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Where great design takes shape

One of my favorite things about putting together an issue of *Metal Architecture* is seeing the incredible creativity that goes into the projects we feature. Just when I think I've seen every possible way to use metal in a building, something comes along that surprises me.

That's especially true for our annual **Design Book,** which takes center stage in this issue.

What makes the Design Book so special isn't simply the beautiful photography or the impressive buildings. It's the stories behind them. Every project starts with an idea, a challenge, or a vision, and it's fascinating to see how architects and designers bring those ideas to life.

Metal has come a long way from being viewed primarily as a practical building material. Today, it's an integral part of the architectural conversation, offering designers an incredible range of possibilities through color, texture, shape, and form. And as the projects in this year's Design Book demonstrate, there really is no shortage of imagination when it comes to putting those possibilities to work.

I also think it's important to recognize that great architecture is rarely the work of just one person. Behind every finished project is a team of architects, designers, manufacturers, fabricators, and installers, each contributing their expertise to turn a concept into something tangible. It's that collaboration that makes the finished results so impressive.

One of the things I hope you'll take away from this issue is a little inspiration. Perhaps it's a detail you hadn't considered, a creative application of a familiar product, or simply a project that makes you stop and take a second look. Sometimes the best ideas come from seeing how someone else approached a challenge.

As we begin to wrap up another year, I want to thank everyone who continues to share their projects and stories with us. It's a privilege to showcase your work, and I never tire of seeing what's possible when creativity and innovation come together.

I hope you enjoy exploring this year's Design Book as much as we've enjoyed bringing it to you. And who knows? Maybe we'll be featuring one of your projects next year.

Melanie Kowal



Melanie Kowal
EXECUTIVE PUBLISHER

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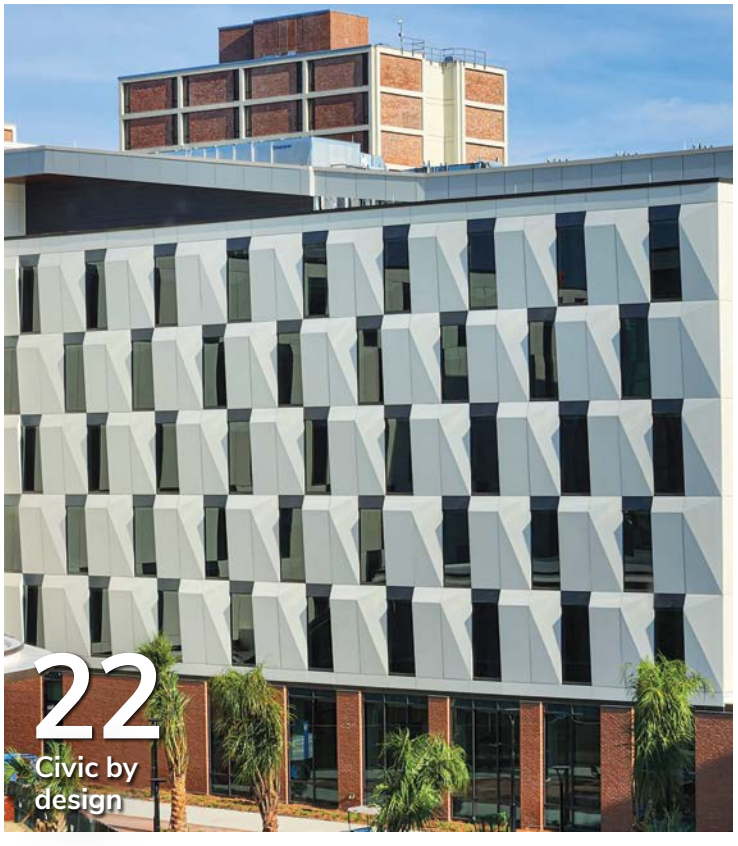


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On the cover

GKD Mediamesh transforms Mandeville Art Gallery's entrance into a transparent digital canvas, showcasing art and video while preserving views through the facade when the LEDs are off.

Photo courtesy GKD Group

Designed to weather the desert

Line and Space uses metal to shape Arizona architecture

By Ciara Lalor-Lindo

Photos courtesy Line and Space

Arizona's desert climate is unforgiving, so a project's building materials must withstand the intense sun and extreme heat. For Line and Space, LLC, steel has become a versatile tool for meeting those demands while offering structural efficiency, durability, and opportunities to create eye-catching shading and architectural detail.

Line and Space principals Henry Tom, FAIA, and Johnny Birkinbine, AIA, have been with the firm for over 30 years, playing critical roles in its development. The pair discuss how programming, site conditions, and environmental conditions aid their design process, and why metal often plays a key role in their work, shaping a project's identity and performance.

MA: When starting a new project, what does the design process usually look like, and when do conversations about materials and fabrication begin?

HENRY: The project usually starts with an intensive programming process to define the project's goals, needs, and wants. Once that's established, we'll start the design process, which goes through the typical schematic design development and then into the construction documents.

Material selection depends on the environment we're in and how the materials blend with the existing space.

JOHNNY: During the programming and early design phase, we also conduct an extensive site analysis for each project to understand existing site conditions and context and to identify natural or unnatural forces that might inform our design and material choices.

MA: Do you feel there's a consistent Line and Space approach to using metal, or does it vary widely depending on the site, program, and climate?

HENRY: Arizona has a dry climate, with very intense heat and sun, and metal does well in that. We use metal, mostly steel, because it's durable and works well here.

If you leave steel in its natural state, you won't have to maintain it or paint it. You don't need to take measures to prevent the sun from taking a toll on it through fading and oxidation, because steel looks good as it ages and becomes more weathered.







MA: How do you choose between metals, and what are the main trade-offs you are weighing in terms of structure, maintenance, local availability, and environmental impact?

HENRY: We typically use steel or materials that require minimal maintenance while providing adequate support for columns, beams, and decking, and of course, the decorative aspects of the project. With steel, we can achieve long spans with shallow sections that we wouldn't be able to with wood or concrete. The floor plates or roof sections are much thinner than other materials, allowing us to use less material while getting the intended look.

Steel's wonderful because it has such a wide variety. You can get it in long spans, different shapes, configurations, and sizes.

JOHNNY: We're always looking for durable materials since they're exposed to many elements in our desert climate and are often civic projects used by the public. Public use and the impact of using the building affect what we decide to use and how we exhibit that material and its use in architectural elements.

We gravitate toward steel because it's a beautiful material that offers us many creative design options for shading and building.

MA: How do you decide when metal should become a defining feature of a project and when it should stay in the background?

HENRY: That's hard to say. We just completed a project at the University of Arizona, which was the Andrew Weil Center for Integrative Medicine. The building itself was made of steel, which we found to be the best material used because of its flexibility. The building has a curve, and the steel allowed us to respond to that. Then, on the outside of the building, there are shading elements designed to shield the glass, and steel was the obvious choice for that, too.

MA: In 2018, Line and Space won Build Magazine's Best Sustainable Design Practice in Arizona. Sustainability is clearly important to your firm. How do you incorporate it in your projects?

HENRY: It's a big part of our firm. Sustainability starts at the beginning with proper building orientation, making sure our project is shaded by avoiding west-facing glass, as the west sun is the most intense during the summer, in the late afternoon and evening.

Sustainability has been a focus of the firm since it started nearly 50 years ago.

MA: Are there any recent projects that reflect the scope and principles that Line and Space encompasses?

HENRY: We recently completed several interesting projects. One is the Andrew Weil Center for Integrated Medicine, which I previously mentioned. We built a library in Sahuarita, Arizona, that uses metal cladding and makes a statement for the community.

JOHNNY: At Pima County's Northwest Service Center, we used steel along the entry plaza to enhance the shading and prevent direct glare from entering the building through the windows.

Since 1978, Line and Space's projects have shown that steel is more than a structural material or finish; it is an adaptable part of a broader, climate-responsive design strategy. Its ability to span long distances with relatively shallow sections, weather gracefully in the Arizona sun, and form durable shading systems makes it well-suited to the firm's needs.

