels and reducing glare and heat gain were also considerations.

*“We had just invested \$1.3 million in a condominium with stunning views,” Marto explains. “The last thing we wanted to do was to install heavy draperies that would protect the interior but close off views to the outside.”*





# Caribe Resort, Orange Beach, AL

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The solution was a solar control window film. Not only would the window film help protect the valuables from sun and UV damage, but it would also help to reduce cooling costs. Additionally, the Caribe Resort development has strict guidelines regarding a uniform look for its exterior. Because the window film selected has no metals, it is not reflective, so it is difficult to see with the naked eye the difference between the windows that have film on them, and the windows that do not.

*“In addition to allowing us to maintain our views with less reflectivity, we now have peace of mind, knowing that we have one of the most effective products available to help keep our furnishings protected from the damaging effects of the sun,” Marto says.*

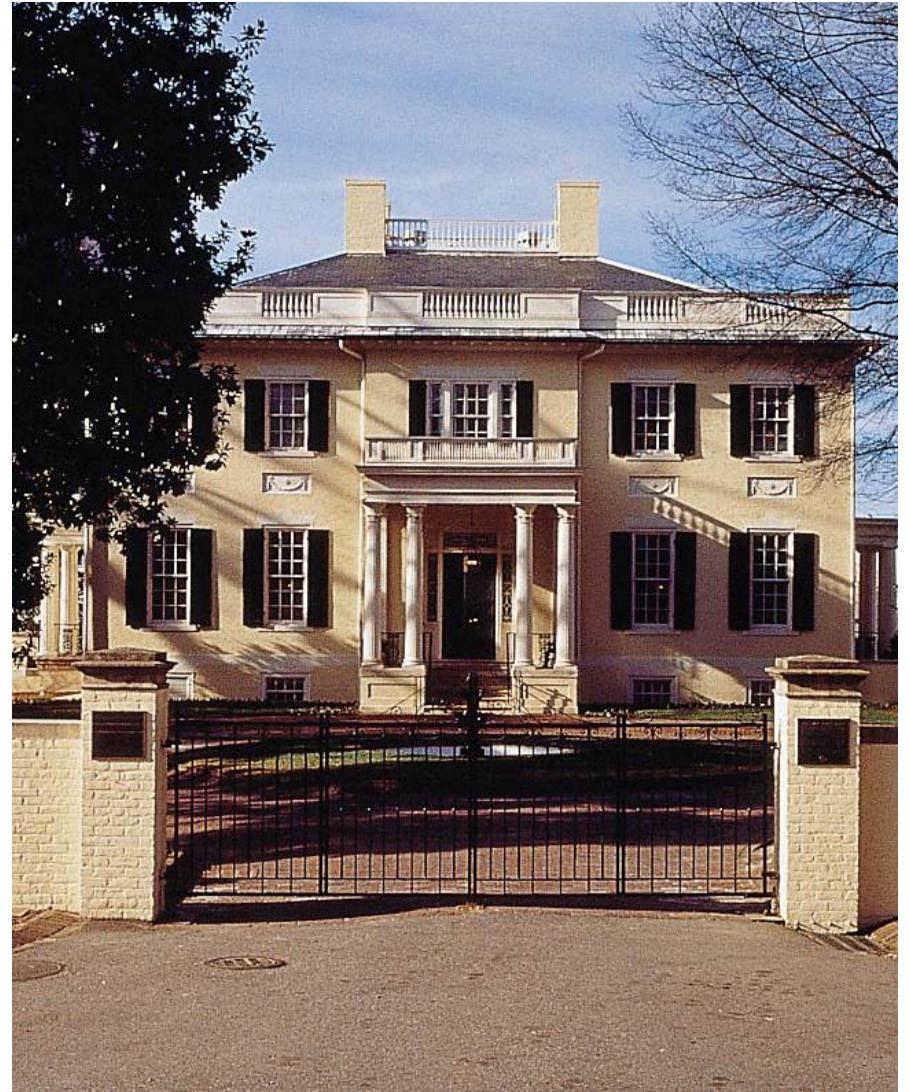


# The Virginia Executive Mansion, Richmond, VA

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The Virginia Executive Mansion (Governor's Mansion), built in 1813, is the oldest, continuously occupied executive mansion in the U.S.

As project managers neared the completion of a six-month, \$7.5-million renovation of the house, they pondered how best to protect the residence. First, they wanted to preserve the priceless antique furnishings and fabrics, hand-woven carpets, and artwork from the damaging effects of the sun. And second, they wanted to supplement the safety and security system by making it difficult to break through the glass windows and doors.





