LICENSED ARCHITECT

Association of Licensed Architects

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Spring 2022

Architectural Photography: Getting the Best Shot

Beyond Energy - Glass in Architecture

Design of Monumental Stairs

Sign Language Interpreter's Stations

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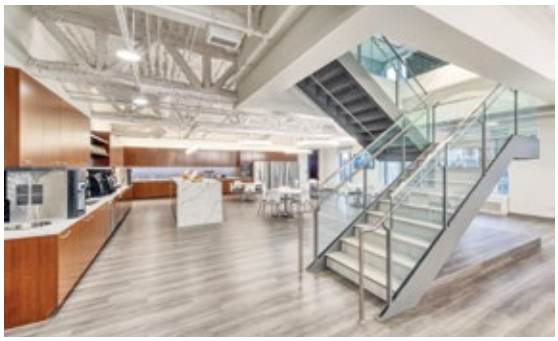

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Cover Photo:
The Kartrite Resort & Indoor Waterpark, Monticello, NY (Courtesy ADCI, Inc)

PRESIDENT'S message

Welcome to the spring issue of Licensed Architect Magazine. We hope you will send us your comments about topics of interest and even articles you might like to contribute.

So far, our spring has been very busy: first with the ALA Design Awards Celebration at Wingspread, Racine, WI on April 8. This was a wonderful opportunity to start moving toward more in-person events. Wingspread, designed by Frank Lloyd Wright, was the perfect setting for the presentation of 31 design awards. Attendees toured the home, enjoyed a cocktail reception and some even stayed overnight at the inviting Guest House designed in harmony with the prairie style of Wingspread.

On May 24 we held the ALA Building Enclosure Conference at the Mid-America Carpenters Regional Council. This event was in person and available via Zoom. The conference featured three speakers with topics on detailing, waterproofing and roofing. A tour of skill advancement centers was included for those who attended in person. We were so pleased to see more than 65 attendees in person. I know we have missed the connection and the energy that is created when seeing and socializing with our group.

On June 7, a two-hour program, *The Ethical Practice of Architecture*, was presented both in person and via Zoom at the Minnesota Builders Exchange.

The trend back to in-person events continues into the summer and fall with our golf outing September 14 and our second conference, slated for November 10. Our Programs Committee is planning more programs including tours for summer and fall. Stay tuned.

A bit delayed and upcoming: Due to the pandemic, our 2022-2023 Board elections were postponed. They will be held in June. Our 2023-2024 elections will be held in the fall with installation at the Annual Meeting in December.

While the last couple of years have been challenging, we continue to provide quality programs and content for our members and look forward to the opportunities that are ahead. I am honored to serve ALA as President. Thank you to the members, affiliates, and sponsors for your continued support and I hope everyone will join me to help make the future great!

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Association of Licensed Architects
400 E. Randolph St., Suite 2305
Chicago, IL 60601
Phone: (847) 382-0630
Fax: (847) 382-8380
E-mail: ALA@alatoday.org
Web Site: www.alatoday.org

A TO B PUBLISHING INC.
662 Dudley Avenue
Winnipeg, MB CANADA
R3M 1R8

PUBLISHER
Andrew Pattison
204.275.6946
marcomap@shaw.ca

ADVERTISING SALES
Bert Eastman
204.997.6371
bert@atobpublishing.com

Wayne Jury
204.803.1300
waynej@atobpublishing.com

PRODUCTION TEAM
harper media
your social media strategy & web marketing partner
700 - 200 Main Street
Winnipeg, MB
R3C 1A8

DIRECTOR
Aaron Harper
204.318.1121 xt. 101
aharper@harpermedia.ca

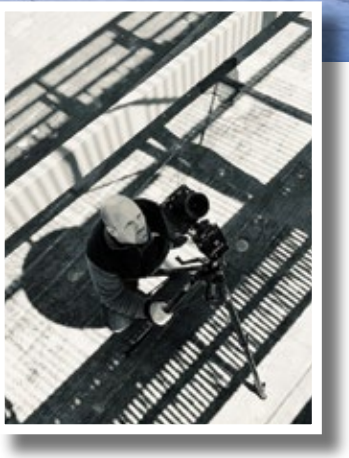
LAYOUT & DESIGN
Joel Gunter
204.318.1121 xt. 108
joel@harpermedia.ca

Getting the Best Shot: A conversation with Cameron Campbell, Architectural Photographer

Cameron Campbell, AIA, Integrated Studio, an architectural photographer, architect and academic at Iowa State University, has been taking photos since he was 13 years old. He shares his thoughts on the joys and challenges of his art and how he works with architectural firms.

PHOTO: CAMERON CAMPBELL, INTEGRATED STUDIO

ALA 2021 Gold Award Winner: Monroe County Hospital & Clinics Outpatient Expansion, Albia, IA; INVISION Architecture.



An architectural photographer needs to know the story:

"When starting an assignment, I need to understand the project and what the intentions are. Then I scout and assess the building and how to photograph it." Campbell says this comes from experience and, of course, from his background as an architect. "It's knowing how to move about the building and where to be throughout the day to get the best light."

Photo: Cameron Campbell, Integrated Studio

ALA 2020 Presidential Award Winner: Ullem Chapel, Moravia, IA; ASK Studio.

Photo: Cameron Campbell, Integrated Studio

ALA 2021 Gold Award Winner: Lincoln Savings Bank Central Campus, Waterloo, IA; INVISION Architecture.

Architectural photography takes time, timing and a little bit of luck.

It's also about how people feel when walking into a building. "When you enter a building, it's different from what the camera sees. Your brain fills in the blanks and leaves out little details, such as missing or out-of-place elements that might be discordant when captured on camera. To simulate the experience of walking through the space, we work closely with the client on staging."

Timing is everything:

Architectural photography takes time, timing and a little bit of luck, says Campbell, given construction schedules, the seasons and the unpredictability of the weather.

On recent assignments:

Campbell photographed two projects for INVISION Architecture that received 2021 Gold Awards from the Association of Licensed Architects. One project, Lincoln Savings, featured an overview shot from the atrium, which cleverly showcased the new elements of the building while honoring its historic past as a John Deere Tractor Company facility. Understanding the project's design intent and getting access to the atrium vantage point through his relationship with INVISION allowed him to get this impressive shot.

For the 2020 ALA Design Awards Presidential Award winner, Ullem Chapel, designed by ASK Studio, Campbell and crew, loaded down with equipment, trekked through farm fields on a sweltering Iowa summer day. Despite the challenge of potential disruption by a herd of cows, the resulting photos beautifully tell us the purpose of the chapel: A place for quiet contemplation and appreciation of nature.

ADCI
experience | architecture | design

Architectural Design Consultants, Inc. of Wisconsin Dells and Madison, WI — a 2022 Best Firms to Work For Zweig Award winner — offers comprehensive architecture and interior design services across varied markets, with projects all over the United States. The firm's relationship-first approach helps them build strong, successful partnerships and create imaginative spaces with both a compelling user experience and efficient function.

Senior architect Ryan McKichan has been with the firm since 2004 and is an important asset to ADCI's hospitality team and more. McKichan's unique designs blend creativity and intentionality for high-profile projects that demand constructability as well as streamlined operations.

OKANA Resort & Indoor Waterpark, Oklahoma City, OK

Set in the heart of the Oklahoma City River District, OKANA rejuvenates a complex redevelopment site and builds connection on a massive scale, integrating public waterfront and bike trails with unique cultural destinations like the First Americans Museum.

Credits: Photos By JakeRost Photography of Madison, WI

Tangent, Madison, WI

This upscale kitchen and taproom, located in downtown Madison's booming E Washington Ave corridor, combines rustic flooring, opulent chandeliers, Moroccan-style tile and art-deco-inspired wallpaper for a vibe uniquely its own. Floor-to-ceiling windows showcase a view of the Capitol dome.

Credits: Photos By JakeRost Photography of Madison, WI

Lake Delton Fire & EMS Complex, Lake Delton, WI

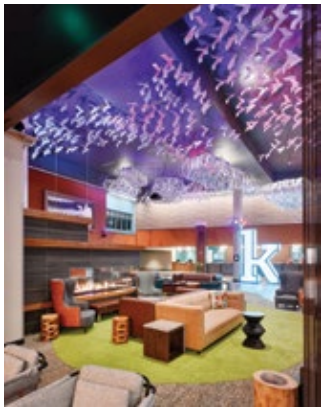
After outgrowing previous facilities, Village fire and EMS personnel needed a solution that increased space and improved function. The new 34,000-SF building houses the fire station, an emergency operations center and a fitness facility that serves multiple local government agencies.

Credits: Exterior Photos by JakeRost Photography of Madison, WI; Interior Photos Courtesy of Ideal Builders

Ginger Bread House Preschool, Sun Prairie, WI

In designing their second business location in the Greater Madison area, ADCI helped Ginger Bread House develop a signature look, creating a homey, welcoming environment with gabled roofs and craftsman-style details. This facility includes classrooms, a kitchen, and support spaces.