Whether used as a visual statement, as at the Sahuarita library, or more functionally to provide shade and reduce glare at Pima County's Northwest Service Center, metal helps the firm deliver performance, sustainability, and design expression. MA

Far left: The University of Arizona's Andrew Weil Center for Integrative Medicine in Tucson.
Photo: Bradley Wheeler Photo

Top left: The University of Arizona's Andrew Weil Center for Integrative Medicine in Tucson.
Photo: Logan Havens

Top middle: Pima County Northwest Service Center in Tucson.
Photo: Bradley Wheeler Photo

Top right: Sahuarita Regional Library in Sahuarita.
Photo: Bradley Wheeler Photo



FM vs. Miami-Dade Approved

What you need to know

By Carla Guzman

Photos: Kingspan Insulated Panels North America

An FM Approval doesn't automatically apply to every field configuration using that product.

An architect specifies an insulated metal panel (IMP) because the project needs FM approval. A general contractor swaps a fastener spacing to save a few dollars on a Miami-Dade project. A specification lists both FM and Miami-Dade for the same wall, assuming they overlap. All three are common on IMP projects, and they point to the same misunderstanding: FM Approvals and Miami-Dade Notices of Acceptance (NOAs) do not give a panel unlimited approval regardless of how it is installed. The claimed performance is tied to a specific tested and approved configuration.

That distinction sounds small. On a project schedule, it isn't.

What FM and Miami-Dade actually are

FM Approval is a widely recognized certification focused on property loss prevention and used throughout the insurance and construction industries. FM Global, the organization behind FM Approvals, is an international property insurance and loss prevention engineering firm operating in more than 100 countries. When a product carries the FM Approved mark, it means it has been independently evaluated and tested by FM Global and meets FM Approvals' rigorous performance requirements for the specific approved configuration. It's a distinction that carries real weight with building owners, insurers, designers, and specifiers.

Miami-Dade County developed its product-approval program after Hurricane Andrew exposed significant weaknesses in how buildings and building envelopes performed under hurricane conditions. NOAs issued under that program aren't limited to Miami-Dade County itself; they address products and systems intended for use under the stringent requirements of



Florida's High-Velocity Hurricane Zone (HVHZ), and they may also be recognized or referenced for projects outside Miami-Dade that reference the same HVHZ requirements.

An approval covers the system, not the product

For IMP wall systems, FM Approvals and Miami-Dade NOAs evaluate specific tested configurations rather than treating the panel itself as approved for every possible installation. Depending on the approval, the listing can include panel width, thickness, and facer gauge, as well as fasteners, fastener spacing, support conditions, substrate, and clips. Change one of those, and you may no longer be within the tested configuration, even if the panel itself hasn't changed.

That's why a panel can be part of an FM-approved system on one project but not qualify on the next, depending on the assembly configuration. If the support spacing on the drawings is eight feet on-center and the applicable listing permits only five feet for the required pressure, the assembly doesn't meet the applicable approval, regardless of the panel type.

FM and Miami-Dade solve different problems

The two approvals get lumped together in conversation, but they exist for different reasons.

Miami-Dade NOAs address products and systems intended for use in High-Velocity Hurricane Zones, as defined by the Florida Building Code. Depending on the product and application, testing can address structural wind pressure, impact, and cyclic loading, as well as air and water performance. The resulting NOA documents the approved configurations, limitations, and installation requirements that go with them.

FM Approvals are generally driven by insurance and project specifications rather than geography. If a building is FM-insured, or if FM requirements are included in the project spec for other reasons, the applicable system must follow the requirements of the relevant FM listing and FM design criteria. FM has its own methodology for determining required wind ratings, outlined in the Property Loss Prevention Data Sheet 1-28, which differs from the ASCE wind-load calculation process commonly used for building structural design.

That difference in methodology matters more than it looks on paper. With conventional engineering design using ASCE loads, engineers generally have more flexibility to use available test data to evaluate different project conditions. FM is much more restrictive. The design needs to stay within the parameters of the applicable assembly in the FM listing.

That leads to an important distinction: a project can reference FM design criteria without necessarily being FM-insured or requiring FM Approved assemblies throughout. These are separate requirements, and specs sometimes ask for the second when they only need the first.

Fastener specificity, especially with FM

The level of detail in these listings surprises many people the first time they read one closely. A Miami-Dade NOA for a specific IMP, for example, may specify the panel thickness range, the standard fastener-and-clip method, the minimum support thickness, and the support spacing tied to the load. FM goes further. FM listings can also include the fastener manufacturer or specific product required as part of the approved assembly. That's not a substitution that should be made on-site without checking the listing. If the listing calls for a specific fastener brand, substituting another one may put the installed assembly outside the FM Approval.

An FM Approval doesn't automatically apply to every field configuration using that product. The installation must still comply with the applicable FM Approval Guide listing and its stated conditions.

Where this goes wrong on real projects

The failure pattern is consistent: a spec calls for FM or Miami-Dade approval, the team assumes the panel product itself carries that approval regardless of configuration, and the mismatch surfaces later when someone checks the actual fastener spacing or support gauge against



the listing. Catch it during design, and the fix might be a support spacing adjustment or an additional row of fasteners. Catch it after the structure is up, and the same fix now involves rework, schedule delays, and costs that could have been avoided.

Some specs list both FM and Miami-Dade for the same assembly, assuming the requirements are interchangeable. They often aren't. If both are required, the selected configuration must satisfy both approvals, which may require reconciling different fasteners, support conditions, allowable pressures, or other installation limits. Worth asking early: does this project actually need both, or was one requirement carried into the spec without confirming how the two approvals align?

New assembly approvals can also take many months, depending on the scope of testing, laboratory availability, and the review process involved. Even when a project team is seeking acceptance of a modification rather than pursuing a completely new tested configuration, the review can still be significant.

Changes that appear conservative, such as increasing support thickness or tightening fastener spacing, may be easier to evaluate than reductions in capacity, but they still need to be reviewed against the applicable approval rather than assumed acceptable in the field. Reducing support thickness, increasing support spacing, or otherwise moving beyond approved limits is a different conversation and may require additional engineering evaluation or new testing.

What to ask before the spec is finalized

The most useful thing an architect or contractor can do early is confirm what the project actually requires and why. Is the building FM-insured, or does the spec simply reference FM requirements for other reasons? Is the site inside a High-Velocity Hurricane Zone, and what product approval pathway does the authority having jurisdiction require? Once that's clear, the next question follows naturally: which approved assembly meets that requirement, and do the proposed panel configuration, fastener type, spacing, and support specifications fall within that listing's scope?

For example, consider a new distribution center in Miami-Dade County with IMP walls and a standing-seam metal roof. An early design checklist might look like this:

1. **Establish the Miami-Dade requirements.**
   Because the project is located in Miami-Dade County, it is within Florida's High-Velocity Hurricane Zone (HVHZ). Establish the applicable design pressures and identify the Miami-Dade-approved wall and roof assemblies that can meet the project conditions.

2. **Determine whether FM requirements also apply.**
   Confirm whether the building will be FM-insured or whether the owner or project specifications require FM Approved assemblies or FM design criteria.

3. **Identify the applicable approvals for each assembly.**
   Review the current Miami-Dade NOAs and, if required, FM Approval Guide listings for the proposed IMP wall and standing-seam roof systems.

4. **Match the project design to the approved configurations.**
   Compare the required design pressures and project conditions with the applicable approvals, including panel type and thickness, support



spacing and specs, fasteners, clips, attachment spacing, and other listed limitations.

5. **If both Miami-Dade and FM requirements apply, satisfy both.**
   Compliance with one does not automatically establish compliance with the other. Select and detail wall and roof assemblies that fall within the applicable requirements of both. Where the requirements differ, the more restrictive condition may govern, so the assembly remains within the limitations of both.

