



**CS** Construction Specialties

**Mastering  
Movement™  
Academy**

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Mastering the Physical Movement of Sun and Light – Sunshades

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## Mastering Movement Academy

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## Learning Objectives

### UPON COMPLETING THIS COURSE, YOU SHOULD BE ABLE TO:

- Explain how to optimize the sun as a natural resource to decrease light and HVAC system demands and in turn improve building efficiency.
- Discuss external sunshade systems and their benefits including energy efficiencies and the positive impacts on the health, safety, and welfare of building occupants.
- Assess how proper sun management contributes to LEED and IECC 2021 Zero Code standards to provide healthier more productive spaces.
- Incorporate sunshades as both a functional system and aesthetically innovative design element.

## Course Overview

The sun is an integral part of our lives. As it moves around us, it can affect our mood, focus, performance, and overall well-being. While many impacts are positive, it can also bring adversities to our environments and personal comfort.

In this presentation we look at how the natural light and heat of the sun can be harnessed to benefit commercial spaces and their inhabitants. We will explore solutions to minimize energy consumption and improve occupant satisfaction. And we will delve into the criteria to utilize sunshades to elevate building performance and create visually striking designs.

## Course Overview

### IN THIS COURSE WE WILL EXPLORE:

- Components and applications of sunshades
- Energy saving functionalities
- LEED credit contributions
- Design qualities



## The Impact of Light

The human body is dependent on light to signal performance within the circadian rhythm. This internal system regulates wake/sleep cycles, concentration, metabolic health, and mental health.

The Sleep Foundation estimates that the circadian rhythm has a role in nearly every function of the human body. Exposure to natural daylight is essential to maintaining these functions but many individuals do not gain adequate exposure to natural light throughout the day.



**The EPA estimates that the average American spends 90% of their time indoors.**

Opportunities for exposure to natural light are often very limited by traditional building designs that rely on window tinting and internal shading devices. While these components do provide occupant comfort, it is at the expense of natural light integration. As members of the built community, we have a unique opportunity to provide positive impacts to human life by meeting people where they are spending most of their time: indoors – at work, school, while shopping, etc.

Photo by [Jimmy Dean](#) on [Unsplash](#)

## Daylighting integration within commercial buildings is proven to enhance occupant performance and comfort on various levels:

- Increased concentration
- Increased work and learning outcomes
- Improved mood
- Increased visual comfort
- Reduced headaches
- Reduced eye tension
- Reduced stress

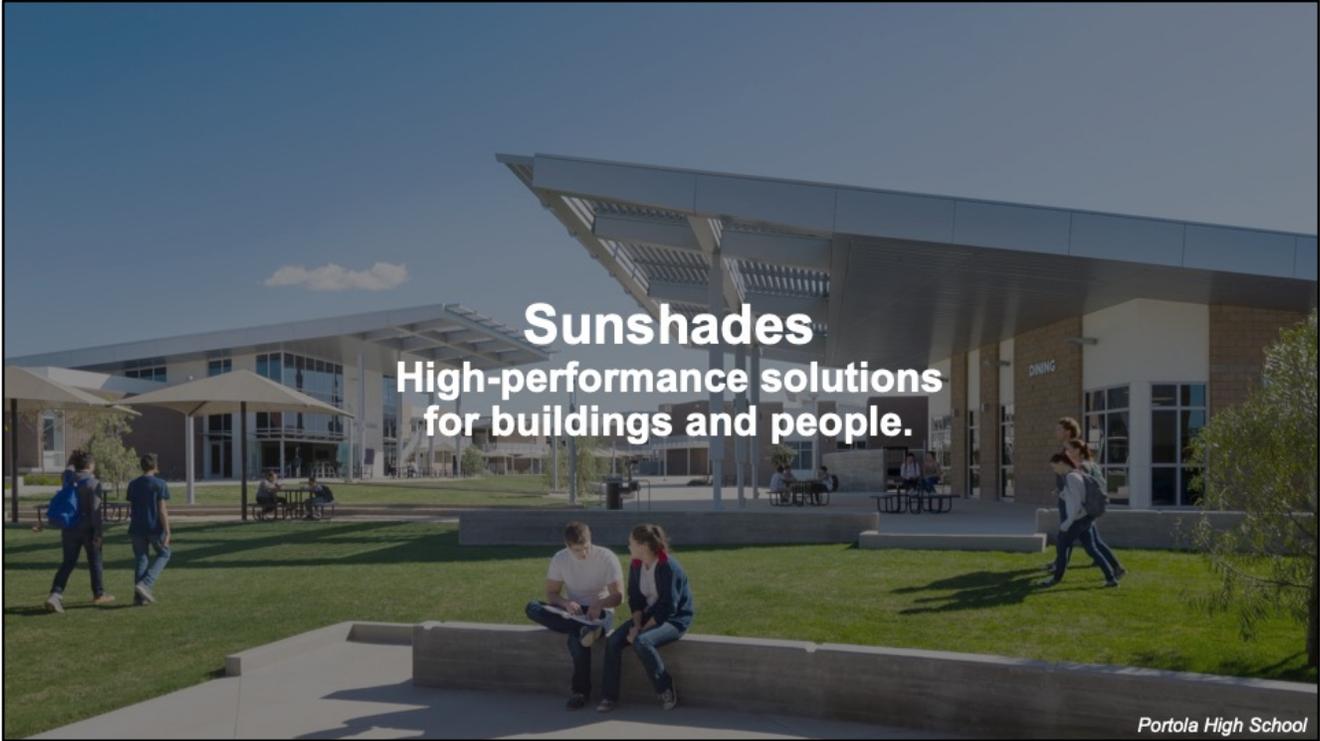


*Semans Library at UNC School of the Arts*



## The sun can also bring several adversities

to an environment including excess heat and solar gains, glare, and inconsistent lighting levels. Because of this, managing the sun requires thoughtful intent and purposeful solutions.