Credits: Photos by Mike Rebholz of Ontonagon, MI



The Kartrite Resort & Indoor Waterpark, Monticello, NY

A modern luxury lodge and cutting-edge indoor waterpark are a stunning addition to NY's historic Catskills. This 2019 Aquatics International Dream Design and winner of the 2019 WWA Leading Edge Award has 324 suites, a conference center and a spa.

TANDEM
ARCHITECTURE

Founded in 2006, Tandem Architecture is an award-winning, full-service architecture firm based in Chicago with work across multiple states. Our roots are in residential design of custom, production and multifamily homes. We currently have multiple mixed-use, transit oriented developments (TOD) projects around the Chicagoland area where we are also performing land planning and entitlement services for the properties.

In addition, we have designed many commercial projects from private car galleries to finished office spaces and light commercial buildings. Since our Team has worked in both construction and development our experience in these areas allows us to offer our clients knowledge and insight that most Architecture firms cannot offer.

Itasca Station, Itasca, IL

Conceptual Design for Itasca Station, an 87 Unit Mixed-Use TOD apartment building in Itasca Illinois.

Glenwood Station, Glen Ellyn, IL

Glenwood Station an 86-unit Mixed-Use TOD apartment building set to start in Summer of 2022 in Downtown Glen Ellyn, Illinois.

Quincy Station, Westmont, IL

Quincy Station is a 94-unit Mixed-Use TOD apartment building which will anchor a revival of Downtown Westmont Illinois. Construction to be complete in June 2022

Lilac Station, Lombard, IL

Lilac Station Mixed-Use TOD apartment building – We won the design submission for the proposed use for an open site in Lombard Illinois. This 118-unit Mixed-Use TOD apartment building and 10,000sf grocery store is currently under construction, to be completed in Spring 2023

Lilac Station Commercial Building, Lombard, IL

Lilac Station Commercial Building is a 10,000sf one-story commercial building designed for a CO-OP Grocer tenant, construction to be completed in Fall 2022

Private Car Gallery, Chicago, IL

Private Car Gallery – This private car gallery was designed as a showplace for 14-18 collector cars to be viewed from the owner's lounge area through a wall of glass.
Emily Gualdoni Photography

Lincoln Square New Single-Family Home, Chicago, IL

This Modern Farmhouse design home blends into this Chicago neighborhood of classic siding and frame homes, with its own modern flair

Beyond Energy: How Glass in Architecture Contributes to Occupant Well-Being and Comfort

Glass as a multifaceted solution for post-pandemic commercial and residential construction

BY: ERIKA FREDRICKSON

Glass is a significant architectural technology featuring versatile applications and the ability to achieve several purposes at once. The multifaceted material is used for transparent glazing in the building envelope to harness natural light and provide views. At the same time, it can incorporate safety characteristics that prevent severe weather or guard against assault—such as intentional breaking in or bullets—from affecting the building and its occupants.

Glazing technologies have improved in the form of high-performance thermal systems, which can help building owners hit or surpass sustainability goals. The wide range of aesthetic possibilities make it a unique design element inside and outside, while still being functional on other levels. More recently, in light of a worldwide pandemic, glass offers a solution for homes and commercial buildings to help decrease virus transmission and make healthier, happier spaces for people.

Bird-Friendly Glass

There are so many functions that glass can perform in combination with its basic natural-light qualities. In fact, the glass industry is always finding new ways to meet design needs. One example is bird-friendly glass, which has recently become a hot topic in the glass world.

PHOTO: GEOFF CAPTAIN; COURTESY OF C.R. LAURENCE

Shown is a clear-view glass partition system with a swing door.

Glass is a multifunctional product… and need not be specified to satisfy just one design goal.

According to the American Bird Conservancy (ABC), about 1 billion birds die annually from colliding with public and private buildings. The passive, invisible killer? Clear and reflective architectural glass. Windows of all sizes in both commercial and residential buildings in urban, suburban, and rural landscapes are thought to be invisible to most or all birds due to fly-through conditions, reflected habitat conditions, or a black-hole effect.

A fly-through condition is created when architectural elements provide birds with a clear line of sight to sky or vegetation on the other side. A reflected habitat condition is a condition in which the reflected image in glass is undisturbed and blends with the surrounding habitat (i.e., sky, vegetation). A black-hole effect, also known as a "passage effect," is a condition in which glass can appear black due to lighting conditions and create the appearance of a cavity or passage through which birds can fly. All of these conditions can create hazardous environments for birds.

Specific buildings may accrue more bird deaths than others due to the large amount of glass and vegetation present. Bird collisions occur throughout the world at all times of day, in every season of the year, and under all weather conditions.

Photo Courtesy of Walker Glass Co. Ltd.

The City of Seattle's Cedar River Municipal Watershed Headquarters located in North Bend, Washington, features bird-friendly glass with acid-etched designs so that birds can identify the glazing and avoid collision.

Even just 10 years ago, there was little science for bird-safe technology and very few products available to architects. Over the past decade, however, increased media attention to the issue has attracted the interest of the public as well as building industry professionals such as glass manufacturers, architects, developers, and landscape designers. The demand for bird safety has resulted in many products tested and marketed as bird safe, and research on bird-glazing collision prevention has guided the development of bird-friendly building design.

The key to bird-safe glass is in transforming clear and reflective glazing into barriers that birds will see and avoid.

Solutions and Mitigation Strategies

Creating visual markers: Research has shown that birds begin to perceive buildings and houses as objects to be avoided when the distance between features or patterns on the glass is approximately 11 inches, with the most effective pattern distance at 4 inches edge-to-edge or less. The denser the pattern, the more effective it becomes in projecting itself as a solid object that is perceived by birds. The following glass and glazing products can help minimize bird-related injuries by creating visual markers:

- Etch
- Frit
- Film
- Decals
- Fenestration patterns of vertical and horizontal mullions
- Decorative grilles and louvers
- Artwork
- Ultraviolet (UV) patterns

Making architectural glass safe for birds is a responsible bird-friendly building design practice. The application of markers that are visible to birds and humans or visible to birds only and spaced 2 inches vertically or 4 inches horizontally on the outer pane of a window, with markers ideally located on or adjacent to the outer glass surface, will reduce bird-window collisions. Products following these prescriptive rules repeatedly have been shown to reduce collisions in an effort to help eliminate bird strikes. Products may be tested in order to verify the potential contribution to a bird-friendly design. The results of testing can provide documented third-party results of the threat factor (the lower the better) of a particular glazing solution.

Muting reflections: Muting reflections is an important strategy in glass facade design. Strategies to mute reflections include:

- Angled glass
- Awnings and overhangs
- Sunshades
- Screens, grilles, or mesh
- Shutters
- Louvers
- Window film

Dimming artificial lights at night: The bright artificial lights found in metropolitan areas can attract and disorient migrating birds. In cities located throughout North America, a program such as "Lights Out" may be effective in reducing bird deaths.

Studies have shown that creating visual markers, muting reflections in glass facades, and minimizing light pollution are ways to create more bird-friendly environments. There are a variety of glass and glazing solutions offered by glass fabricators and other stakeholders that will reduce bird collisions.

Legislation and LEED as Drivers for Bird-Friendly Glass

In June 2020, the U.S. House of Representatives passed H.R. 2, the Moving Forward Act, which included H.R. 919, known as the Bird-Safe Buildings Act. The bill mandates that all public buildings managed by the General Services Administration (GSA)—including new construction, newly acquired buildings, and buildings set for substantial renovation—be designed or altered with bird-friendly materials.

There are many exceptions, including buildings on the historic registry, but those that must become bird-friendly require that 90 percent of the exposed facade material from ground level to 40 feet be either not composed of glass or composed of glass with bird-safe modifications. It also requires that at least 60 percent of the exposed facade above 40 feet meet a modified glass standard, that there should be no transparent passageways or corners, and that all glass adjacent to atria or courtyards containing water features, plants, and other bird attractants also meet the glass standard.

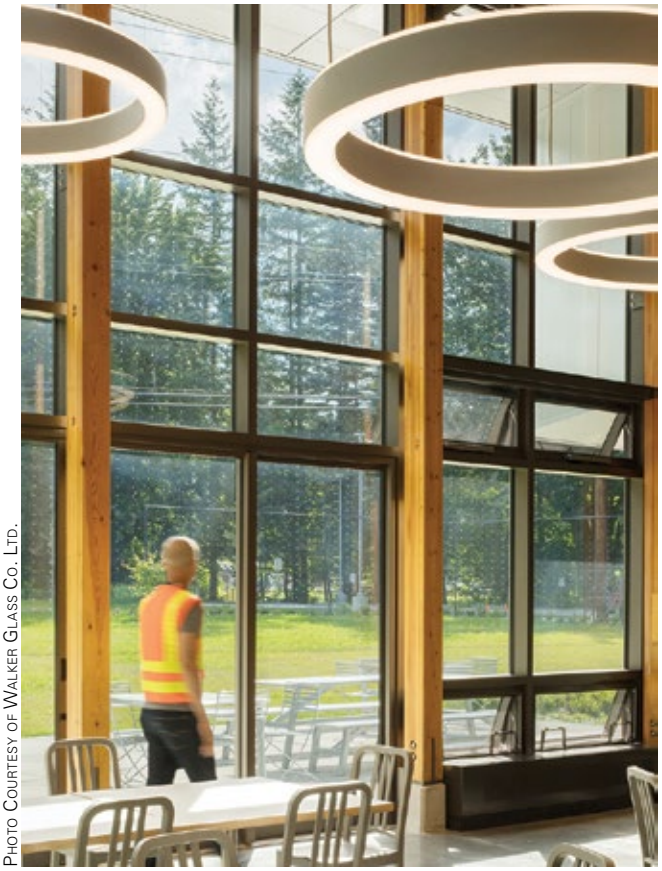


Photo Courtesy of Walker Glass Co. Ltd.