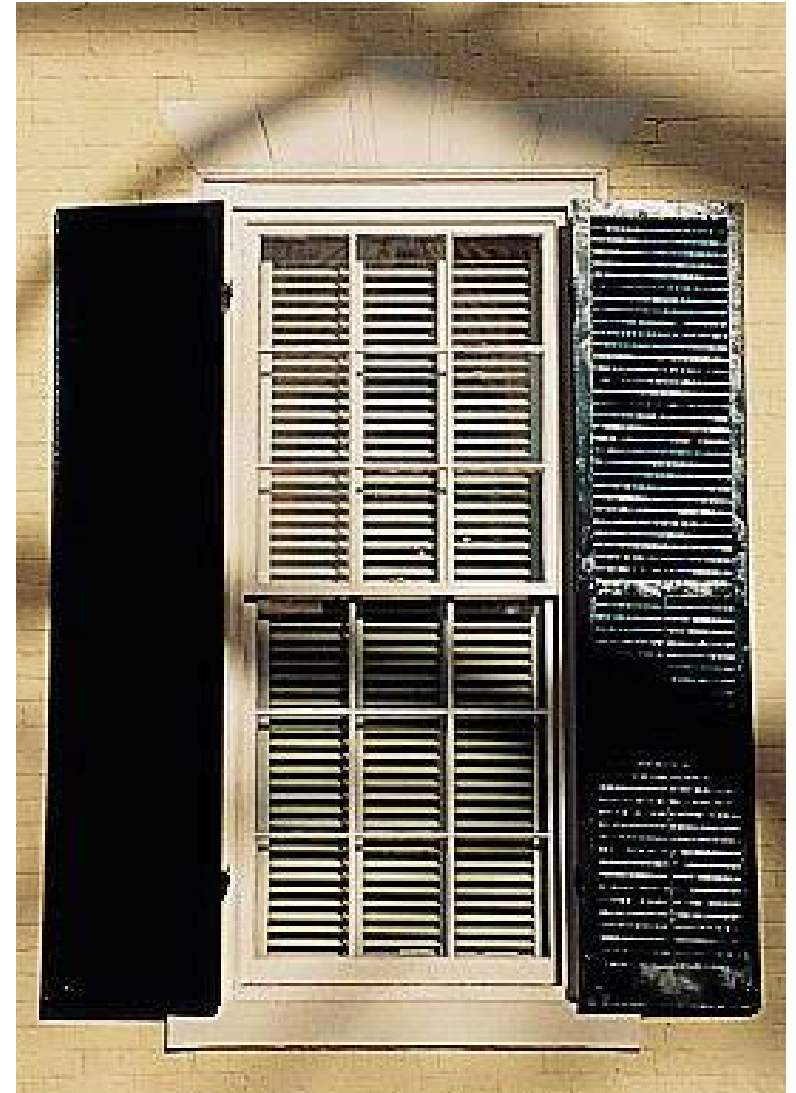
# The Virginia Executive Mansion, Richmond, VA

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John Paul Hanbury, a principal with Hanbury Evans Newill Vlattis & Company, specified a clear window film to maintain the building's aesthetics, blocking up to 99% of the sun's damaging UV rays, and increase the level of safety and security, since the film serves as an invisible shield that is extremely difficult to break.

A week after the installation, Michael Wescott, Project Manager, was so impressed with the results that he asked for the film to be installed on all 96 panels of the mansion's security station.

The hundreds of visitors who tour the mansion every year are unaware of the added protection that preserves the interior furnishings and increases the building's safety and security.





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## Course Summary & Resources

# Summary: Benefits of Solar Control Window Films

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## **Energy savings**

- Save energy and reduce cooling costs by lowering the amount of solar heat entering the building.
- A more efficient HVAC operation improves peak load shedding and reduces hot/cool spot variability.

## **Occupant comfort**

- Imbalances between interior temperatures and sunny and shaded areas of the building are minimized.
- Glare is reduced, thereby reducing eye discomfort and strain. Occupants are protected from the sun's harmful UV rays.

## **Fade protection**

- Interior furnishings are protected and their service life prolonged.

## **Aesthetics and privacy**

- Reflective window films can provide a uniform look to the exterior of your building, and frosted films can be used on building interiors to provide privacy and design elements.

## **Safety and security protection**

- Glass, if broken, is held in place until it is replaced.
- Safety and security films provide impact resistance in cases of attempted break-ins, severe weather, earthquakes, and explosions.

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# Conclusion

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