## Benefits of Sunshades:

- Optimizes energy performance by reducing demands on HVAC and lighting systems
- Reduces building operating costs
- Mitigates solar heat gains
- Minimizes glare
- Preserves views
- Supports daylighting
- Improves occupant well-being and performance
- Custom engineering provides enhanced design options
- Can be integrated with full building envelope and used to add shade to outdoor spaces



## Recognized by LEED and contributes to LEED Certifications:

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- EA Credit 1: Optimize Energy Performance
- IEQ Credits 8.1 and 8.2: Daylight and Views

Some sunshade systems, dependent on manufacturing, can also contribute to MR Credit 4: Recycled Content and ID Credit: Cradle to Cradle certifications.

## Aligned with 2021 IECC Zero Code Renewable Energy Appendix & ASHRAE Standard 90.1-2019

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- Reduces solar absorption
- Supports daylighting

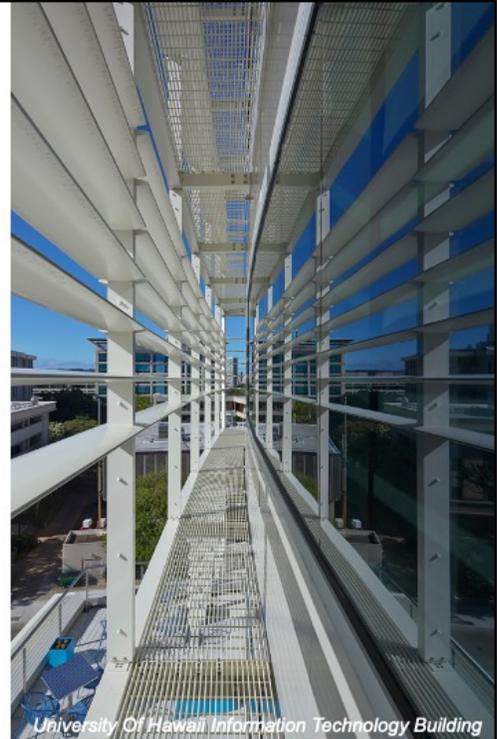
Shading the building envelope enhances window and skylight SHGC and U-factor performance and supports daylight requirements identified by ASHRAE as a standard to exceed minimum efficiency requirements.



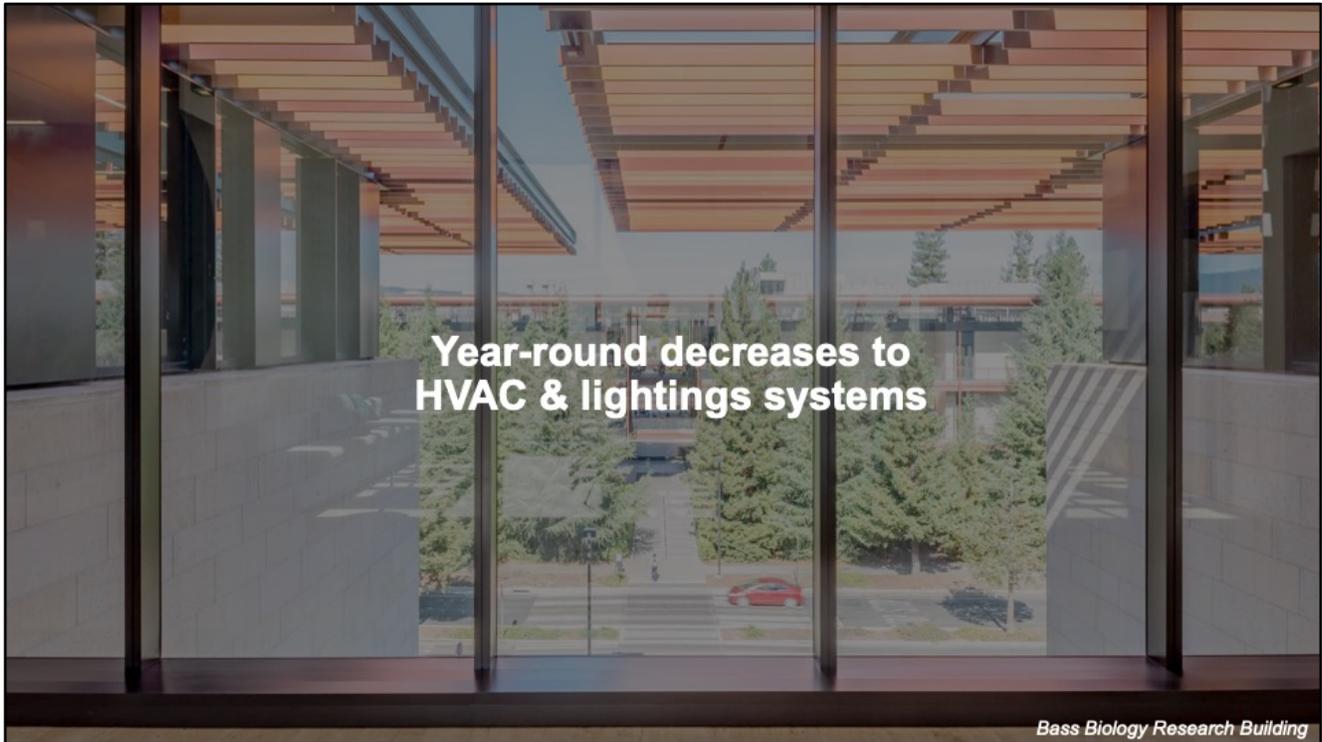
## Function

External sunshade controls are virtually maintenance free and offer the most efficient option to mitigate and optimize the impacts of the sun.