Birds can perceive etching on glass and glazing products, which helps minimize bird-related injuries by creating visual markers.

Legislation is one way to push for bird-friendly glass. There are also incentives. The U.S. Green Building Council's Leadership in Environmental and Energy Design (LEED) green building rating system now enables architects, designers, developers, and building owners to earn credit for incorporating design strategies that reduce bird collisions. The credit is currently being tested in the LEED Pilot Credit Library, a rating system development tool that encourages new or innovative green building technologies.

Glass Is Essential To Occupant Wellness And Comfort

Especially during the 1970s, construction strategy focused on how to manage natural light by blocking it out and using artificial lighting techniques instead. But in recent years, research has shown how important natural light is to occupant well-being for mental state, physical health, and productivity. This rediscovery of natural light as an essential part of building design has led architects to not only incorporate natural light but also harness it in new ways—and one major way to do this has been with glass.

In addition, the global pandemic has shifted workspaces to the home, perhaps in some cases permanently. This section looks at how glass contributes to wellness and comfort, and how new designs using architectural glass are helping to create workspaces that are enhancing the home in new and exciting ways.

Photo Courtesy of Hartung Glass Industries)

Providing daylighting in hospitals—such as this example in St. Luke's Meridian Chapel in Idaho—has shown to reduce patient depression, among other health benefits.

Connections between Glass and Well-Being

Humans are outdoor animals. Our bodies' immune, cardiovascular, and metabolic systems and sleep-wake cycles depend on this light-dark cycle to function properly. Daylight at the right time improves our mood, helps us sleep better at night, manages our weight, and helps us ward off disease. The ability to view the outside environment is also important. On a physiological level, it helps us relax and refocus our eyes on the horizon. Being able to see nature is especially important. According to the U.S. Environmental Protection Agency (EPA), however, humans are now spending 90 percent of our time indoors on average, keeping us from the light cycle that benefits our health. Given this statistic, it is clear that glass and glazing—with advantages of daylight, views, access to nature, and more—are essential to occupant wellness.

Healing Impacts

In a paper titled "Impact of Light on Outcomes in Healthcare Settings," the Center for Health Design showed that maximizing access to daylight in hospitals had a positive impact on patients and a mitigating effect on negative aspects of the hospital environment.

Providing more natural light within hospitals—also known as "daylighting"—reduced patient depression, decreased the length of time patients spent in the hospital, improved sleep, and allowed dementia patients to feel less agitated. The positive outcomes also translated to staff, whose exposure to natural light helped regulate their circadian rhythms and provided them with better sleep and wake cycles.

This connection between natural light and health is not just a bonus. It is not just the fact that getting better sleep is good for you; it is that getting poor sleep has a negative effect that is compounded when a person has other health issues. In this study of natural light in hospitals, natural light helped mitigate potential negative effects that patients and staff were experiencing because of irregular circadian rhythms—health conditions that included sleep disorders, obesity, diabetes, depression, bipolar disorder, and seasonal affective disorder.

Learning Impacts

Besides the health-care study, numerous studies have demonstrated a relationship between glass and improved test scores among students. Good daylighting reduces eye strain, which helps with better reading, processing, and learning. In a study by the Heschong Mahone Group (HMG), students with the most daylight processed 20 percent faster on math tests and 26 percent faster on reading tests in comparison to their peers in the least-daylit classrooms.

Anecdotally, teachers interviewed for the study said that better windows with a view of nature helped both them and their students stay calm and regroup when stress levels began to rise.

Another study indicated that lack of daylight impaired hormone patterns, making it more difficult for children to concentrate or collaborate with peers. These effects had potential long-term consequences, impacting growth and school attendance. HMG's study suggested that better access to daylight and natural views could maximize learning and give teachers an extra month that they could use for other activities besides reading and math.

Workplace Impacts

In a study titled "Impact of Windows and Daylight Exposure on Overall Health and Sleep Quality of Office Workers: A Case-Control Pilot Study" published in the ***Journal of Clinical Sleep Medicine***, two groups were monitored. The first group worked in windowless environments where there were either no windows or the windows were far away. The second group worked in spaces with access to windows and natural light. The well-being and sleep quality of both groups of workers were measured. Results illustrated that those without access to natural light sources during the day did not perform their duties to the highest capacity compared to the group that had access to daylight. They also experienced physical problems, diminished vitality, and poor or interrupted sleep.

According to "The Global Impact of Biophilic Design in the Workplace," views of greenery and water through windows have been linked to lower stress levels for employees compared to those without a window. Data shows that the positive impact of daylight and views correlated with double-digit improvements in productivity, overall better quality of life, sleep, reduced sick leave and staff turnover, and an increased number of applicants for open positions because the job was seen as desirable.

The WELL Building Standard—a global rating system intended to transform buildings and communities—aims to make architects, designers, and building owners more aware of how a space can affect occupants and the environment, ultimately enhancing their experiences of spaces. The way people experience daily light can affect their circadian rhythms, which ends up impacting sleep cycles, which in turn impacts work lives. The WELL Building Standard's illumination guidelines help protect the consistency of a worker's wake and sleep schedule. One way that this happens is to experience natural daylight and darkness, maximizing natural daylight and outside views rather than relying on fluorescent light.

The Art and Science of Daylighting

Daylighting is the practice of placing windows, skylights, and other openings and reflective surfaces in buildings to provide internal lighting from the sun. The aim is to maximize comfort, provide pleasant visual effects, and reduce energy use. The results, of course, have even more significant influence given the health, learning, and work productivity benefits.

Daylighting is not a new concept or practice. Before electric lighting, building interiors were often dark—even during the day—but the evolution of architectural daylighting helped bring in natural light with great success. Early daylighting included a lot of windows: raised eyebrow (a window peeking out of the roof), patterned glass, portholes, transom windows, Dutch doors, and window seats featuring angled windows that played with light across the room.

The science of daylighting design is not just how to provide enough daylight to an occupied space but also how to do so without any undesirable side effects. Beyond adding windows or skylights to a space, it involves carefully balancing heat gain and loss, glare control, and variations in daylight availability. Daylighting designs take into account shading devices that reduce glare. The window size, spacing, glass selection, and how it reflects in a particular space on interior finishes all matter when creating a daylighting system. Typically, one or more of the following are present in a daylighting system:

- Daylight-optimized building footprint
- Climate-responsive window-to-wall-area ratio
- High-performance glazing
- Daylighting-optimized fenestration design
- Skylights (passive or active)
- Tubular daylight devices
- Daylight-redirection devices
- Solar-shading devices
- Daylight-responsive electric lighting controls
- Daylight-optimized interior design (such as furniture design, space planning, and room surface finishes)

Daylighting is best optimized in new construction when the whole original project can be designed around a daylighting system. However, the demand for more daylighting in commercial office and home office spaces has led to retrofit ideas that harness light and natural views in meaningful ways.

When it comes to walls, glass transmits light to adjacent rooms. A window placed above eye level helps diffuse light to the next room while maintaining privacy. Translucent glass panes or walls provide mellow light that a regular glass window cannot offer. Textured, laminated, or sandblasted glass will absorb and reflect light, sometimes scattering the rest depending on how translucent it is. The possibilities for creating light that is not glaring and complements a room are nearly endless.

Daylighting Homes in an Era of Remote Work

Before the COVID-19 pandemic, about 17 percent of U.S. employees worked from home five days or more per week. During the pandemic, this number increased to 44 percent as quarantines and lockdowns made commuting and office work nearly impossible. Remote work became a solution that proved in many cases to be a benefit rather than an impediment to both work productivity and quality of life—which go hand in hand.

As the pandemic winds down, more companies are looking to continue a hybrid or remote work model, which means more workers are seeing their homes and work spaces merge and sometimes collide. The architecture industry has picked up on this trend and in response has developed some home-office solutions that meet the needs of workers looking for permanent workspaces in their homes. A major focus of these trends is how to both designate workspaces—no more just sitting on couches or clearing off dining room tables—and provide the kind of daylighting that will promote health and well-being. Following are a few glass design trends resulting from this new era.