6. **Carry the requirements into the drawings and specifications.**
   Coordinate items such as girt and purlin spacing, support thickness, fastener type, and all other specific requirements so the construction documents reflect approved assemblies.

That means pulling the current FM Approval Guide listing or Miami-Dade NOA and comparing it directly with the project documents.

Asking those questions during design, rather than during submittal review or after erection has started, is what keeps an FM or Miami-Dade requirement from becoming a change order. MA

*With over a decade of experience in regulated manufacturing and engineered building systems, **Carla Guzman** leads the Technical Services division for Kingspan Insulated Panels North America, supporting a broad product portfolio across multiple manufacturing facilities. She oversees engineering, product performance, field support, and warranty functions while partnering closely with Sales, R&D, and Quality and Operations to ensure product capabilities meet evolving market and regulatory requirements.*



Mindful metal walls

Color as a catalyst for materiality and place





For facades and interiors alike, coil, liquid spray, and powder coatings give designers more ways to temper metal's traditionally cold aesthetic articulation.

Facades create a building's first visual impression, communicating function, identity, and intent before visitors enter. Interior walls shape the atmosphere occupants experience over time and can support wayfinding, artistic expression, or act as a blank backdrop. Designing both requires balancing immediate impact with long-term comfort and usability.

The color of facades can also influence the success of a design's integration with its surroundings. Kiki Redhead, global color, material, finish, and trend manager for Sherwin-Williams Design House, notes that walls "can be quite jarring, especially if they are popping out of a neighborhood and not incorporating the architectural exterior with the landscape and the other buildings around it."

Designing with light in mind

When discussing light and metal walls, Redhead highlights the importance of considering the following factors: light quantity, absorption, reflection, time of day and seasonal changes, and the type of light, whether natural or artificial. These conditions affect perceived color, contrast, glare, and surface depth, so they should be evaluated before finalizing a color and finish. Redhead mentions evaluating the tints, tones, or shades that "enhance the space and partner with the lighting rather than fight with the lighting."

In the San Francisco Bay Area, at Salesforce Transit Center, light is an active part of the facade. Designed by



Pelli Clarke & Partners, the curved awning of 140,000 sf (13,006.4 m^2) of perforated aluminum panels is finished in a pearlescent white coating containing small metallic flakes. The flakes reflect daylight, creating a shifting sparkle and visual depth, while the perforations admit diffused light into the interior. Together, the finish, perforation pattern, and curved geometry create a dynamic appearance across the large metal surface.

A monochromatic palette with subtle lighter, darker, warmer, or cooler variations can reduce visual harshness. Another strategy is to introduce micas, metallics, and textures that alter how light is reflected, refracted, or absorbed at the surface. Redhead explains the "additional sensorial experience that those types of finishes and effects give can also manipulate the appearance of the big wall surfaces with the lighting available in the space."

Purposeful expressions of place

When specifying the right material and finish for a metal wall, the selection should account for the building's occupants, function, and setting. A useful question is: how will this wall look, perform, and feel to the people who encounter it?

Understanding the general emotional response people may have to a building's design comes down to meaningfully reflecting on the needs of the communities using the space. Architects can use this thought process to develop material palettes that respond to the needs, activities, and expectations of key user groups. Redhead explains this analysis as a key part of the process: "As the designer is working on creating the scheme and the mood for the design, they use those tactics to identify and specify the colors that will create that same emotional experience and reaction from broad groups of people."

At Thaden School in Bentonville, Ark., the green-gold metallic facade is a purposeful representation of the context and community behind the design. The custom color draws from the surrounding prairie grasses while also referencing the region's automotive culture and the aviation legacy of the school's namesake, Louise Thaden. Across the buildings' folded, ribbed surfaces, the finish shifts with daylight, tying color, form, and local identity into one cohesive architectural statement.

In smaller spaces, the more specific the needs of the occupants, the more walls can "talk" to the individuals within the community. For example, a classroom might use printed graphics as an age-appropriate visual cue, while a lecture hall may use a low-gloss, single-color finish where glare control is a priority.

Airports, shopping centers, and convention centers can host tens of thousands of people a day, depending on the situation. In these large, high-traffic spaces, designers can successfully match metal walls to occupants' needs, either by embracing the versatility of neutrals or by integrating location-specific motifs to introduce the local culture.

Why walls are warming up

The baseline for wall color design has shifted. Neutrals are a versatile design option that architects and specifiers often veer towards when creating designs that integrate seamlessly with their environments. For some time, true

By Hanna Kowal

Photos courtesy Sherwin-Williams Design House

On this spread

Left: The Salesforce Transit Center, in San Francisco Bay Area, Calif.

Photo: Jason O'Rear

Above: Thaden School in Bentonville, Ark.

Photo: Tim Hursley



Freight Yard in Tallahassee, Fla.
Photo: Horton Photography Inc.

neutrals—blacks, whites, and grays—were at the heart of this baseline. Redhead explains that these colors gained traction around 2006, with the automotive and appliance industries leading the charge through stainless steel and silver.

Architecturally, the stark neutrals first emerged in luxury residential with contrasting blacks and whites across walls, trim, and details. Following the 2008 market crash, Redhead observed the architectural landscape fixated on the grayscale for nearly two decades.

Today, these colors are softening. There has been an increasingly visible shift towards complex neutrals, which Redhead defines as "neutrals that are found more in nature: beiges, the taupes, the tans, browns, some greens, some blues." She connects the growing interest in warmer, nature-associated palettes to a broader desire for more comforting spaces, a preference that gained visibility during and after the pandemic. Architects, designers, homeowners, and occupants alike needed the walls they spent so much time inside to be a source of comfort. Where the harshness of true neutrals can come across as jarring, Redhead says, "People are looking for spaces that are more connected with nature and that have a more nurturing aesthetic."

Influencing perception

Perception of a wall is shaped by color, finish, texture, gloss, pattern, and the light conditions in which it is viewed. In terms of color psychology, Redhead shares, "the emotional side of our brains that creates a sense of calm or excitement or that sets a specific mood within the space is reflected back to the person having the experience with that space."

Essentially, how any visual design element resonates with an individual is personal and highly dependent on the unique experiences and connections a person has with specific textures or colors. At the same time, there are design elements that may appeal to a broader social group through shared experiences, whether geographical, cultural, or otherwise. Understanding the styles, textures, and colors that appeal to these demographics is vital. This approach expands metal's expressive range beyond its familiar industrial associations and into the comfort and versatility that the material can provide today.

Tactile trends

Redhead mentions tactility in walls as a trend for both interiors and facades. She explains a reach towards materials like "fuzzy fabric, or some sort of coating that might have a visual or an actual sensorial experience to touch." Sand and wrinkle finishes can introduce physical texture, while veining effects can create visual texture. Both can soften the perceived character of a metal wall.

Strength in metal expression

Coatings can give one metal substrate the visual character of other metals, stone, or weathered surfaces. Finishes that evoke iron, aluminum, stone, or aged metal can lend a wall a more substantial or weathered character. Redhead also presents the option of "aged patinas for a copper look that mimics a metal and a process of oxidation that happens naturally with metal to create looks like that both on exterior and interior." Using finishes that mimic a metal's distinctive traits on other metals expands opportunities for clean applications of the material's unique qualities in more versatile situations.

At Freight Yard in Tallahassee, Fla., a printed coating creates the visual texture of weathered steel without relying on naturally oxidized metal. The design goal was to emulate the look of shipping containers on the exterior. Applied in multiple layers with a dark base coat, a lighter-brown printed pattern, and a protective clear coat, the finish evokes the irregular depth and patina of aged shipping containers while providing a more controlled, consistent appearance. The project shows how coatings can use visual texture to give metal a sense of history and material character, drawing on the context of the location's industrial setting at the Railroad Square arts district.

Variety in metal wall expression

Modern coating, painting, and printing technologies have made metal one of the most adaptable materials for walls. With micas and metallics, walls can further embrace or pay homage to the natural material's visual qualities. Through varying gloss levels, they can adapt to different expressions and reflections of light.