- External Shading System
- Interior Shading Device
- 80% solar gain reduction
- 20% solar gain reduction



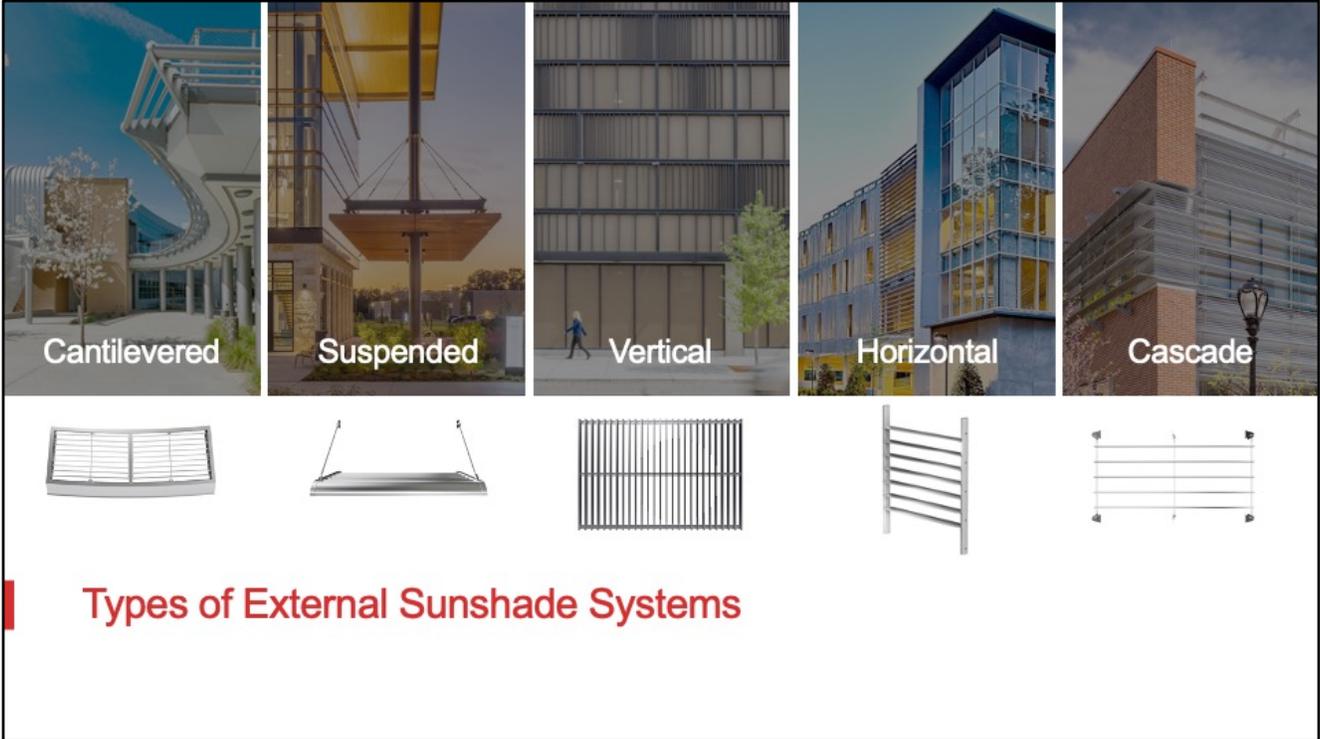
Interior options shade after the solar heat has entered the building. Shading the envelope actually blocks the sun penetration and prevents heat from entering the building. On average, building owners and facility managers can realize energy savings of as much as a 27% with exterior shading systems. There's more energy saving provided with exterior sunshades in hotter climates, and variables such as size of windows, design of the shade, and length of its overhang as well as the glazing employed will also affect savings.



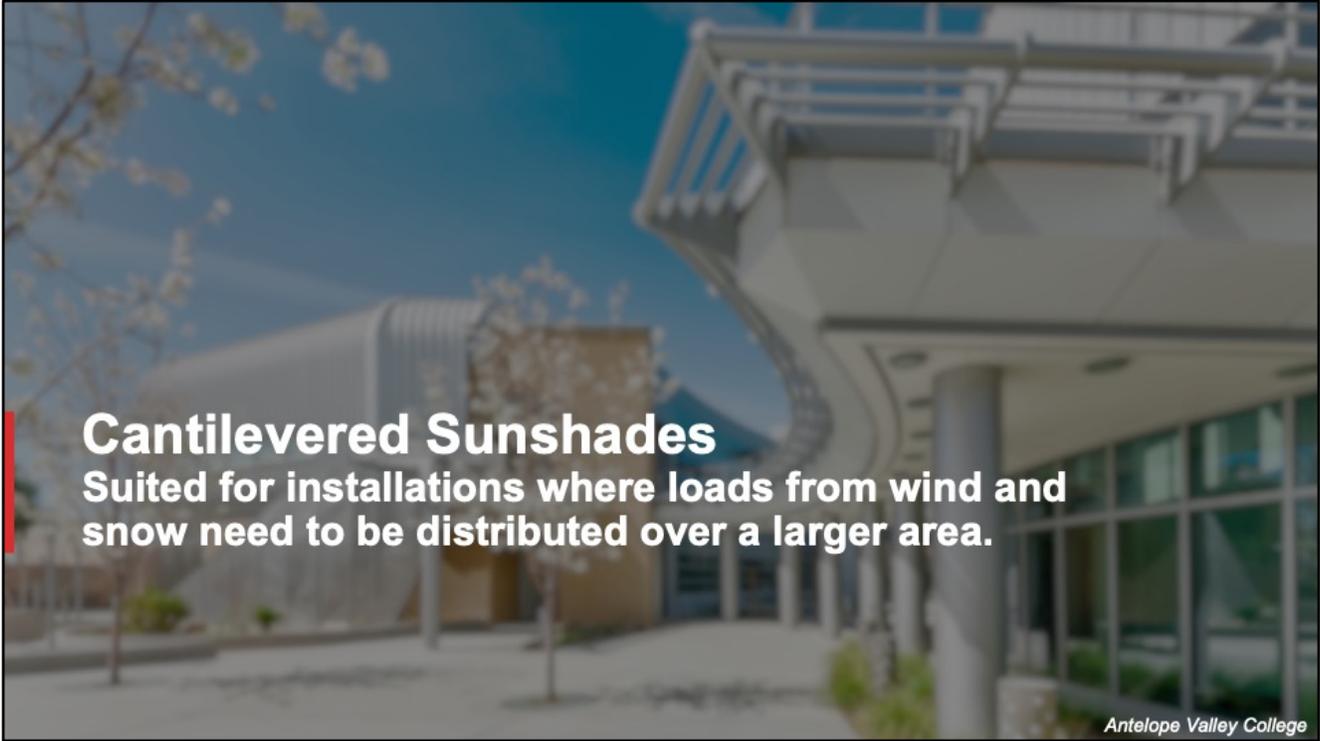
A properly designed sunshade system will block solar heat gains during warmer months and harvest heat in cooler seasons. System configurations are designed to allow optimal light, views, and options for window ventilation.