Transom Windows
A transom indoor window above a door adds a way to borrow light without sacrificing precious wall space. They were popular in the Victorian period as a way to add light when electricity was not available. When electricity did come into use, transom windows provided enough natural light during the day to keep lights off in some rooms, reducing energy use. The same concept is appealing today. Transom windows are aesthetically pleasing and can provide natural light into a designated office space inside the home even when the door is shut, allowing for privacy. Some transom windows are designed to open, which also allows for ventilation. A lightweight chain is attached so the window does not open too far. In other designs, the window can be hinged at the top so that it opens at the bottom.

Stairs
Stairs are an overlooked opportunity for transporting light, but a stairwell is a good place to borrow light from an upper story. Surrounding stairs with glass and white walls facilitates this process, especially if a stairwell is oriented to capture afternoon sunlight upstairs. The orientation of glass and the type of glass—whether it is a panel or blocks—can provide different ways of capturing light while also creating an aesthetically pleasing design.

Interior Windows
Frosted interior windows borrow light from adjacent rooms while still providing privacy. They also increase ventilation, and since interior windows do not require the same insulation, they are generally much cheaper. Open floor plans have been a trend for a while, but the need for a designated workspace is bringing architects back to compartmental design. Interior windows are a way to get the best of both worlds.

Skylights
Skylights can provide light into a closed office space. If the office space is on a lower level, skylights paired with light wells can carry light even farther to other stories. Because daylighting is a system, architects also think about other characteristics of rooms in conjunction with glass. For instance, white tile walls will especially help sunlight travel from a skylight to other parts of the room.

Glass Partitions
Glass partitions and other glass interior structural elements can be used to pull sunlight deeper inside a building. Extremely transparent, low-iron glazing with highly visible light transmission allows light from the outside to filter further into a room while also providing aesthetic structural elements.

Glass As A Protective Barrier Against Environmental Forces

Glass is a strong material with the ability to hold up against even extreme environmental forces, such as hurricanes. The selection of glass for these extreme environments is key, and the options are wide ranging. When compressed, glass is in the same order of magnitude as steel when it comes to strength. This allows designers to incorporate glass into highly ambitious structural applications. Large glass panels can be fabricated up to 3.6 meters in width and 20 meters in length. The large glass panels can be laminated, hot bent, and cold bent, among other things.

This section will look at the durability of glass and how it is used as a protective structure against weather and other

forces. While weather is the focus of this section, safety glass is obviously used for protection against break-ins and active-shooter scenarios, among other things. Selection of glass can be based on multiple objectives, and for security and safety in schools and other facilities—which you can read about in the sidebar on the next page—are other ways that safety glass can be used.

Safety Glass
As stated earlier, safety glass is glass with additional features that make it less likely to break or pose a threat when broken. Common designs include toughened glass (also known as tempered glass), laminated glass, and wired-mesh glass. Following are some examples of those types.

Monolithic Safety-Tempered Glass
Monolithic safety-tempered glass is a single glass lite or pane, but it is also safety tempered. Safety-tempered glass is approximately four times stronger than regular annealed glass and is called "safety glass" because when fractured, it breaks into smaller pieces, making it less likely to cause serious injury. Monolithic safety-tempered glass is also great for daylighting because it allows sunlight to penetrate into the building. This glass is best suited for areas that are not prone to forced entry, such as windows on upper floors.

A single glass lite with an applied film or plastic is also considered safety glass because it is safety tempered and will therefore break into smaller pieces when fractured. A single glass lite with film or plastic also allows for proper daylighting. This glass is more secure than standard single safety-tempered glass lites.

Laminated Glass
Laminated glass is made up of two or more lites that are permanently bonded by heat or pressure with one or more plastic interlayers to provide extra protection. This type of glass is great for areas that need added protection, such as entry doors or glass areas in banks, waiting areas, or other public spaces where safety is a concern. Another safety feature is that when broken, the glass stays contained instead of shattering. This is especially important in the event of forced entry or weather events that could cause flying debris. In addition to safety, laminated glass provides enhanced acoustics by keeping sound in areas where it belongs and out of places where it does not belong. It also provides daylighting for areas where glass may not have been an option before.

Laminated Insulating Glass Unit (IGU)
Laminated glass within an insulating glass unit (IGU) provides all of the benefits previously discussed for laminated glass but brings the added benefit of energy efficiency and resistance to adverse weather. Laminated IGU glass is also made up of two or more lites that are permanently bonded by heat or pressure with one or more plastic interlayers. However, laminated IGU glass provides an extra layer of protection thanks to the spacer that is placed between the two panes. Sometimes a laminated IGU is two laminated pieces of glass, and other times it is a single lite with a spacer and then laminated glass on the other side. This space between the two panes provides extra thermal protection and can limit unwanted heat transfer. This type of glass also can protect against impact from wind and rain in strong storms, such as hurricanes.

Multi-Ply Glass
Multi-ply glass is a high-quality fiberglass sheet that contains multiple inner layers and/or plastic glazing for added protection to withstand extreme conditions, including forced entry, blasts, ballistics, hurricanes, and tornadoes. As with laminated glass, it also can provide enhanced acoustics, keeping sound in areas where appropriate and out where not appropriate. In addition, it offers daylighting options for secure areas that may not otherwise have the chance at daylighting; for example, an area surrounded by a concrete wall for protection.

Glass As A Means For Artistic And Decorative Expression

Glass is able to create more than just a view, and it can provide more than the benefits of natural light. Glass designs can create entire moods and atmospheres. Glass affects a space in a phenomenological sort of way. Using natural light and a variety of colored and textured glass, it can help transform a building from purely functional to aesthetically profound. Architects and artists alike look to glass to create beautiful, durable spaces in and out of buildings, and glass fabricators provide nearly endless options for them to do so. Glass can be digitally printed, etched, silk-screened, laminated with decorative interlayers, and more. Additionally, the industry is beginning to incorporate new technologies into glass and windows.

Emerging Technologies

Photo Realistic Designs
Glass fabricators can achieve resolution quality upward of 2,880 dpi thanks to advancements in printer technology. Designers can print nearly any design in photo-realistic quality on glass with the promise of durability and longevity.

Magnetic Marker Boards
Glass marker boards are a niche but increasingly popular application. The laminated safety glass boards serve as a writable wall cladding. Many glass suppliers offer magnetic marker boards, which are available in custom colors.

Switchable, Interactive Glass
Architectural glass companies are also developing switchable and even interactive smart glass products. Switchable products can provide privacy, turning from clear to opaque at the flip of a switch. The application is becoming more common in changing rooms and restrooms. Companies also are pushing to add interactivity to their switchable products for applications such as multimedia walls.

Old Trends Become New Again

Glass Blocks and Bricks
Glass blocks and glass bricks are design elements associated with the 1980s, but designers are bringing these elements back in ways that feel more updated. They still can be utilized in floor-to-ceiling facades, but they also can be used in more nuanced ways with interiors. Glass block walls can be broken up into smaller modules and incorporated with black frames. Cloudy blocks may evoke 1980s decor, but matte and warm tones provide an updated texture. In some cases, glass bricks can be utilized to evoke a retro vibe without overdoing it by framing modern furniture. Glass blocks and bricks emit a back-lit glow, so the elements around the blocks need to be incorporated into the design in a way that does not clash.

The Skyscraper Total Transparency Vibe
While many in the construction industry have argued since the 1990s that glass skyscrapers and large glass buildings would add to the energy load of urban areas, they were not taking into account the new technology in glass manufacturing. With today's use of double-skin facades, energy is actually saved. What is more, less energy is used during daylight hours (when most people are working in these buildings) because unlike buildings constructed of brick, concrete, or other solid materials that require constant interior lighting, glass buildings are naturally lit. Additionally, the recyclability of glass products is becoming more apparent, both in terms of the number of glass recycling companies that exist and specifically what products can be recycled. This will significantly reduce traditional glass waste and conserve other natural resources needed to manufacture new glass.

The Potential Of Vacuum-Insulating Glazing (Vig)

In developed nations, building energy consumption has grown to reach beyond 40 percent of total final national energy consumption. This high-impact growth in consumption comes as climate change continues its rise as a global threat. How can the design and construction industry turn the tide on energy efficiency and offer solutions to the problem?

One major issue is the inefficient use of energy in terms of indoor climate control for both residential and commercial buildings. Uncontrolled heat loss through the building envelope is a key problem to be solved—and the main culprit for this loss is windows.

While there are plenty of window solutions aiming to overcome energy loss, a unique alternative has emerged in recent years. Vacuum-insulating glazing (VIG) is a glass solution that provides high thermal performance in a thin profile. VIG is installed in new construction, restoration, and refrigeration applications. This section focuses on VIG technology and how it can be incorporated into various architectural elements and cooling systems.

VIG Fundamentals

VIG is a glass solution with a growing footprint in the construction market. It is composed of two pieces of glass—or lites—in the thickness of a single pane, typically 0.12–0.23 inch. The gas in the space between the lites is extracted using either a small pump-out tube (also known as an evacuation port) or a vacuum chamber to create a vacuum rather than being filled with air or argon. The glass lites remain separated by pillars (or microspacers) that are approximately 0.005–0.012 inch thick and made of a high-strength material, such as metal or ceramic. They can be arranged in various patterns across the surface of the glass. The pillars may be either glued in place or held in place by the glass.

