

# Peek Behind the Shade: Convention Center Roller Shade System Design

By Ben MacKenzie, PE

As Veil | engineered shading continues to expand shading consulting into new markets, I wanted to take a moment to reflect on where my career began, as a mechanical engineer designing in the large venue/convention center market sector.

Unbeknownst to me, the coordination challenges experienced first-hand between the architect and engineer on motorized roller shade systems would eventually lead me down a path that would lay the groundwork for what is now Veil. This article will take a dive into industry-wide challenges regarding roller shades on venue designs, as well as what our team at Veil does to extract incredible performance out of these under-represented products:

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**Overview of an Engineered Shading System**

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## Engineered Shading System

Today's venue has emerged as an icon of architecture and a reflection of the surrounding city. Gone are the box-like caverns seen solely as an exhibit hall, replaced by vibrant buildings for gathering and the sharing of thought and an embodiment of the culture of the city it calls home. Venues have come to host some of the most unique - and largest - curtain walls in present-day architecture. Thus, motorized roller shades have become a common solution to help tackle glare control of these expansive curtain walls and should be a priority for architects and engineers involved in these flagship projects.

Motorized roller shades have existed in the built environment for many years; however, they are often applied as a one-size-fits-all system that is briefly specified and treated as an afterthought rather than a key system in how a visitor experiences their space. The fact that they already exist in some form is a critical point. Since these are relatively common systems, the cost to implement a properly engineered roller shade system is minor, and most of Veil's projects have tailored these systems to reduce the overall cost through bespoke/ thoughtful design.

While systems such as electrochromic glass have emerged, slow reaction times, cost, poor interior visual perception, and lobbying issues (Weiss, 2022) have caused our team to be apprehensive with using them as a common solution on most projects. Veil prides itself as a novel member of the design team focused on window treatment design and control, improving the performance of numerous parts of traditional roller shade design to directly improve the effectiveness and experiences in your venue.

## Sustainability and Energy Use

Veil works together with your sustainability consultant, mechanical engineer, and lighting designers to, for the first time, seamlessly translate solar studies into a complete shading system design. We then provide proper information to your engineer to add the implications into the mechanical calculations allowing for quantifiable capital cost (reduced HVAC system size) and life cycle savings (reduced day-to-day energy use).

As a licensed mechanical engineer with thousands of hours spent in the venue market sector, I know firsthand how apprehensive engineers (mechanical, electrical, and technology) are to get involved giving input on roller shade design as it is a Division 12 system, and thus technically the responsibility of the architect. That said, the energy use from the abundance of glazing on today's convention center is a tremendous source of heating/cooling energy use and is a key driver in a venue's energy use intensity\* rating. **A dedicated shading consultant is your simplest way to allow engineers to benefit from the motorized shades in your design and quantify the design to directly reduce energy use** and pursue U.S. Green Building Council (USGBC) LEED certification and International WELL Building Institute (IWBI) WELL certification.

By understanding the impact of the roller shade on the most common daylighting metrics, Spatial Daylight Autonomy (sDA) and Annual Sunlight Exposure (ASE), our team routinely improves occupant comfort via glare control while also presenting opportunity for LEED and WELL pursuance. With a professional electrical engineer and lighting designer on staff, our team is equipped to help navigate the nuances of code requirements and industry-leading design best-practices to evaluate the daylighting implications of your roller shade system.



## A Closer Look at USGBC LEED + IWBI WELL Certification

Most projects pursuing LEED accreditation simply request a "green" or recyclable fabric, ignoring fabric performance, and more importantly, the engineered control performance of the system. True reduction in energy use comes from the proper application and integration of shading technologies while factoring shade fabric performance into an energy model, LEED points are available through the shading system through several key categories:

### LEED BD+C New Construction Indoor Environmental Quality - Energy and Atmosphere - 1 to 6 Points

Focusing specifically on option three: Systems Optimization, projects must improve beyond ASHRAE Standard 90.1-2016, and one of the least understood, yet easily realized, points considers the improvement of building envelope performance. The key factor to consider is that the 50% solar heat gain coefficient (SHGC) now includes the window shade factors. Veil works with one of the world's leading fabric manufacturer, Mermet, to provide complex glazing reports that show combined facade and shade thermal performance. Our team currently uses the common E-screen fabric (3% white/white) and shows a 60% improvement in SHGC performance when factoring in the fabric. Thermal-specific fabrics are also available to see even more pronounced SHGC reduction.