Video

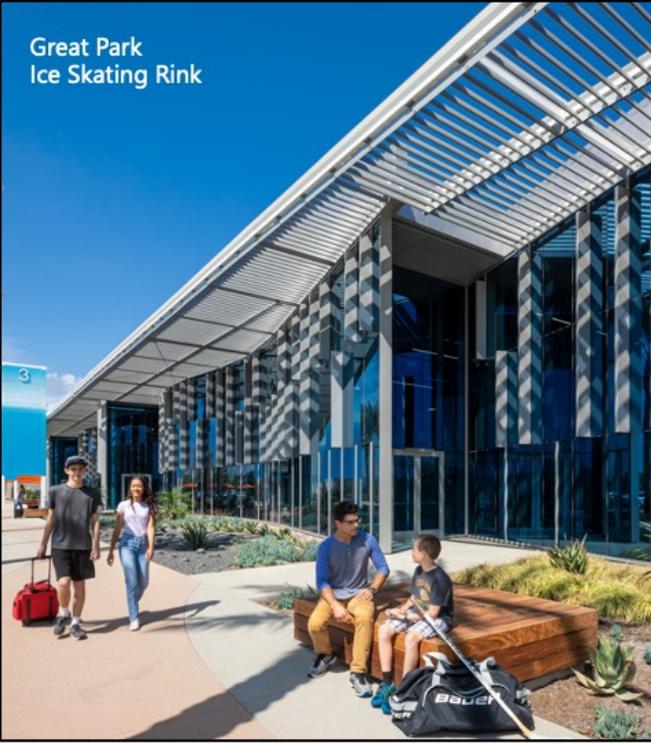


Sunshade systems can be custom engineered to meet your unique design, building conditions, and load bearing requirements.

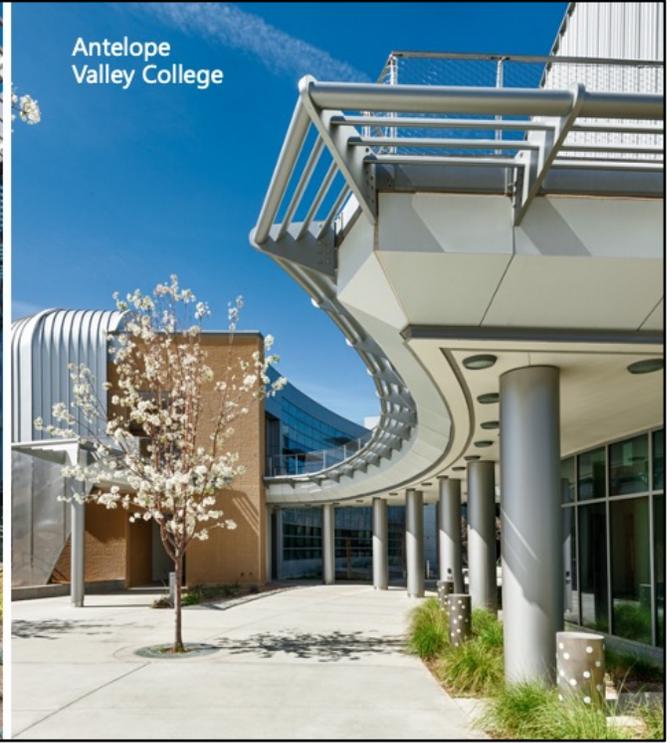


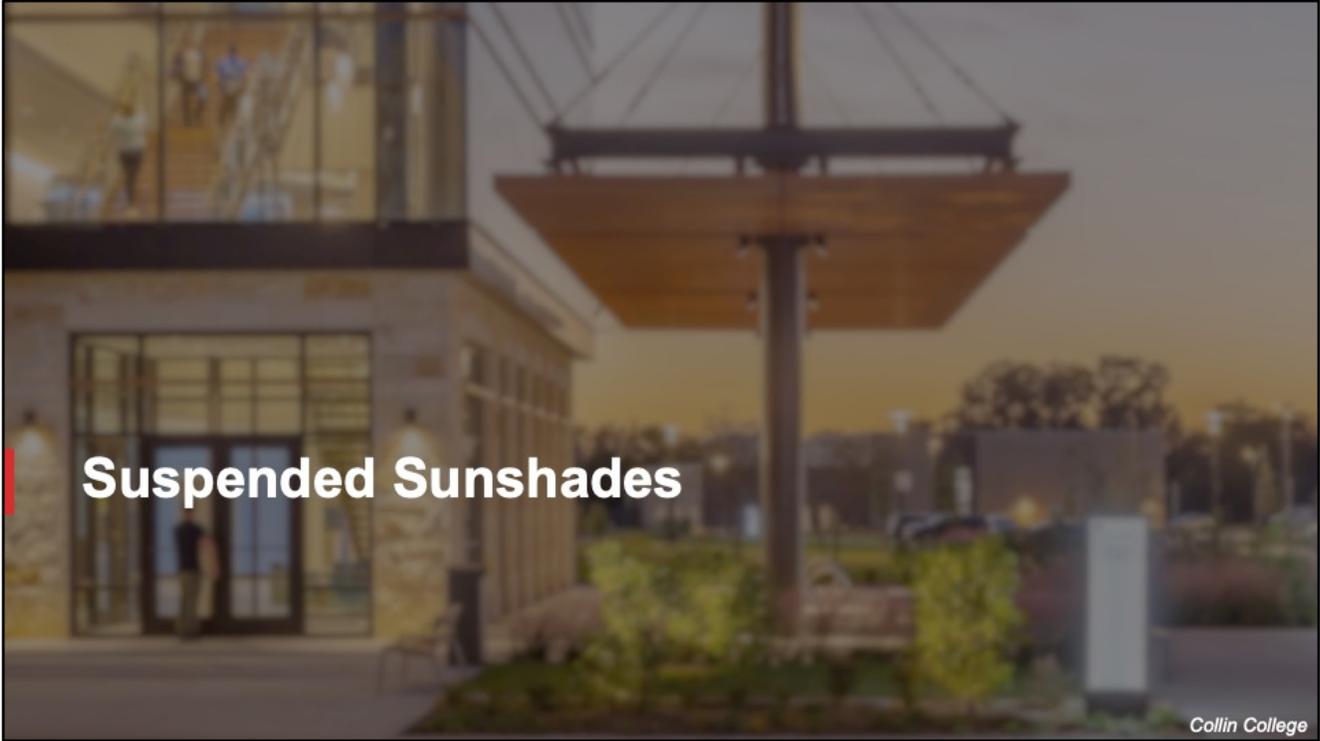
This is a traditional method that shades the windows and the interior space below. The sunshade system cantilevers off the building to cast a shadow below.