By varying shades with multi-tone coatings, an illusion of texture can be created. With tactile coatings, an authentic warmth can be introduced to the material. Balancing these considerations with color can create metal walls with deliberate and impactful resonance for both building occupants and passersby. MA

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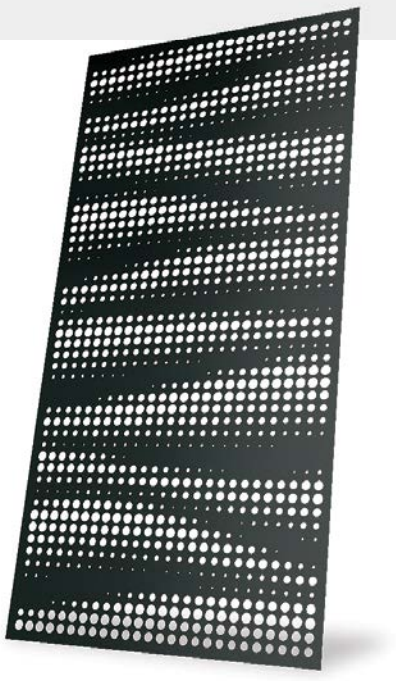
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Translating parametric analysis into design strategy

By Alvaro Quintana and Charles Mummert

The design team partnered with owners to use parametric analysis to optimize performance at the manufacturing facility and Clemson CVM.

Renderings courtesy of Flad Architects

As designers, we know that effective sustainable design solutions make a meaningful impact on occupant well-being and the environment, while also providing long-term energy savings. Therefore, it is our job to demonstrate that value through an objective, data-driven approach, ensuring that strategies are not deprioritized or eliminated from the final design for cost-cutting.

Balancing sustainable design ambition, budget constraints, and performance demands is one of the greatest challenges facing building owners today.

Integrating sustainable design solutions from early planning and visioning ensures alignment with the project vision. Early parametric analysis provides data confirming that these strategies will achieve their purpose. When sustainability is inseparable from the design vision and project goals and backed by data, it can withstand the pressures of value engineering.

This story will highlight these points with two case studies: a new manufacturing facility in North Carolina and the Clemson University College of Veterinary Medicine (CVM). We'll showcase how early parametric analysis leads to better performance, cost certainty, design quality, and future-proofed investments.

Building for Occupant Comfort and Well-Being

An effective building project must create an environment that is far more than functional. It should provide a









sense of place, culture, and identity that resonates with occupants. Additionally, owners and occupants alike have rising expectations for building performance and environmental responsibility.

According to the AIA Framework for Design Excellence, one important principle is Design for Integration. It states that design should be rooted in the connection of people, place, and ideas. This includes an integrated design process that respects and values multiple viewpoints and all stakeholders.

It asks how the project will engage the senses and connect people to the place, and what makes it one people will advocate for?

In simple terms, a building should be a place where people want to spend their time, a place that provides physical, mental, and emotional comfort. This includes sensory considerations for regulating temperature, access to daylight, avoiding glare, and engaging in the biophilic benefits of interacting with nature.

A successful design is one that provides multiple benefits across the "triple bottom line" of social, economic, and environmental value. However, the priorities of occupant experience, building performance, budget, schedule, and long-term value often conflict with one another. This is why building performance, life-cycle costs, occupant comfort, and environmental impact must be part of early design decisions and ingrained with the project goals.

Parametric Analysis Confirms Design is Backed by Data

When designing the manufacturing facility and Clemson CVM, the design team worked closely with the building owners to conduct parametric analysis, a method of evaluating how adjusting specific variables or parameters within a model affects the performance of a building or system.

In these case studies, we tested variable input parameters for building elements in our models to assess their impact on daylight, glare, annual sunlight exposure, and solar control.

This provides performance-based data to inform architectural form from the outset rather than being applied after major design decisions have been made. With this information, the team can make better choices before critical design and budget decisions are locked in.

For clients and building owners, this means more informed investment decisions and enhanced life-cycle performance, leading to a better return on investment. It can also improve design quality by creating environments that offer higher rates of occupant satisfaction, support recruitment and retention, and are more resilient and positioned for long-term performance.

Early analysis also reduces risk and rework for contractors and is more efficient value engineering when scope and performance expectations are more clearly defined. This leads to better alignment between owners, designers, and builders.



With its optimized facade fins, this 100,000-sf manufacturing facility in North Carolina reduces glare and excessive sunlight while preserving daylight.

Photo © SkySite Images Inc.; Charlie Sarratt, Photographer

For the design team, data-driven design decisions enable greater confidence in balancing performance and aesthetics, as well as enhanced architectural quality and project outcomes.

Case Study: Manufacturing Facility

We worked with the client to design a new manufacturing facility in North Carolina that would enable the company to expand production capacity and add to their growing product lines. It features 100,000 square feet of high-bay manufacturing and warehouse space, along with 15,000 square feet of finished office space that serves as an inviting front door to the facility. Unlike opaque industrial buildings of the past, the project was envisioned as an inviting, public-facing facility.

The goals of the project were to showcase production innovations for future clients, establish a welcoming entrance, integrate and strengthen the company's brand identity, and provide opportunities to engage with the surrounding community. Additionally, the new facility would need to offer flexibility to adapt to changing industry standards and feature a resilient design.

To meet these parameters, early design envisioned a high-performance glass curtain wall with a veil of vertical aluminum fins. The fins would unify the front-of-house, establish a distinctive architectural identity, and provide solar control to improve occupant comfort.

Through parametric analysis, the team tested design options with or without the fins. The conditions analyzed included average illuminance (lux), spatial daylight autonomy (sDA), annual sunlight exposure (ASE), daylight glare probability (DGP), and seasonal solar exposure.

The results demonstrated that the fins provided measurable reductions in excessive sunlight exposure and glare while still maintaining important daylight access. Additionally, the team fine-tuned and optimized fin placement, spacing, and depth by testing these parameters and analyzing their impact on daylight quality and glare reduction throughout the building. For example, placing the fins lower further reduced glare, while placing them higher created a greater sense of openness. Demonstrating improved building performance through analysis, the design team provided measurable benefits and justification for retaining the fins during value engineering.

As a result, the front-of-house achieved a unified architectural expression that enhances occupant comfort, strengthens community presence, and provides a distinctive identity for the facility.

Case Study: Clemson University College of Veterinary Medicine

We recently had the opportunity to work with Clemson to provide architectural design services for its new CVM campus, which will establish the first veterinary medicine school in South Carolina. The complex features eight buildings totaling 248,000 square feet, including classrooms, clinical learning, research labs, and a community clinic.

Rooted in Southern regionalism, the campus vision took design cues from barns and houses associated with traditional Southern architecture. It features large porches at entrances and key locations, creating welcoming beacons that unify the campus. The porches establish a cohesive architectural language that reinforces campus identity and creates a sense of place that encourages connection and collaboration between students, faculty, clinicians, and the community.

Vet med students and faculty are learning and working in a high-stress environment, and biophilic


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Photo © SkySite Images Inc.; Charlie Sarratt, Photographer

design strategies, such as porches, offer respite spaces and strengthen connections to nature, which have been shown to reduce stress and support well-being.

To enhance solar protection while preserving architectural charm and environmental performance, the design integrated horizontal aluminum fins into the traditional porch concept. Early parametric analysis tested different angles, depths, and spacing of these sunshades and the resulting impact on solar exposure. By varying the spacing between the fins, the team tested three spacing options – 2' 0", 2' 3", and 2' 6" – along with varying angles and depths to optimize solar control and daylighting for all seasons and to enable comfort year-round.

Ultimately, the largest spacing option of 2' 6" best balanced the appropriate shading in summer with optimal sunlight in winter. Crucially, optimizing fin placement allowed the design team to reduce the total length of aluminum required for the fins by 438 linear feet, a 21% reduction compared to the 2' 0" option. This achieved the desired solar performance while significantly improving cost efficiency and material resource consumption.