## LEED BD+C New Construction Innovation - 1 to 5 Points

USGBC created innovation credits to “encourage projects to achieve exceptional or innovative performance”. Veil has helped design teams use their roller shade systems to secure Innovation points through an integrated approach that ties the shading system into the Building Management System (BMS) to help reduce peak and operational heating/cooling loads.

## WELL Accreditation with Roller Shades

WELL includes features that provide points for shading solutions implemented on projects, WELL v1 Feature No. 60 Automated Shading and Dimming Controls Part 1: Automated Sunlight Control (Link) or WELL v2 Feature L05 Daylight Design Strategies Part 2 Integrate Solar Shading (Link) are routinely overlooked Features that rewards design teams and owners for implementing automatic shading control systems with the explicit intent to reduce glare at users' workstations. With nearly every motorized shade in modern building construction being driven by an intelligent motor, the cost to add or tailor control logic to these shades is minimal, especially compared to the cost of the overall shading system.

Like the cross-discipline requirements of the design & construction of roller shade system infrastructure, verification of these WELL features are also the responsibility of a project's MEP engineer. With the complete design-build capabilities of Veil and its contracting partners, and our licensed engineers on staff, we are a resource for all parties in the A/E/C industry to properly pursue, and capitalize on, WELL accreditations.

Visit our sustainability page at [veilengineering.com/sustainability](http://veilengineering.com/sustainability) to read more.

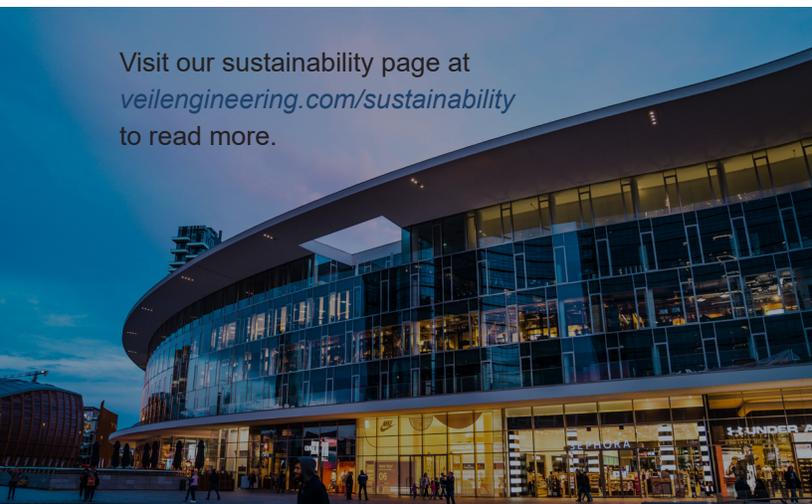
## Flexibility of Space

The commons/gathering space has emerged as the pulse of a venue, seen as critical to breakout sessions between larger meetings. Personally, these common spaces are where the true business and relationships happen. Often located at the exterior of venues, daylight and excessive glare are continuously a concern in these areas, and even a motorized shading system is not enough to properly address glare. Any system that relies on human interface will not function reliably. Local control switches should be replaced with engineered control sequences to make sure that glare is always controlled, and the shades remain hidden when not needed, maintaining views to the outside as often as possible.

Using solar tracking and audio-visual integrations is key in guaranteeing roller shades operate seamlessly without unwanted user interaction or distraction to allow spaces to adapt automatically to the needs of each event and benefit the venue's varying use requirements.

### Examples:

- Solar tracking roller shades automatically address glare to create comfortable environments in common spaces, removing the need for users to manually activate and control the shades.
- Integrated roller shades in meeting rooms tie into the lighting control and audio/visual systems to create scenes that compliment those created by the lighting and technology design teams. Ensuring the shade and communication control protocol during design is critical.
- Networked system with centralized facility control to allow entire building override or setting of shades to globally prepare for specific shows/needs.
- By creating a flexible, networked shading system, these control sequences can easily be modified throughout the life of the venue, allowing for features to be adjusted for the future needs of the space.





## Improving the Outdoor Space

Convention centers in cities with moderate climates (i.e. San Diego, CA and Ningbo, China) are providing a new experience for prospective exhibits through the creation of outdoor and open-air exhibit areas. However, advances in roller shade technology allows locations with more variable weather to transform the possibilities of outdoor meeting spaces. Zipper roller shades, such as Draper ZipShade, are a tool our engineers at Veil have used to give design teams and owners a way to create semi-enclosed outdoor spaces that create a flexible barrier against glare, wind, rain, and provide a barrier that allows for the tempering of outdoor space with heating/cooling. An overlooked benefit of these systems is the acoustical barrier that they create allowing for private meeting spaces in the center of bustling urban areas.