Great Park  
Ice Skating Rink

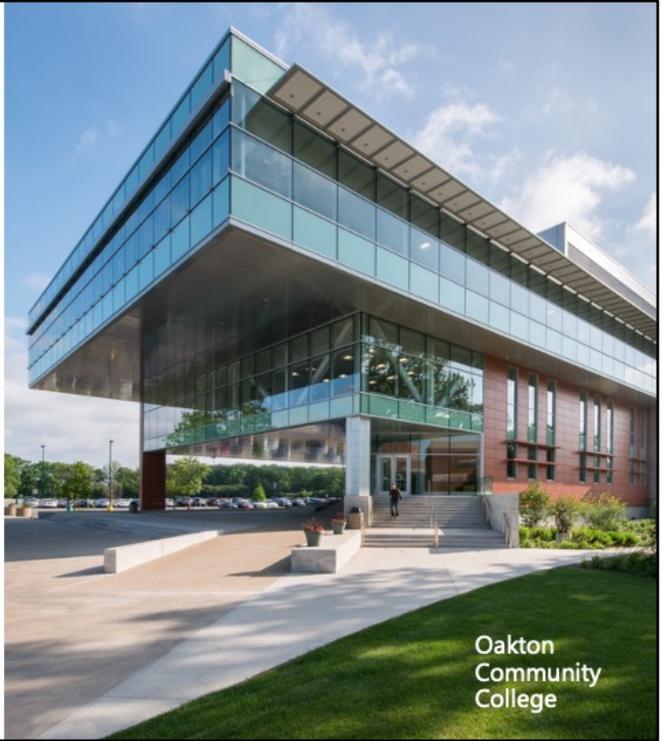


Antelope  
Valley College

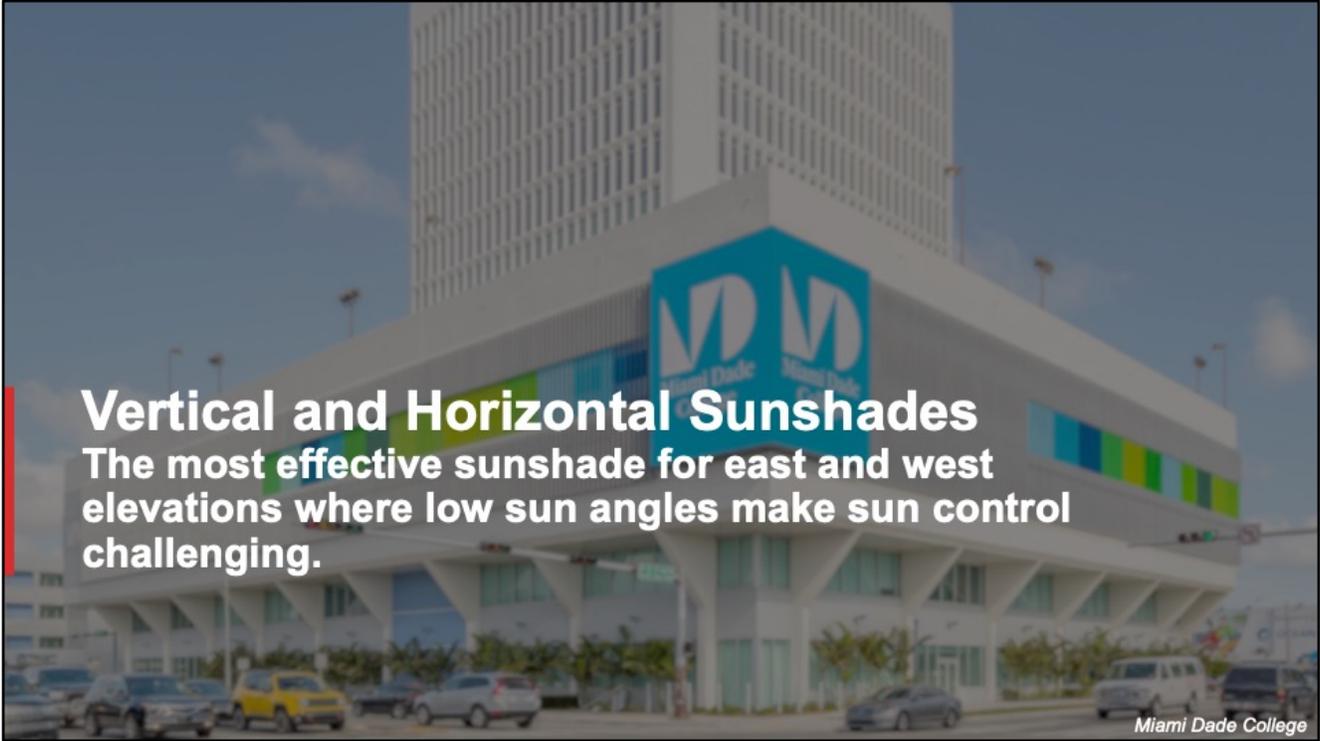




Suspended shades are systems that are mounted with an additional tie-back to the building, typically this tie-back member is a suspension rod or suspension cable. these type of systems are used for shades that have large cantilevers and need the added support.