Once a vacuum is made, the edges are sealed to create a permanent vacuum. For units that have a visible pump-out tube, there may be a safety cap placed over the tube for additional durability. The pressure of the evacuated cavity is typically on the order of 0.1 Pa to eliminate the

Photo Courtesy of LandGlass

Vacuum-insulating glazing (VIG) offers thermal performance values that surpass those of traditional insulating glass units (IGUs) and in some cases begin to rival solid walls.

conductive and convective heat exchange between the two lites of glass. To reduce radiative heat exchange, a low-e coating can be used on one of the internal surfaces of the VIG, typically surface 2. Matching flatness on both lites of glass is critical to successful VIG fabrication to keep the array of pillars in place. Keeping the pillars in place prevents the lites from touching to avoid creating a thermal conduction pathway that could reduce the performance of the VIG.

VIG offers thermal performance values that surpass those of traditional IGUs and in some cases begin to rival solid walls. VIG also offers acoustic performance benefits and condensation resistance.

Current VIG Market Application

New Construction

VIG has a couple of key advantages over traditional glazing. Because VIG offers higher energy performance in a thinner profile, it allows for window and sash designs that are also much thinner and lighter than typical construction methods. A thinner profile product offers benefits in terms of wall thickness, window thickness, matching existing window extrusion design, and reducing the overall glazing component weight.

VIG also offers higher performance for a given profile. By utilizing the VIG either as a standalone product or in a hybrid VIG, manufacturers can exceed the performance values of typical IGU design required by model building codes. VIG can enable compliance with more stringent energy standards, such as Passive House Local Law 97.

Restoration

The thin profile of VIG allows buildings designed for the weight of monolithic glass to achieve and/or exceed the thermal performance of double-glazed or triple-glazed units. VIG can be used in an existing sash to reduce installation costs and maintain historic integrity. VIG also may be used as an interior storm lite for additional performance.

Refrigeration

Refrigeration applications typically require both low condensation potential and high insulation values. VIG offers significant benefits for the refrigeration market compared to traditional IGU construction, such as a slim profile, energy efficiency, and high visibility for consumers to see and access products. Safety requirements in commercial refrigeration can be met with tempering, lamination, or film— similar to architectural safety glass.

Energy Performance

Pillar array: The pillar array affects convection and conduction components of heat transfer. The distance between pillars can be increased if thicker glass or heat-treated glass is used. A wider pillar array allows for less heat transfer, so a lower (better) U-factor can be achieved. However, a wider array must not allow the two lites to touch, which may cause unacceptable glass distortion and be aesthetically unappealing.

Glass coating: The emissivity of the glass coating, along with the placement and number of coatings used, also drives energy performance. A higher-performing, low-emissivity coating can reduce both the solar heat gain coefficient and the U-factor, as in a standard IGU.

Vacuum level: Lower pressure reduces heat flow.

Conclusion

Glass is a multifunctional product. Glass need not be specified to satisfy just one design goal. For example, insulating glass can be used to meet energy requirements and maintain occupant comfort while indoors. It can be tempered or laminated to achieve a variety of safety and security performance levels. It can be decorated for aesthetic appeal or privacy, or to achieve bird-deterrence measures. And, by its nature, glass allows for natural daylight and views, which is a proven element in occupant physiological well-being. By now, you should be able to explain how new bird-friendly technologies are helping to reduce avian deaths across the country. You should be able to describe trends in using glass in home workspaces and office spaces, and how these daylighting options can lead to better health and well-being for occupants. And finally, you should be able to discuss the ways that glass currently is used for artistic and decorative expression, and provide examples of how VIG technology supports better building options when it comes to architectural glass construction.

About the Author:
Erika Fredrickson *is an independent writer and editor focusing on technology, the environment, and history. She is a frequent contributor for continuing education courses and publications through Confluence Communications.*
www.confluencec.com

The National Glass Association (NGA) *is the largest trade association serving the architectural glass and metals industry. A technical and educational resource, NGA envisions a future in which glass is the material of choice to enhance spaces where people live, play, learn, work and heal.* **www.glass.org**

The "Bird Cage"

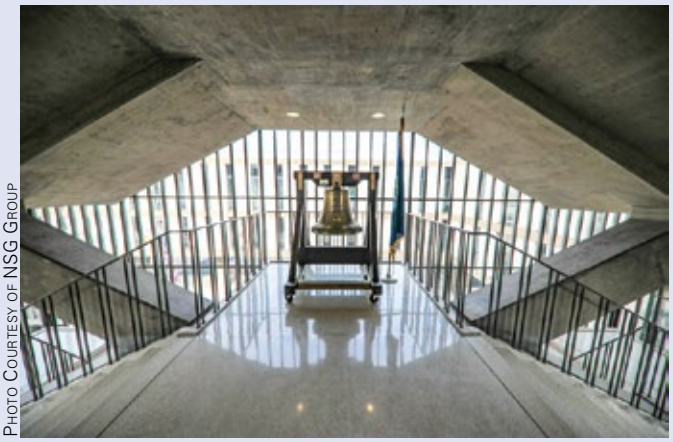
Vacuum-insulating glazing (VIG) was critical to the restoration of the 1955 Eero Saarinen-designed "Bird Cage" at the Milwaukee County War Memorial. The Bird Cage is a double-cantilever staircase enclosed with a glass and steel curtain wall with elegant lines that emulate an ornate cage. Initially, consultants felt the tall vertical wall, which was made of single-pane glass glazed into highly customized steel fin frames, could not be restored and should instead be replaced with a contemporary double-glazed wall.

The architecture team decided to try a creative approach using VIG technology to keep the original style. Instead of using regular insulating glass, which would double the weight of the structure and change its appearance, it used VIG, glazing it into the original custom fin frames. The steel fin frames were restored and painted in the original color, and vacuum-insulating units were installed in the original glazing pockets.

The incorporation of the VIG profile into the original, restored curtain system wall was a tenacious and smart approach that breathed new life into the staircase, while also providing a stunning example of well-executed architectural innovation.

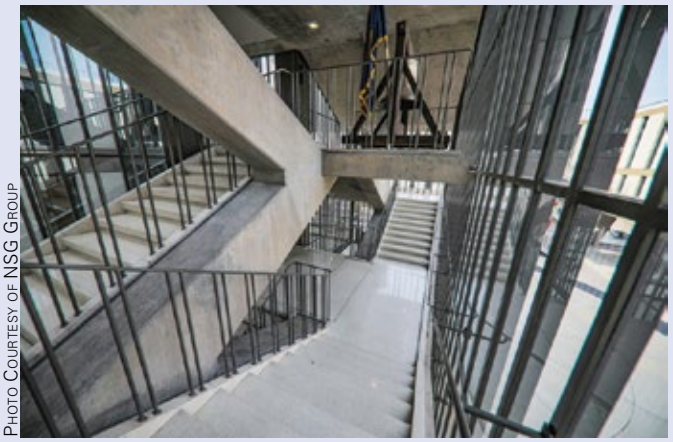
One surprising outcome: The renovation ended up costing far less than the original proposal of tearing down the "bird cage" and replacing it with a less-illustrious aluminum staircase.

PHOTO COURTESY OF NSG GROUP



VIG was critical to the restoration of the 1955 Eero Saarinen-designed "Bird Cage"—a double cantilever staircase enclosed with a glass and steel curtain wall with elegant lines that emulate an ornate cage.

PHOTO COURTESY OF NSG GROUP



The incorporation of the VIG profile into the original, restored curtain system wall of the Bird Cage showed creative innovation at a lower cost than it would have been to tear it down and replace it with aluminum.

Test Questions

CE Quiz - Continuing Education Test – Glass in Architecture

1. What does a fly-through condition refer to when talking about glass hazards for birds?
   a. A black-hole effect
   b. Habitat reflection
   c. Clear line of sight to the sky
   d. A cavity

2. What are some strategies for muting reflections in glass to make it more bird-friendly?
   a. Angled glass
   b. Etching
   c. Decals
   d. UV patterns

3. According to the U.S. Environmental Protection Agency (EPA), humans spend about what percentage of time indoors, which leads to a disruption in the light cycle?
   a. 25 percent
   b. 86 percent
   c. 50 percent
   d. 90 percent

4. In a study by the Heschong Mahone Group, students who were deprived of daylit classrooms:
   a. fell asleep more often
   b. processed math and reading tests slower
   c. were more likely to get diabetes
   d. paid better attention to their teachers

5. Data shows that the positive impact of light and what other element related to glass helped improve workplace productivity and overall better quality of life for workers?
   a. Thermal efficiency
   b. Glass blocks
   c. Symmetry
   d. Nature views

6. Daylighting takes into account not just letting in light but also balancing glare control, variations in daylight availability, and:
   a. heat gain and loss
   b. aesthetic trends
   c. costs
   d. bird safety

7. What glass elements borrow light from inside a building and provide compartmental designs as some residents turn from open-floor plans to private home offices?
   a. Mirrors
   b. Frosted interior windows
   c. Skylights
   d. Staircases

8. What does vacuum-insulated glazing (VIG) provide besides a thin profile?
   a. Ventilation
   b. High security
   c. High thermal performance
   d. All of the above

9. VIG is commonly used in news construction, but when it is used in existing sash, it can reduce installation costs and:
   a. maintain historic integrity
   b. update outdated aesthetics
   c. provide better home security
   d. offer a temporary solution for gaining LEED points

10. The types of glass recommended for physical barriers that meet safety and health performance standards are laminated and:
   a. annealed
   b. frosted
   c. bulletproof
   d. fully tempered

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Coordinated Design of Monumental Stairs

BY: CONNOR J. BRUNS, S.E., CHASE M. SLAVIN, S.E., AND ERIC J. TWOMEY, S.E., SIMPSON GUMPERTZ & HEGER

There are few standalone components in building construction that closely intertwine architecture and structure. Stairs present a great opportunity to explore geometric expression and display materials while functioning to connect spaces. Whether used as a connection between office floors or as an architectural feature, stairs offer challenging opportunities for design and construction, for the architect and engineer alike. This article explores the design considerations related to stair types, materials, serviceability, and design responsibility.