Through collaboration with the university and the contractor, we shared data-backed refinements, aligning all stakeholders on the optimized design and ensuring performance solutions were fully embraced.

The campus opened its doors to its first class of vet med students this fall, and the project is expected to provide year-round user comfort, support student interaction and campus identity, optimize solar performance, and demonstrate how sustainability can reinforce design vision.

Key Takeaways

These two case studies demonstrate how early parametric analysis supports informed, collaborative decision-making that improves occupant experience, environmental performance, project value, and long-term outcomes.

For the manufacturing facility, early parametric analysis yielded performance data demonstrating the value of the fins and justifying their retention in the final design. In the case of the Clemson CVM, parametric testing allowed the team to fine-tune the total number, size, and placement of the fins, resulting in cost savings.

Concept-phase parametric studies allow project teams to make these decisions before budget and schedule pressures intensify. This enables teams to identify cost efficiencies and better evaluate options to optimize performance. Backed by data, key elements of the design vision are optimized with sustainable design strategies, providing reliable information for teams to better evaluate options during value engineering. Collaboration is key as shared performance data builds alignment among clients, contractors, and design teams.

Ultimately, the most effective sustainable buildings are those in which environmental performance and design vision are intertwined, developed together from the earliest stages of design. This provides lasting value that extends beyond energy performance, promoting the health, well-being, and cultural experience of those who inhabit these spaces. MA

Alvaro Quintana, *International Assoc. AIA is an associate principal and project designer for Flad Architects with over 25 years of experience working on a range of facility types, including academic, science and technology, workplace, urban, and cultural. He is knowledgeable across all areas of the design process and works to establish strong relationships with each client while providing leadership in massing development, layout planning, material selection, and team management.*

Charles Mummert, *AIA, LEED AP BD+C, is a principal at Flad Architects. Chuck's more than 35 years of experience includes master planning, programming, and conceptual design for a wide variety of project types. His work articulates his clients' goals and aspirations while addressing complex programmatic requirements, sustainability objectives, and issues of image and identity. His personal design philosophy synthesizes disparate individual requirements into a cohesive solution.*



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Civic by design

MCM elevates community hub architecture

By Jeff Henry

Left: Gray metal composite cladding gives Campbell Aquatic Center a contemporary civic presence, with durable, UV-resistant finishes and panels suited to years of public use.

Photo courtesy JW Glass Services

Right: Faceted white, gray, and bronze panels create a rhythmic rainscreen across the University of Florida's Honors Village, combining sculptural depth with durable drainage and ventilation.

Photo courtesy CEI Materials

Community hubs ask more of a facade than many other building types. They are not just enclosures; they are identity-makers, first impressions, and long-term performance systems for spaces meant to bring people together. Whether the program is academic, civic, cultural, or transit-oriented, these buildings must feel open and durable at the same time. They need to welcome daily users, stand up to heavy traffic, express institutional character, and remain maintainable over the long haul. That is where metal composite material (MCM) continues to prove its value—not as a generic finish choice, but as a system-driven design tool that helps architects balance performance, flexibility, and visual impact.

The most effective community-hub projects are rarely the ones that treat the facade as a late-stage aesthetic layer. The stronger projects are the ones that begin with a broader question: how should the building function socially, visually, and technically for the people who will use it every day? That project-guided perspective matters because community hubs serve multiple audiences at once. They may need to feel civic without feeling cold, contemporary without dating quickly, and expressive without becoming difficult to build. MCM fits this challenge well because it gives design teams clean geometry, durable finishes, color consistency, and the ability to create a deliberate architectural identity across varied masses and program zones.



A strong example of that logic is the University of Florida Honors Village in Gainesville, Florida. This is not simply a housing project. The development includes four residential towers and a commons building totaling more than 415,000 square feet, housing 1,407 students in a setting designed around shared student life. The facade treatment is part of what makes the project feel memorable. The custom white panels read as a patterned three-dimensional skin rather than a flat enclosure. The exterior uses repeating faceted modules with crisp folded geometry, visible reveal joints, and a strong play of light and shadow across the surface. That dimensional treatment gives the building a distinct identity without relying on visual clutter. It is disciplined, rhythmic, and highly architectural—an example of how panelized cladding can create depth and motion while still supporting a cohesive large-scale composition. The cladding on this project is built from a custom white, custom gray, and dark bronze palette of metal composite panels and uses a drained, rear-ventilated rainscreen assembly. Its performance is the reason the system suits a project of this scale. Rain is managed by draining most of the water at the outermost surface of the wall, with the remaining moisture handled by cavity drainage and evaporation through a ventilated rear cavity. This mechanism lets the wall dry rather than trap water behind the cladding.

Just as important, that dimensional effect is disciplined rather than decorative. The custom white modules are organized in a clear rhythm around dark window bands, with visible horizontal and vertical reveal joints helping structure the facade into a legible grid. The result is a building envelope that feels sculptural but still ordered. That matters on a large, multi-building academic project: depth and repetition help scale the architecture, while the contrast between the bright faceted panel fields and the darker

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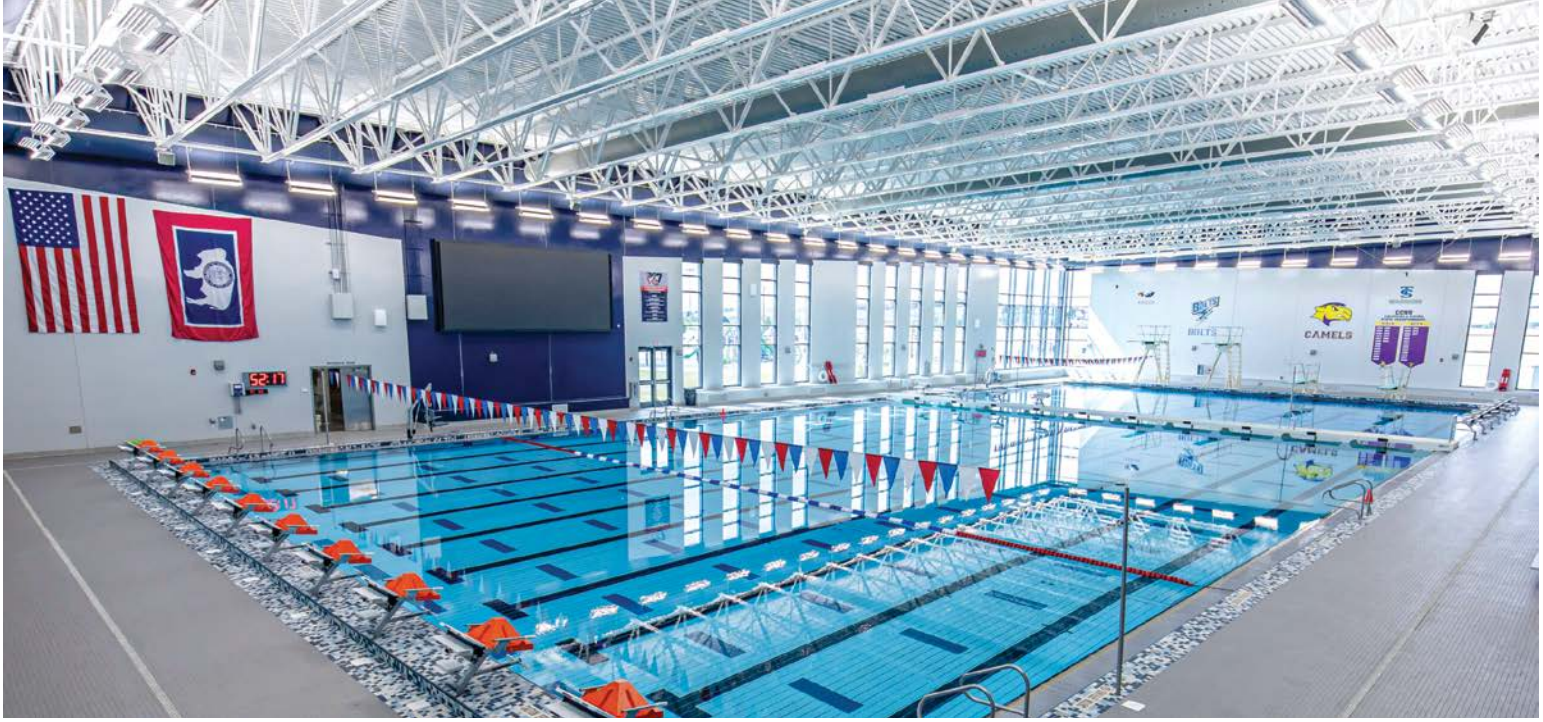


Photo courtesy Landmark Aquatic

openings creates a strong visual identity for the honors community.