Widen Photo: Left to Right:  
CollinCollege\_7  
Oakton Community College\_2

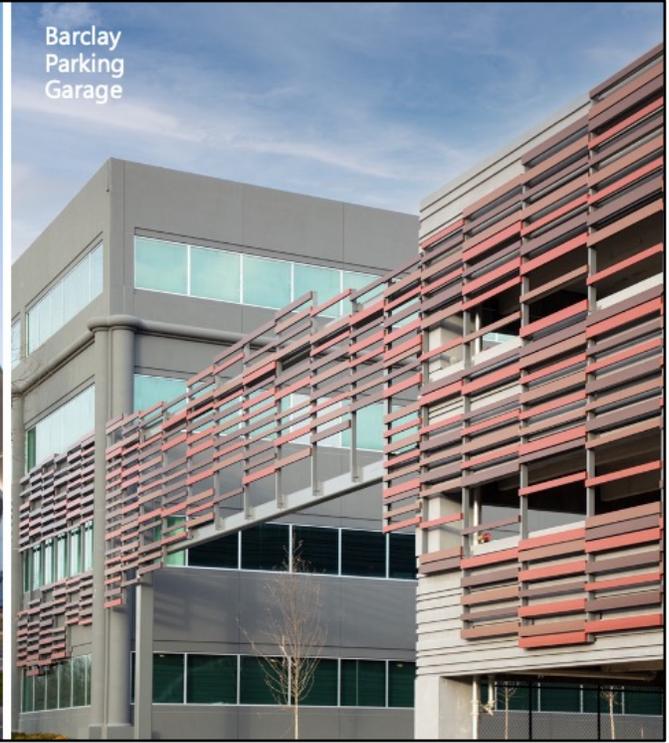


Blades vertically mount in front of the window and help shade the interior even when the sun is lowest on the horizon. Custom engineering allows the system to also function as a unique architectural element to enhance the building design.

Charlotte Douglas  
International  
Airport



Barclay  
Parking  
Garage





This system can be quickly and efficiently constructed on-site.





## Additional Enhancements

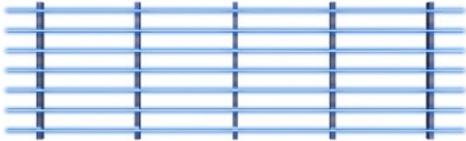
- LED lighting
- Custom fabricated shapes, patterns, and textures
- Nonmetallic materials such as solid surfacing (e.g., Corian)
- Materials can be manipulated to create unique aesthetic appeal

Sunshades can be custom engineered to allow for additional components that elevate performance and design.

## LED Lighting

Energy-efficient, very low voltage

LED lighting can be integrated within airfoil blades to create distinctive design opportunities.

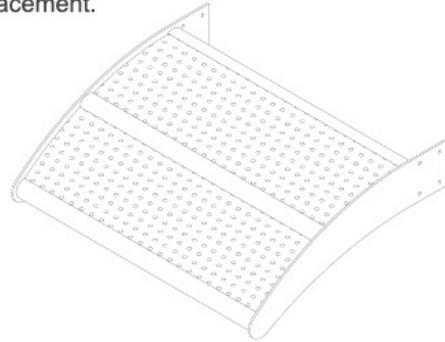




## Custom Fabricated Designs

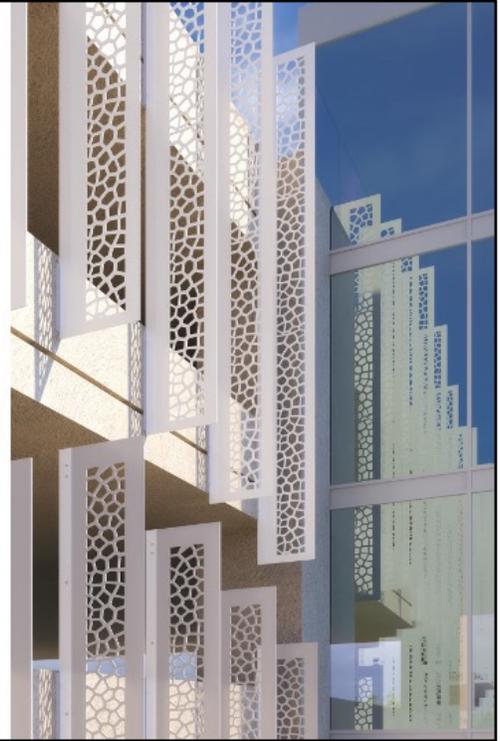
Unique shapes, patterns, and textures can be custom fabricated within the infill area.

The result creates dramatic shadowing and light dappling effects both indoors and out depending on placement.

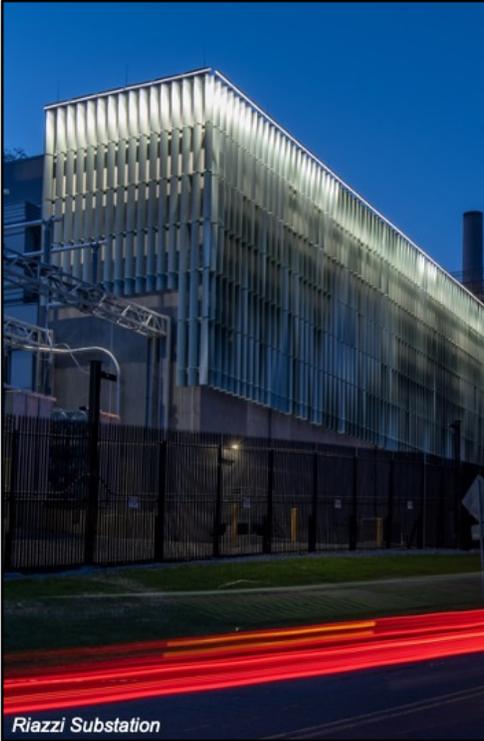


## Nonmetallic Materials

Nonmetallic materials such as Corian can be thermoformed into nearly any 2-D or 3-D shape to provide limitless design capabilities while achieving enhanced durability.