Stair Types

Though all stairs share the primary goal of conveying people from one space to another, not all stairs are the same. Stair complexity ranges from the utilitarian, back-of-house stair to the geometrically complex monumental stair showcased in a building or outdoor public setting. This article focuses on monumental stairs, rather than back-of-house stairs.

Building codes and programmatic layout often dictate the stair geometry. Constrained areas may require L-shaped, switchback, or spiral stairs, while open or exterior spaces may utilize a straight stair with or without intermediate landings, depending on overall length. The stair type and support conditions play an essential role in the structural performance of the stair as well as the constructability and cost. Stringers and landings may be self-supported, supported by posts, or hung from structure above. In renovation projects, the stair location and support conditions are often driven by the feasibility of strengthening the existing structure. Complex geometries require more sophisticated fabrication and analyses to predict structural performance.

Stairs can be designed to perform a variety of functions in addition to connecting levels of a building. When located in gathering areas, stairs may incorporate bleacher-style seating or additional gathering space at oversized landings. Whether these features are supported by the stair structure or are independent of the stair can play an important role in the design approach.

With so many interconnected features impacting the performance of stairs, each monumental stair project is unique and requires thorough evaluation and coordination between all involved parties to provide a holistic evaluation of the structure to achieve aesthetic, functional, and operational goals.

Stairs present a great opportunity to explore geometric expression.

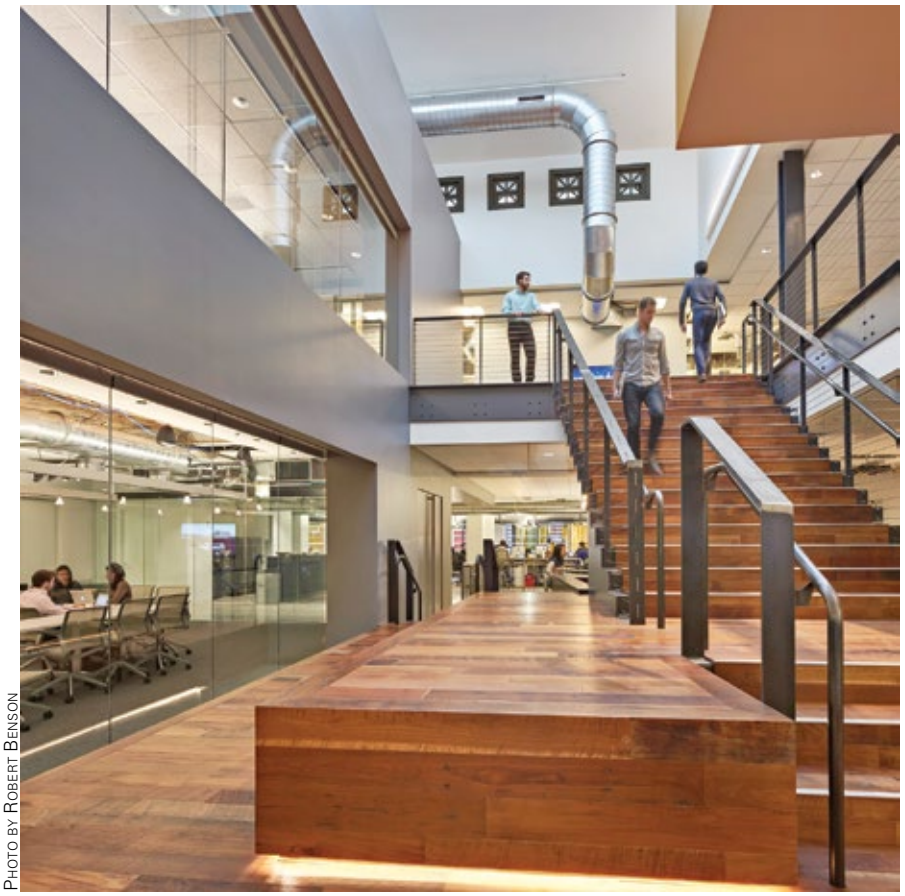


PHOTO BY ROBERT BENSON

Havas Village, Boston, MA; Type: Straight; Material: Steel

Material

While designing architectural stairs may involve exploring many geometric and material permutations, selecting the structural material early in the design process is particularly critical when architecture and structure are integrated, when exploring unique materials or geometrically complex forms, or when enhanced durability is a project driver.

Although other constraints may limit the stair location and geometry, architectural and structural material selection has boundless permutations. Steel is the most common material for stair structures because of its inherent stiffness, geometric flexibility, and compatibility with the host structure in both new and existing buildings.

Steel framing is also easily clad with wood veneer, terrazzo, stone, drywall, or laminates at stringer, tread, riser, and landing elements. Alternatively, steel can be exposed and painted to emphasize the structure. Architecturally exposed structural steel (AESS) finish quality ranges from basic (Category 1) to showcase (Category 4) elements as defined in the American Institute of Steel Construction (AISC) - *Code of Standard Practice for Steel Buildings and Bridges* (ANSI/AISC 303-16). With each step in AESS category comes more stringent detailing requirements, such as welds ground smooth and hidden seams and bolts, and subsequently, an increased cost premium. Selectively specifying the AESS category based on the individual components is prudent; allowing hidden elements or elements far from view to have a relaxed AESS requirement rather than specifying every element to be a higher finish can provide significant cost savings. Visual samples and mock-ups of architecturally significant connections are also valuable tools for a successful AESS project. Ultimately, AESS involves enhanced coordination between the design and construction teams to detail, fabricate, and erect a feature element with tighter tolerances and special surface treatments.

Coordination between the architect, structural engineer, and various fabricators is paramount.

For exterior stair projects, particularly those in moderate and extreme environments, reinforced concrete, stainless steel, galvanized steel, and weathering steel are frequently used for increased durability. Weathering steel, well known by the trademark COR-TEN®, provides a unique aesthetic because of its naturally oxidizing finish that forms a corrosion-resistant coating. Compatibility of dissimilar materials in exterior environments is paramount and, when overlooked, may have a detrimental impact on aesthetics and durability. For example, while stainless steel rail posts can be welded to a weathering steel stringer, the weathering steel oxidized coating (rust) will likely stain adjacent materials such as precast concrete treads or surrounding landscape features. This rust staining can also occur during the natural development of the weathering steel patina if runoff water is not managed properly.

Engineered wood, glass, and composites are other possible structural solutions for monumental stairs. Although frequently used in other building applications, these materials present detailing, fabrication, and performance challenges for stairs. When designing a stair with unique or new materials, partnering with experienced specialty fabricators early in design is advised. Advanced engineering analyses, parametric studies, mock-ups, and project-specific testing of material strengths and connection details may be warranted, particularly when needed to demonstrate code compliance.

Stair guard and handrail systems are often constructed of metal (e.g., picket rail), a combination of metal and glass (e.g., metal handrail and glass guard or metal guard and rail with glass infill panels), or wood framing, with the latter primarily on residential projects. Metallic options include steel, galvanized steel, aluminum, stainless steel, or less commonly, a cooper or bronze alloy. For glass guard systems, the

Photo by JC Anderson

Chicago Workplace; Type: Switchback; Material: AESS

guard is supported by either discrete button connections or a continuous glazing shoe. Generally, the weight of various guard and handrail materials have minimal relative impact on the structural performance because their weight is negligible to the overall stair weight. Yet when the guard-to-stringer connection is a highly visible detail, coordination between the architect, structural engineer, and various fabricators is paramount. As an example, the continuous aluminum glazing shoe can be omitted and incorporated into the top of a multi-ply steel stringer by recessing the middle ply.