On a project centered on connection, belonging, and student interaction, the cladding contributes to that identity by giving the architecture a memorable surface language—one built on light, shadow, relief, and disciplined repetition. That is a strong example of how MCM can elevate a community-hub project when the facade is treated as part of the building's social and architectural character from the beginning.

A second useful example is the Campbell Aquatic Center in Gillette, Wyoming. Recreation and aquatic centers are classic community hubs because they serve broad user groups, accommodate both organized and informal activity, and often become highly visible civic assets within a community. What makes the Campbell Aquatic Center a strong example is not just that it is recreational. It is that buildings like this have to balance durability, civic presence, and approachability. Unlike single-purpose back-of-house buildings, aquatic centers are public destinations. They host families, students, teams, events, and repeat daily traffic. Their exteriors need to feel durable enough for long-term use, but still contemporary and inviting. The cladding here is also metal composite material finished in Castle Gray. That coating system is what does the long-term work on a building like this: it resists chalking, fading, and color shift under sustained UV, and it protects the aluminum substrate from the moisture and airborne corrosives that come with a heavily used public facility. Aluminum itself does not rust, and the composite structure resists warping, denting, and the moisture-related failure modes that degrade other cladding materials over time, so the finish and the flatness both hold up under years of exposure.

That durability matters more than usual in a rec center, because aquatic facilities are among the most aggressive interior and exterior environments in commercial construction — warm, humid air carrying chlorine and chloramine compounds that attack steel and lesser metals. There, a coated aluminum composite skin has a real advantage over ferrous assemblies, since it presents no rusting substrate to attack. What the panel also delivers is consistency: because the finish is factory-applied to a coil before forming, every panel on the building matches the next, which is the difference between a façade that reads as one deliberate gesture and one that looks patched together across a large, highly visible civic facade.

Why MCM continues to fit community-hub architecture

These projects reveal an important strategic point for architects and owners: community-hub design is not just about choosing a visually appealing material. It is about selecting a system that can support repeated use, complicated adjacencies, and long-term institutional expectations. Libraries, student commons, recreation centers, art centers, civic buildings, museums, and transit-related facilities all share that reality. They are highly visible, heavily used, and often expected to represent a broader brand or mission. In those conditions, metal composite material performs best when it is part of a coordinated facade approach from

the outset—one that considers attachment strategy, panel layout, transitions, durability, and constructability early in the process.

On durability, the case rests on the construction of the panel and the quality of its finish. MCM is two aluminum face sheets bonded to either a thermoplastic or a mineral-filled core, which means the surface is aluminum rather than an iron-based substrate, and the coating — not the metal — is what carries the building's appearance over time. That coating is specified to a demanding standard: a coil-applied fluoropolymer finish that meets or exceeds AAMA 2605, the top tier of exterior finish performance. In plain terms, that is a finish engineered to hold its color and surface integrity through years of the harshest sun exposure in the country while tolerating salt-laden air. Equally important for an institutional owner is that individual panels are designed for removal and replacement, so a damaged panel can be exchanged without dismantling the wall around it, and routine upkeep is limited to cleaning with appropriate solutions.

On constructability, the value shows up in the tolerance and detailing requirements. The tolerance lets a large wall read as a single continuous plane rather than a field of individual panels. Attachment is defined with equal precision: panels are held with fasteners and anchored securely while still allowing for the necessary thermal and structural movement the assembly will see over its life. That movement provision is not incidental. Aluminum has a high coefficient of thermal expansion, so an assembly that does not account for expansion and contraction in its attachment and joint design is one that develops distortion and oil-canning in service. The specification also anticipates galvanic corrosion directly, requiring an isolating coating and gasketed fasteners wherever dissimilar metals would otherwise touch. Because the panels are fabricated off site to precise dimensions before they reach the field, the field work becomes assembly rather than adaptation, which is what protects the schedule on a heavily sequenced civic project. That off-site discipline has to be set early, which is why the system performs best when attachment strategy, panel layout, and transitions are settled during design — and why 3D laser scanning tied into the project's building model, generating accurate as-built drawings for production, is the tool that makes those decisions reliable rather than aspirational. Lightweight relative to its stiffness, the material is also easier and faster to handle and install than many alternative exterior cladding systems.

The best community hubs do not chase presence for its own sake. They create places people want to return to—places that feel intuitive, durable, and distinct. At the University of Florida Honors Village, the visually dimensional white panel treatment shows how facade depth and rhythm can reinforce identity on a large student-centered campus environment. At Dallas College's Cedar Valley Student Engagement Center, the building's multi-use public role shows how MCM supports flexible, welcoming architecture built for gathering and engagement. These are useful examples because they move the conversation beyond generic claims about material performance and into what owners, architects, and users actually experience: buildings that must work hard, look intentional, and serve as anchors for community life. MA

Jeff Henry *is the CEO and co-founder of CEI Materials, where he leads the company's strategic direction, operational performance, and long-term growth. Since co-founding CEI in 2008, he has helped build the company into a trusted partner for complex architectural cladding projects across North America, with a reputation for precision, quality, and performance.*





Metal that responds to people and communities

Metal Architecture's 2026 Design Book

By Ciara Lalor-Lindo

From residences and civic facilities to airports, sports complexes, and advanced manufacturing plants, the projects featured in the 2026 Design Book demonstrate the versatility, performance, and design potential of metal in the built environment. Each combines durability and efficiency with thoughtful architectural expression, whether through insulated metal panels, standing-seam roofs, metal facades, structural steel systems, or custom finishes.

Together, the featured works highlight how metal construction supports ambitious goals for sustainability, resilience, energy performance, and visual impact. Across a wide range of building types and scales, project teams used metal systems to create distinctive spaces that respond to their communities, users, and surroundings.



Architecture firm: Bruns Architecture
Manufacturer: EcoSteel, Metl-Span
Metal installer: EcoSteel
General contractor: Bauer Builders

RESIDENTIAL

Casper Residence

Photos courtesy EcoSteel

This 10,000-sf home in Mount Horeb, Wis., incorporates modern luxury while nestled in cozy mountain landscapes. This collaboration between Bruns Architecture, EcoSteel, and Metl-Span exceeded the clients' needs by embodying sophistication through sustainable design.

The home features flat insulated wall panels, standing-seam insulated roof panels, and a PEMB structure that combines the homeowner's vision of a home that is both industrial and tranquil.