Product Photo: Left to Right:  
Corian-Mosaic  
Corian-Stencil

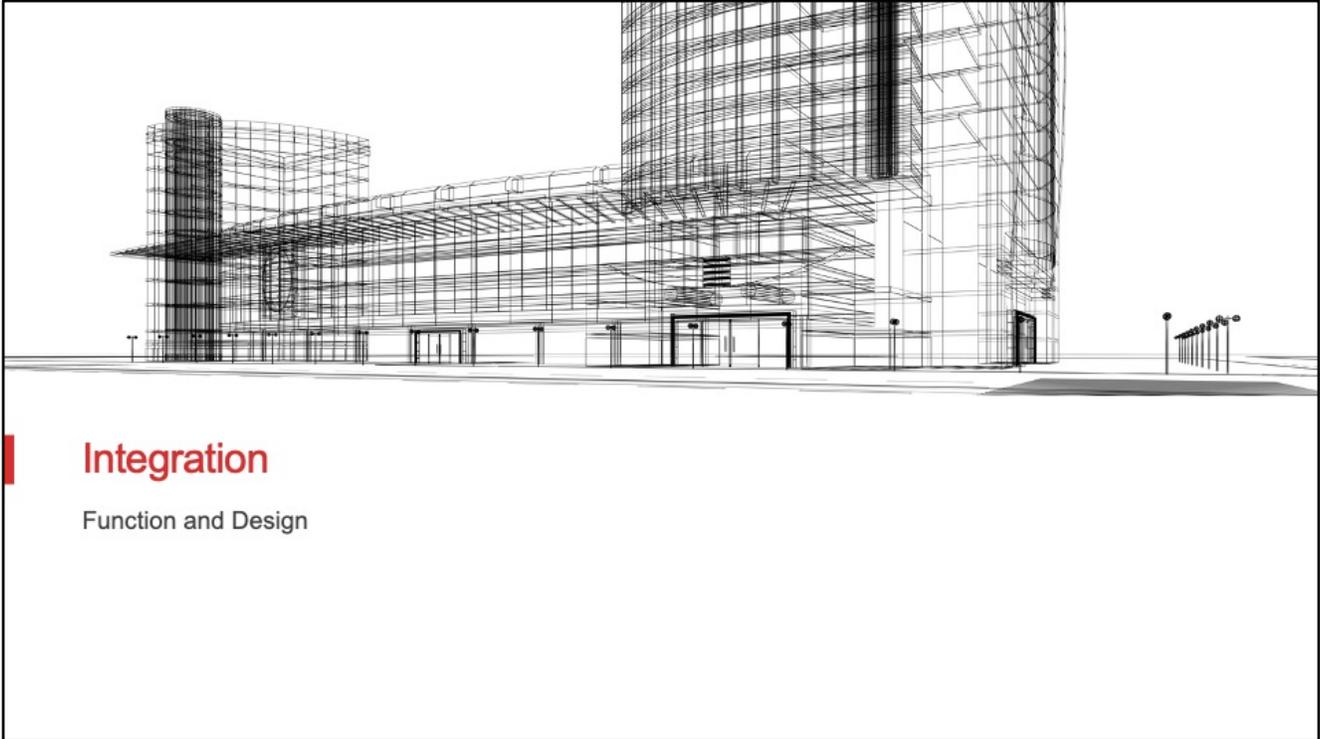


Riazzi Substation

## Shape Manipulation

Achieve the design flexibility of custom architectural metal and the performance of a sunshade system. Create the illusion of movement with a twisted extrusion and incorporate unique patterns to suite your vision for design.





## Integration

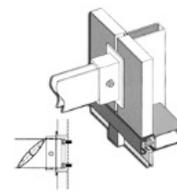
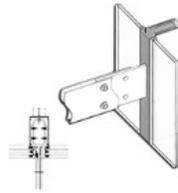
Function and Design

Sunshades span both function and design. Integrating a sunshade solution requires a holistic approach. Contracting engineering support from the beginning of the project is recommended.



## Applications:

Steel | Concrete | Metal panel | Curtain wall | Brick



Sunshades can be integrated with virtually any building material.

## Custom engineering versus pre-engineered sunshade systems:

### Pre-engineered

- Designed to fit standard window spans
- Standardized design options, profiles, and finishes
- Limited aesthetic enhancements
- Contributes to LEED certifications

### Engineered

- Designed for your unique project specifications
- Engineered to accommodate specified snow and wind loads
- Unlimited sizing capabilities
- Complete design flexibility including unique enhancements based on your original designs
- Start to finish project support
- Contributes to LEED certifications

When selecting a sunshade system, typically two options are available: pre-engineered and custom engineered. Both options can provide effective shading capabilities and contribute to LEED certifications. Custom options are often selected when a project design integrates sunshade elements as an aesthetic feature or when specific sizing based on loads are required. When opting for custom solutions, early involvement is recommended to ensure systems are properly matched to the building design.



Sunshades are a proven and powerful solution to reduce demands on lighting and HVAC systems and improving occupant satisfaction and performance. They can also be a striking design element. These projects demonstrate how function meets form when integrating sunshades as part of a building project.



*Boeing Everett Delivery Center*

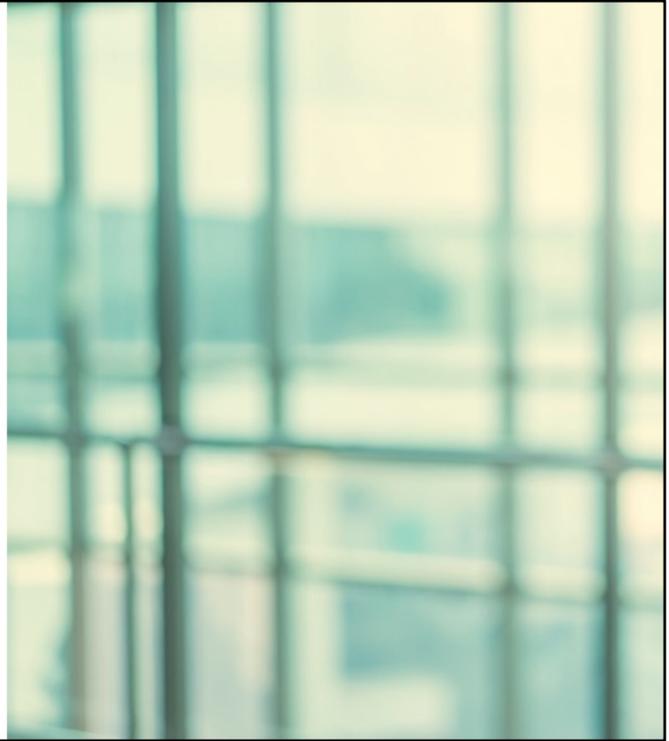


**Project:** Boeing Everett Delivery Center | Everett, WA  
**Architect:** DLR Group

The Boeing Delivery Center is a unique building with many functions. It is used as an event center, a showroom for commercial airplanes, an office for Boeing staff, and an international airport.