Structural Design

Stair structural design considers both strength and serviceability performance objectives. The goal of strength design is to prevent the collapse of the structure under extremely rare loading. This includes the weight of permanent construction elements (dead load), occupancy live load (typically equivalent to a shoulder-to-shoulder gathering), and seismic loading. Exterior stair loads also include environmental effects from snow, rain, wind, and ice. Serviceability design, on the other hand, aims to maintain functionality during common loading conditions such as an individual or group descending the stair. The serviceability considerations most relevant to stair design are user comfort, deflections, and compatibility with supported and adjacent building components.

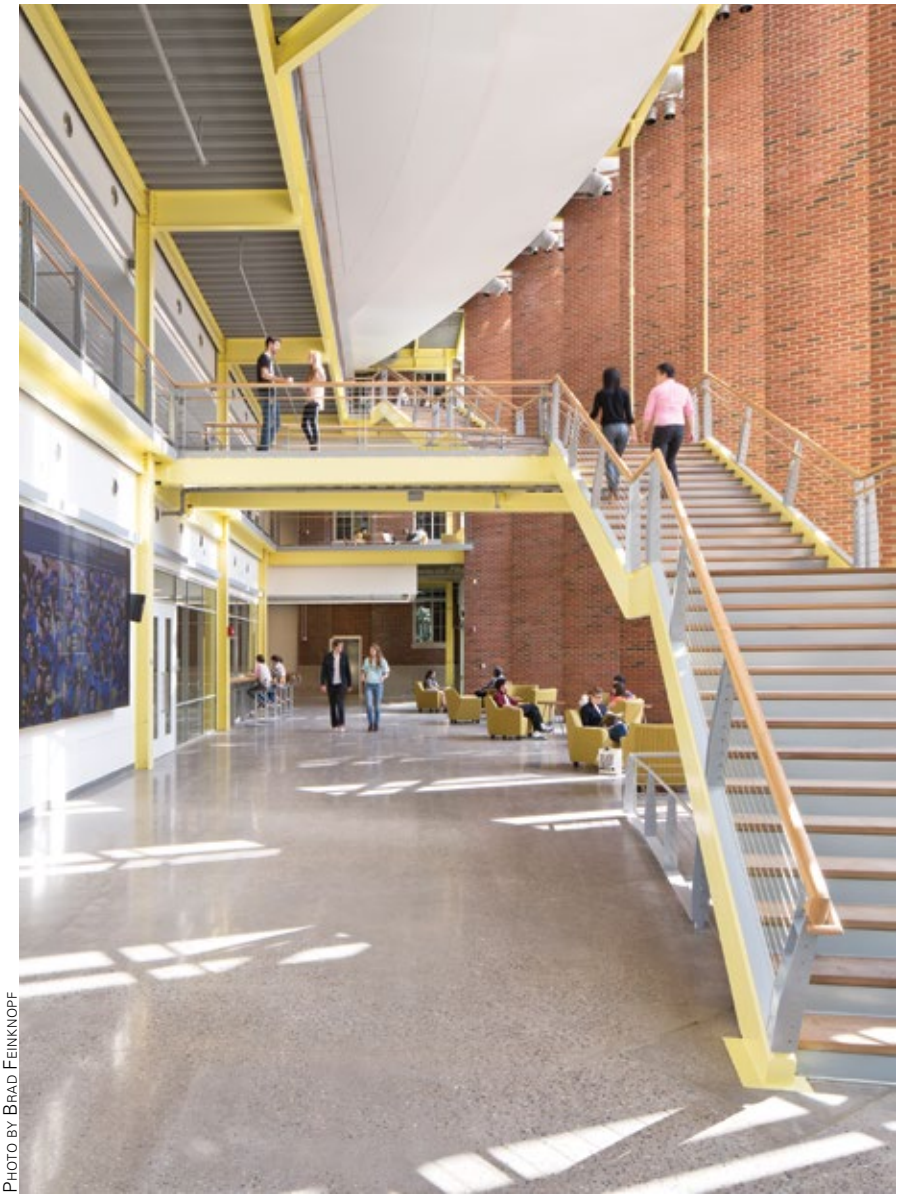


PHOTO BY BRAD FEINKNOPF

Ronald Rettner Hall, University of Rochester, Rochester, NY; Type: Straight; Material: AESS

While collapse prevention is an objective goal based on code-prescribed statistical evaluations of material strengths and loading conditions, much of serviceability design is subjective, and the results are less easily predicted. The building code does not provide stair-specific serviceability criteria, but only provides basic minimum deflection requirements for floor, roof, and exterior wall construction. Thus, establishing performance objectives related to deflection and vibration starts with interpreting available guides and using engineering judgment. For steel-framed stairs, AISC has issued a widely used design guide that recommends tolerable limits for vibration. However, the owner and the design team are ultimately responsible for determining acceptable vibration tolerance limits for their project.

Occupant comfort for vibrations is also dependent on the use of the stair as more than a means for moving people between spaces. People are unlikely to notice objectionable vibrations while descending the stair yet are much more likely to consider vibrations unpleasant when they do not expect it: listening to a presentation on a bleacher-style stair or taking a call while standing on the landing. The structural engineer's stair vibration analysis should consider these specific scenarios.

In addition to vibration, stair serviceability design must consider the effect of lateral and vertical movements on the stair finishes, particularly brittle materials susceptible to cracking. When materials are not detailed to tolerate

movement, such as sealant around a glass infill panel, structural engineers will increase the stiffness of the stair structure to meet the finish movement limits. Increasing the stiffness is most efficiently achieved with deeper stringer elements and thicker stair treads or providing supplemental support at landings when permitted.

To establish the vibration and deflection limits, the team should ask:

- Will users sit or stand on the stairs while others are ascending/ descending?
- Are there workstations or other sensitive areas near the stair?
- Does the user have a heightened expectation of the stair stiffness?
- How are the finishes connected to the stair structure? What are the deflection criteria of the finishes?
- If a similar stair has been constructed, how has it performed?
- Have the stiffness and details of the supporting construction been taken into consideration in the evaluation of the stair?

Once the intended use, user expectations, and impact on surrounding spaces are established, the team can define serviceability goals while also considering the up-front construction cost and stair aesthetics.

How Can Architects Improve Stair Performance?

Architects play a significant role in contributing to the serviceability performance of stairs. The most obvious way architects impact stair performance is by selecting the shape, span, and allowable depth of the structure, which is usually desired to be as shallow as possible. Straight stairs have relatively long spans, which, when not designed appropriately, can result in large deflections and noticeable vibrations. Switch-back and spiral stairs tend to be more rigid and have improved vibration performance. Reducing a stair span by adding support at the landing(s) can also dramatically improve vibration performance.

The architectural finishes on stairs also play a prominent role in the stair's vibration performance. A person walking on any structure will induce vibrations in that structure, which will gradually dissipate over time. This energy dissipation is called damping, and is similar to the effects of automobile shock absorbers. For stairs, damping mainly occurs through friction in connections with other architectural components. Therefore, providing additional finishes such as drywall soffits can improve vibration performance. Tread, riser, and guardrail connections that rely on frictional interfaces (e.g., bolted connections) will also increase damping. For stairs with open risers or exposed structural steel, increased stringer depth or supplemental landing support may be necessary to achieve similar performance to an enclosed stair.

The weight of the architectural finishes also impacts the vibration behavior of the stair. Increasing the weight of finishes without an equivalent increase in stair stiffness decreases the natural vibrational frequency, bringing it closer to a person's stepping frequency, thus closer to resonance. However, an individual footfall will have a smaller impact on a heavier structure due to its increased inertia.

Photo by Halkin Mason

Hoover Mason Trestle, Bethlehem, PA; Type: Exterior Custom; Material: Weathering Steel

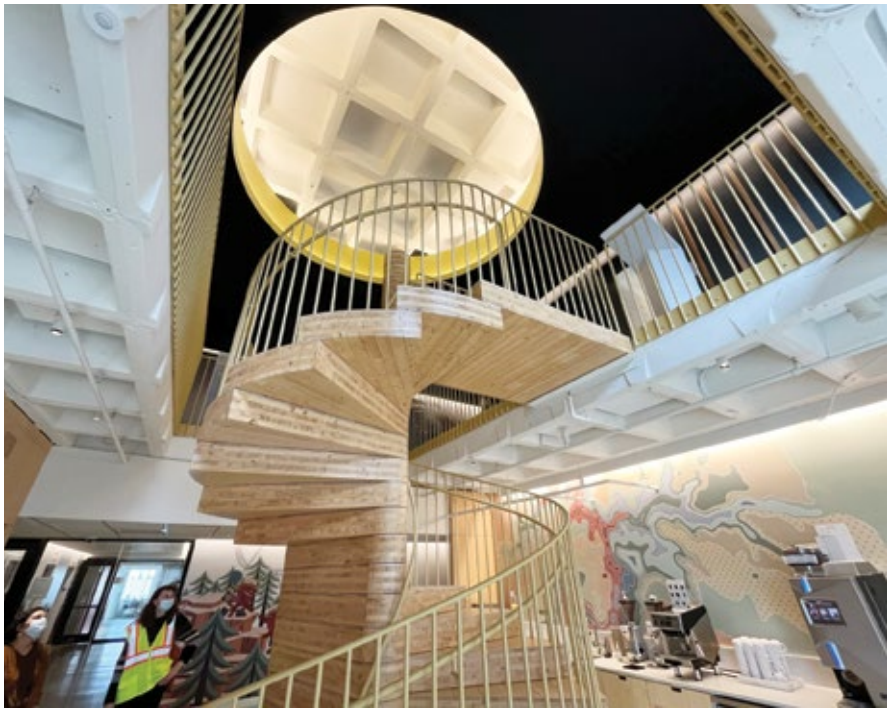


Photo by Simpson Gumpertz & Heger

Kendall Square Workspace, Cambridge, MA; Type: Spiral; Material: Cross-Laminated-Timber

Stair finishes may have competing impacts as they can increase damping, which will reduce the likelihood of objectionable vibration, but will also decrease the natural frequency, making it more susceptible to objectionable vibration. Given these complexities, the architect and structural engineer should work towards an optimal solution balancing aesthetics and function.