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PROJECT: Sarasota County Government Planning and Development Services Building

AMERICAN BUILDINGS AUTHORIZED BUILDER: Halfacre Construction Company









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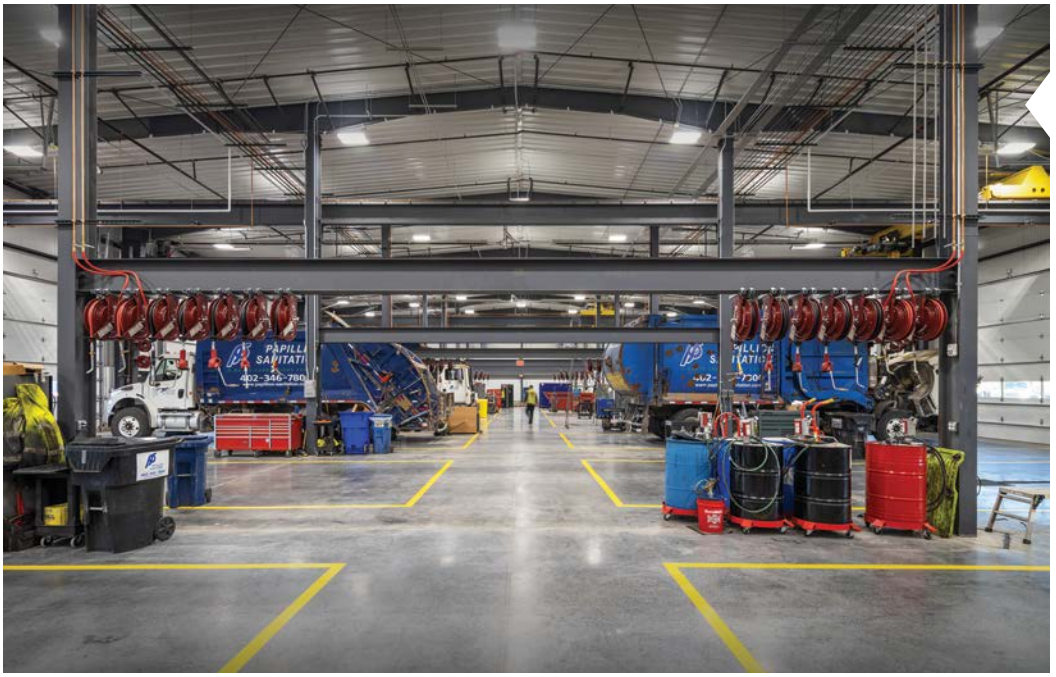
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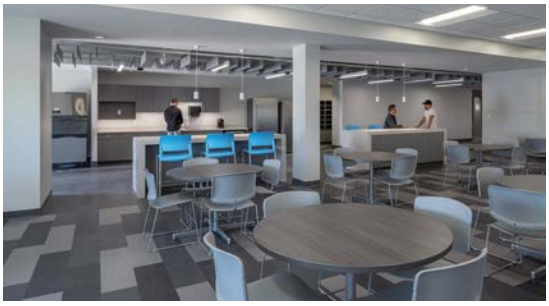
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PROJECT: Papillion Sanitation

AMERICAN BUILDINGS AUTHORIZED BUILDER: K.C. Petersen Construction Company

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RESIDENTIAL

Harsens Island Residence

Photos courtesy ATAS International Inc.

Designed and built by the owner, this home in Harsens Island was finished in phases. The garage was not built until a couple of years after the home's completion.

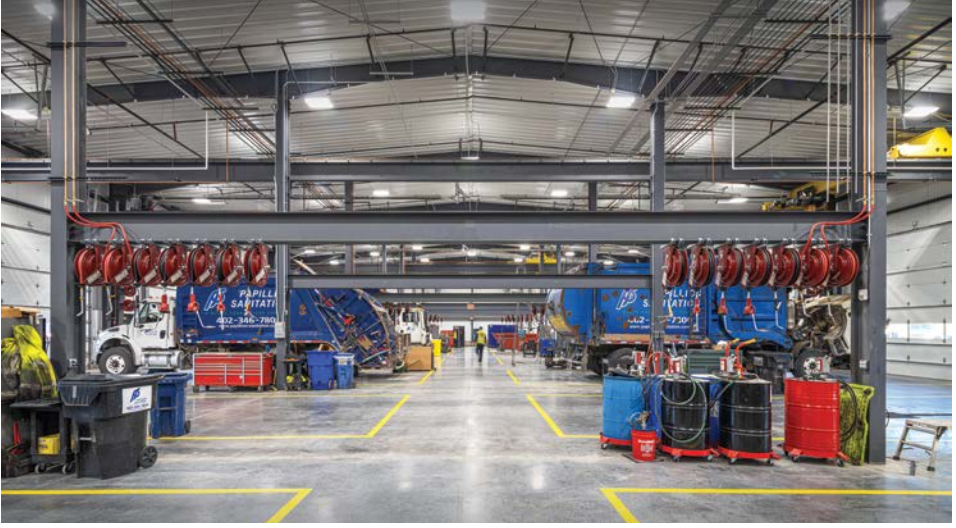
Due to its durability, longevity, and visual appeal, 1,296 square feet of ATAS .032 aluminum panels in bronze were used for the garage, seamlessly matching the previously completed home's exterior.

Both the home and garage are clad with 100% recyclable aluminum panels, ensuring that beauty and sustainability play key roles in this home's foundation.

Architecture firm: Design Team Plus

Manufacturer: ATAS International Inc.





Architecture firm: Slate Architecture
Manufacturer: American Buildings
Metal installer: KC. Petersen Construction Co.
General contractors: KC. Petersen Construction Co., Lueder Construction

TRANSPORTATION

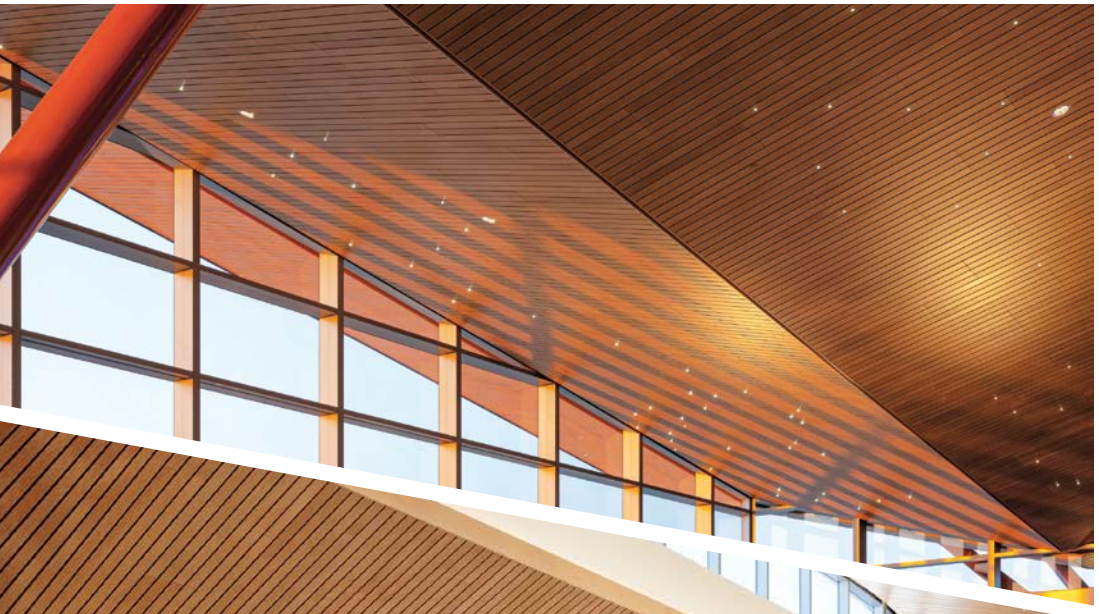
Papillion Sanitation

Photos courtesy Nucor Buildings Group

In Bellevue, Neb., Papillion Sanitation's 30,000-sf headquarters combines truck repair, fabrication, and office space in a modern, energy-efficient facility. Built by K.C. Petersen Construction Co., the exterior features insulated metal panels paired with a durable metal roof.

A glass-front entry framed by vibrant blue exposed structural steel pays homage to the company's brand, while open, daylight-filled workspaces and a partial mezzanine provide flexible office space. The specialized truck repair shop includes one 5-ton and two 10-ton overhead cranes, along with multiple overhead doors for efficient access and operation.







Architecture firm: Luis Vidal + Architects
Manufacturer: Armstrong World Industries
Metal installers: Gensler, HDR
General contractor: Wyatt Inc.