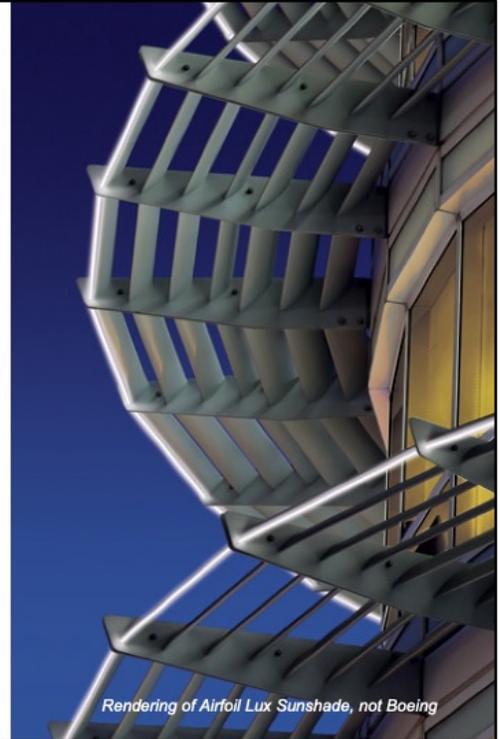
## Challenge

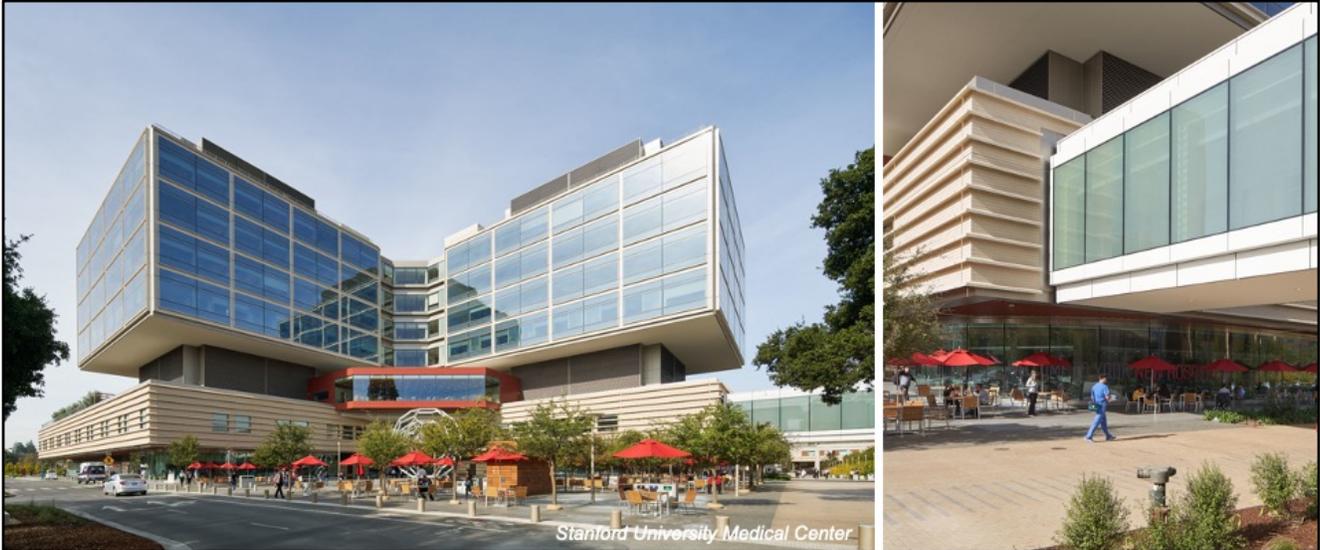
Reduce solar heat gain and glare during the day.



## Solution

Aluminum airfoil blades were added to a 10' cantilevered sunshade at the crown of the building and 3' cantilevered sunshades mounted to the windows below. The system was finished in a Cradle to Cradle Certified silver powder coating. The blades of the sunshade were illuminated with energy-efficient, very low voltage LED lights to add drama and recognition to the building after dusk.





*Stanford University Medical Center*

**Project:** Stanford University Medical Center | Stanford, CA  
**Architect:** Rafael Viñoly Architects

Stanford University Medical Center is internationally renowned for leading some of the most important medical advances. When they embarked on a facility expansion, they turned to Rafael Viñoly Architects to translate this commitment to innovation into a state-of-the-art medical campus.

## Challenge

Establish connections with the new and existing buildings while creating an enhanced environment that would be welcoming to patients, staff, and visitors.



## Solution

A modular layout was designed to incorporate the usage of outdoor spaces with hospital functions. A central atrium and rooftop gardens were created to integrate natural elements and green space. A dynamic sunshade system was used to create shading throughout the outdoors spaces. Sunshades were carried indoors to provide sun management without obstructing views of the surrounding gardens.



## Summary: Lighting the Path for Sunshades

- Consider shading systems early in project development to accommodate structural requirements and to ensure a cohesive design.
- Communicate increased energy efficiency and decreased operating costs with building owners to establish ROI.
- Integrate envelope shading with other buildings systems such as daylighting and HVAC building automations for even greater efficiencies.
- Utilize sunshade systems as custom architectural metal to enhance building aesthetics while also enhancing building performance.

As you consider sunshade strategies for your projects, remember: early design integration is vital for success. This not only provides optimal energy efficiency, is also allows greater design flexibility to match building characteristics and provide opportunities for creativity.



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