While many consider stair guards an architectural finish element, they can significantly increase stiffness if integrated into the structure, such as a deep glass panel or a steel Vierendeel truss. Though often ignored in the structural analysis, if the handrail is carefully designed and integrated into the structure, it can provide a very stiff structural element, allowing for shallow depth within the plane of the treads.

Design Responsibility

The architect is primarily responsible for documenting the stair type and layout, finishes, slab opening dimensions, and overall code compliance. The structural design and design responsibility will vary depending on stair type and selected design process. Back-of-house stairs are typical and well-established; their design is delegated to a miscellaneous metals contractor's Specialty Structural Engineer (SSE). For monumental stair projects, the design team's Structural Engineer of Record (SER) will often provide the engineered design of the stair stringers, treads, landing elements, and the connections to the host building. When the stair is in an existing building, the SER will evaluate the existing construction, and include design for strengthening if required. This gives the design team full control over the stair design process, particularly the nuances related to serviceability design.

For some projects, particularly those without an SER, the monumental stair, guard, and handrail design may be delegated to a fabricator specializing in stairs and architectural metals. The delegated design process may provide competitive bidding and allows fabricators to utilize preferred SSE and fabrication details.

Shortcomings in delegated design usually occur when relatively little stair information is detailed in the design documents. Architecturally significant details and, at a minimum, concepts of their related structural support will not be properly priced in bids if not properly detailed. This can lead to less desirable alternatives once omissions are identified to meet the project cost and schedule unless a change order is tolerable. In addition to the architectural stair plans, sections, and details, the design documents should specify, at a minimum, the primary member types and dimensional limits, minimum design loads, and serviceability criteria such as deflection and vibration limits. Where the stair interfaces with the base building structure, the SER should include connection details, either conceptual or fully detailed, indicating anticipated movement and loading.

The delegated design process is designated as a *deferred submittal* in Chapter 1 of the 2018 International Building Code (IBC). While the Architect or SER may elect to delegate the stair design responsibility, as the *registered design professional in responsible* charge of the project, they are responsible for reviewing respective submittals (e.g., shop drawings and calculations) for conformance to the performance requirements and compatibility with the building design.

Closing

Every monumental stair project presents unique challenges, whether due to geometric requirements, materials used, functional requirements, or serviceability performance goals. Design decisions require coordination not only between architect and engineer, but also with the building owner and construction team when possible. Clearly defining project objectives early in project with all who may be impacted provides the clearest path to a successful project.

Sign language is about seeing the voices, rather than hearing them.

Requirements for sign language interpreter's stations in 2017 ICC A117.1.

BY KIMBERLY PAARLBERG, RA, ICC

People need to be able to communicate effectively for a variety of reasons! We use communication to share information, ask questions, express wants and needs, develop social relationships, etc. Many entities have obligations under civil rights laws to ensure effective communication with people who are deaf or hard of hearing. For example, television and movies provide closed captioning as an accommodation.

Something new to the 2017 edition of accessibility standard, ICC A117.1, *Accessible and Useable Buildings and Facilities*, are sign language interpreters stations. While not required by the International Building Code (IBC), the technical criteria in ICC A117.1 can be used as guidance for someone who want to provide this option. So why choose to provide sign language interpreters instead of closed captioning? One reason might be that there is not a screen to display the captioning; but, there are other reasons as well.

Many people enjoy having the opportunity to see live theater. When you see a performance, not only what the actors say, but how they say it – tones, inflection, emphasis – puts life into the performance. Sign language is a visual language that uses gestures and handshapes to represent concepts or ideas. For example, performers may ask a question by raising the pitch of their voices and by adjusting word order; while American Sign Language (ASL) users ask a question by raising their eyebrows, widening their eyes, and tilting their bodies forward. A person using sign language uses more than just the hands. Seeing the whole face, especially the eyes and mouth, is crucial in being able to tell between similar-looking signs. Captioning does not provide that extra level of communication.

The sign language interpreter's station requirement (ICC A117.1 Section 802.11) includes technical criteria for the space where an interpreter needs to stand or sit; and the locations of seats in the performance venue where the audience should be able to sit to view the interpreter.

The interpreter needs a place to stand at the front of the room, preferably close to the same level as the person speaking or the action of the performance so that someone in the audience can watch both. The space for standing should be at least 24 inches deep and 36 inches wide. Providing a large area around

that location is desirable. Since sign language interpreters need to switch out often, a dedicated location might also allow space for a chair over to the side for the off-duty interpreter to rest and wait.

It is not the intent of these provision to require seating within the entire segment specified by the 60 degree angle in both directions; that would force the interpreter station to the center of the stage. Typically the interpreter is off to one side of the podium or stage. Seats within 60 degrees left or right of the interpretors location will have the best line of sight to see the interpreter. There are no special requirements for the seats, but those seats within this viewing angle would be where someone who needed the service of the sign language interpreter would need to sit. This information is important for ticket sellers who need to be able to accommodate a request from someone who needs to see an interpreter. Being off too far to the side would not allow for an adequate view of the interpreter.

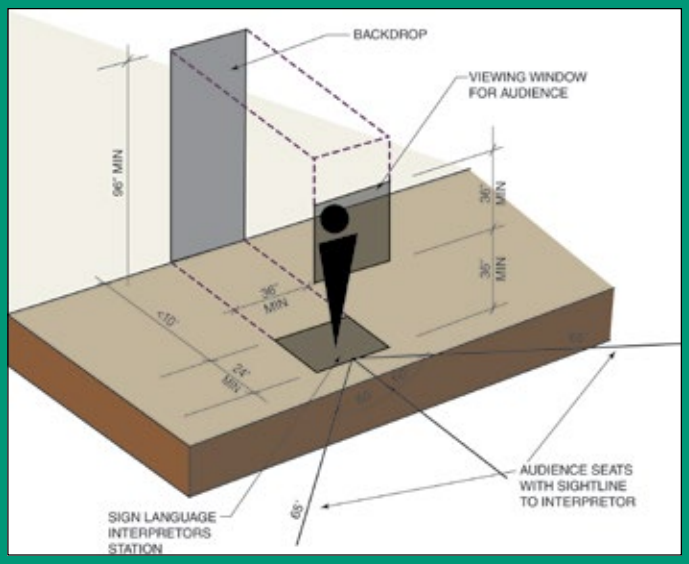
Viewers also need to be able to see the interpreter from waist to top of head. A sightline to allow for a 'viewing window' from 3 feet to 6 feet (915 mm to 1830 mm) above the location where the interpreter is standing. This will allow people in some of the closer seats to be able to see the interpreter sign, even though they cannot see the interpreter's feet.

Adequate lighting (10 footcandles at 48 inches able above the floor where the interpreter stands) is needed for the audience to see the interpreter. This is especially important if the interpreter is off to the side in a darkened theater. In addition to the level of lighting, best practice would be to limit the shadows cast by that light; a spot light from the front would be better than a down light from the ceiling. Many interpreters use facial expressions in addition to the signs to indicate the emotion of what is being said.

A patterned background or a brightly colored background would be a distraction for persons viewing an interpreter. If there is a wall within 10 feet of the interpreter location, that wall should not have a pattern, texture or be a shiny surface to a height of at least 10 feet. The extra height is in consideration of a person in the front rows having an angle that looks more up at the interpreter than straight on. The optimum color is French blue. This is a non-distracting color that works for any skin tone that the interpreter might have. There is an exception that allows for someone to put up a moveable backdrop so the facility would not have to change the finish or decoration on the wall.

The International Building Code (IBC) provisions

The International Building Code (IBC) does include some provisions to assist communication with people who are deaf or hard of hearing. Some examples are visible alarms (Section 907.5.2.3.2), assisted listening devices (Section 1109.2.7), captioning (Section 1109.2.7.3), variable message signage (Section 1112.5), classroom acoustics (Section 1207), two-way communication in elevator lobbies or areas of refuge (Section 1009.8) and within elevator cabs (Section 3001.2). References are the 2021 edition. The 2021 IBC referenced the 2017 ICC A117.1, Accessible and Usable Buildings and Facilities for many of the technical (how to) requirements.



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