Our team integrates wind sensors to automatically retract the shades when severe storms pass through to protect the shade itself from damage. Exterior shades can cover large spans, with our team recently completing a design where an exterior area over 100 feet long was supplemented with roller shades to create an outdoor meeting space. Ultimately, exterior shading devices extend the useful season of outdoor space long past a standard “open” area.

While many interior fabrics are rated for outdoor use, the use of interior fabrics in exterior applications typically shortens warranty coverage. However, along with the uptick in exterior shade application, fabric manufacturers have developed some beautiful – and durable – exterior specific fabrics, including the Mermet Natté and Satiné (Link) bringing robust color options to designers.

On the topic of the exterior of our venue designs, most architects have heard of, or seen, the dreaded “checker-board” building now, where an otherwise uniform façade is spoiled by the random, uncontrolled appearance of white roller shades. While each color on a fabric swatch card has its place, all too often we see roller shade designs where exterior color and fabric selections are neglected, limiting the ability for an architect to control the final installed product. Several of today’s fabrics have dual-sided color options allowing designers to select, for example, dark exterior-facing colors to blend with the façade, and light interior colors to compliment the interior space. With the exterior appearance of a modern convention center being a key quality, exterior appearance of the roller shade system is a critical component for the design team to control. This can go one step farther in proper control sequences to “reset” or align the shade hem bars when spaces are not in use.

# Acoustical Considerations of Roller Shades

Let's face it, venues are loud. The roller shade presents an opportunity to add a large "acoustically absorbent" surface to a space, which can be especially important in the previously discussed commons/gathering spaces in venues where overall noise is regularly an issue. Traditionally, specifications only focus on the acoustic implications of a motor—**the fabric is key**. The noise reduction coefficient (NRC)\* is simplifying the effectiveness of a material to absorb sound from a scale of 0.0 - 1.0, the higher is better. Roller shade fabric can range from NRC 0.0 for a blackout fabric (Mermet flocke) up to the impressive NRC 0.50 (Mermet E-screen 1%), which can exceed the NRC of carpet. The difficulty of roller shade acoustics comes from the variability of these numbers. For example, by changing the openness factor\* of a single fabric, using E-Screen, a robust "work horse" fabric, you see that E-screen 1%, 3%, 5%, and 10% has a wide breath of NRC ranging 0.50, 0.15, 0.10, and 0.05 respectively, or exceptional-to-poor, all depending on the openness factor (Mermet, 2020). Acoustical benefits of roller shade fabric extend past fabric selection.

Engineered control sequences are a woefully under researched area of building science. Veil is currently kicking off an acoustical study with the University of Nebraska where our team aims to test an acoustical interlock where shades are deployed under conditions of continuous noise exposure over a set threshold.

*\*EUI: Energy Use Intensity (NRC) Energy use intensity (EUI) is an indicator of the energy efficiency of a building's design and/or operations. EUI is expressed as energy per square foot (or meter) per year. (AIA, 2020)*

*\*NRC: The Noise Reduction Coefficient (NRC) is a scalar representation of the amount of sound energy absorbed upon striking a particular surface. An NRC of 0 indicates perfect reflection; an NRC of 1 indicates perfect absorption. (Lindeberg, 2018)*

*\*Openness Factor: How much open space is present in a fabric, think views and light through. A 10% openness fabric means that 10% of the fabric surface is open for light to pass through.*

## Sources

AIA. (2020, August 20). Energy use intensity (EUI). The Voice of the Architectural Profession in California. Retrieved April 24, 2022, from <https://aiacalifornia.org/energy-use-intensity-eui/>

Mermet. (2020, November 17). Enhancing Acoustic Performance through the use of Window Shade Fabric. Mermet USA. Retrieved January 12, 2022, from <https://mermetusa.com/site/user/files/1/enhancing-acoustic-performance-white-paper.pdf>

Lindeberg, D. (2018, February 5). What is NRC, STC, and SAA? Design Strategies. Retrieved January 12, 2022, from <https://www.dsfinishes.com/ds-blog/2018/2/5/what-is-nrc-stc-and-saa>

Weiss, L. (2022, January 7). Boon for 'dynamic Glass' offers window into budget bill lobbying. Roll Call. Retrieved January 10, 2022, from <https://www.rollcall.com/2022/01/10/boon-for-dynamic-glass-offers-window-into-budget-bill-lobbying/>



**We could talk shades all day.**  
Let's work together.



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