TRANSPORTATION

Pittsburgh International Airport

Photo: Ema Peter Photography, courtesy Armstrong World Industries

The Terminal Modernization Program at PIT incorporates more than 400,000 square feet of Armstrong wood-looking ceiling systems, creating a landmark "rolling hills" design across the terminal's interior and exterior. The sweeping ceiling evokes Western Pennsylvania's natural landscape while reflecting the region's industrial heritage, guiding travelers through the airport with a warm, fluid visual experience.

Inside, approximately 300,000 square feet of aluminum linear panels form curved, straight, and warped surfaces; outside, 100,000 square feet of steel panels extend the design through the glass facade. The metal panels were selected in place of real wood to provide lasting color consistency and performance under humid conditions. Their custom wood-like finish preserves the warmth of natural materials while supporting the scale, complex geometry, acoustic needs, and long-term durability required for a major transportation hub.

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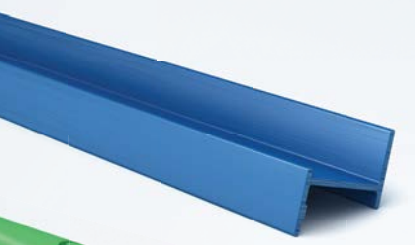
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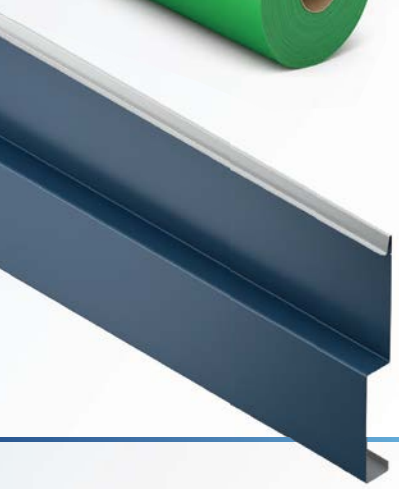
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Architecture firm: Goodwyn Mills Cawood
Manufacturer: American Buildings, Marino/WARE, YKK AP, and Safti First
Metal installers: American Buildings, Iron Rock, and Five-T-Co
General contractor: Halfacre Construction

MUNICIPAL

Sarasota County Planning and Development Services

Photos: Nicholas Ferris Photography LLC, courtesy Goodwyn Mills Cawood

One Stop is a 55,000-sf public-facing office facility that, for the first time, brings together all Sarasota County departments responsible for permitting vertical construction under one roof.

The PEMB system includes ribbed wall panels and a standing-seam metal roof to create a durable envelope, designed by Goodwyn Mills Cawood, constructed by Halfacre Construction, and installed by American Buildings, Iron Rock, and FIVE-T-CO.

The facility is composed of high-recycled-content steel and aluminum, and features a certified cool and solar-ready metal roof, daylight harvesting, LED lighting controls, and a 300-kW solar array, expandable to 360-kW.

With a focus on sustainability, the project aims to achieve AIA 2030 compliance, LEED Silver certification (at minimum), and is progressing toward net zero energy.



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CULTURAL CENTERS

UCSD Mandeville Art Gallery

Photos courtesy GKD Group

The defining feature of UC San Diego's renovated Mandeville Art Gallery is its GKD Mediamesh media facade, a transparent stainless-steel metal fabric integrated with LED tubing. Wrapped around three sides of a metal frame at the gallery entrance, the mesh creates a large-scale digital canvas for artwork, video, and other programmed content.

Unlike a conventional solid screen, the lightweight metal mesh remains visually open when the LEDs are off, allowing views through the facade and avoiding the black appearance of traditional display systems. Chosen for its transparency, flexibility, cost efficiency, and maintainability, the mesh transforms the gallery entrance into a dynamic architectural feature that supports ongoing artistic expression.

Architecture firm: Studio E Architects
Engineering firm: Syska Hennessey Group
Manufacturer: GKD-USA
General contractor: Turner Construction Group

First Redeemer Church Expansion

Photos courtesy MillerClapperton

To create more space for learning, worship, fellowship, and family programming, the First Redeemer Church expansion in Cumming, Ga., adds a new 45,000-sf, three-story adult education center and an 8,000-sf preschool addition.

Designed by POH+W Architects and built by CBI General Contractors, the project includes classrooms, conference space, a preschool worship center, an indoor playground, expanded parking, and convenient covered drop-off areas.

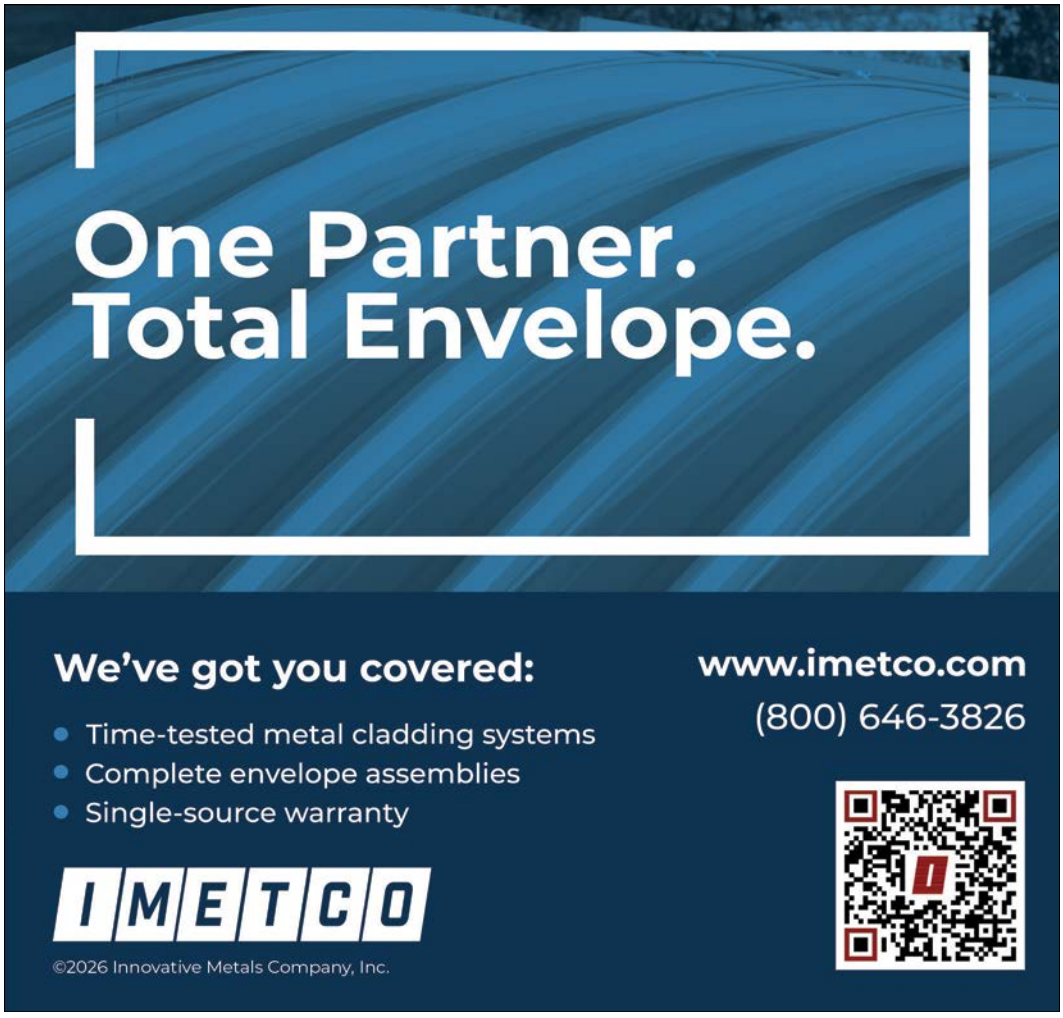
MillerClapperton installed more than 5,400 square feet of Alpolic metal composite material panels in bronze, pewter, and copper-inspired finishes. Used on the adult center's tower, fascia, soffits, fin wall, and prominent cross, as well as the preschool entry canopy, the panels give the expansion a modern, welcoming presence and a bold focal point along Highway 141.



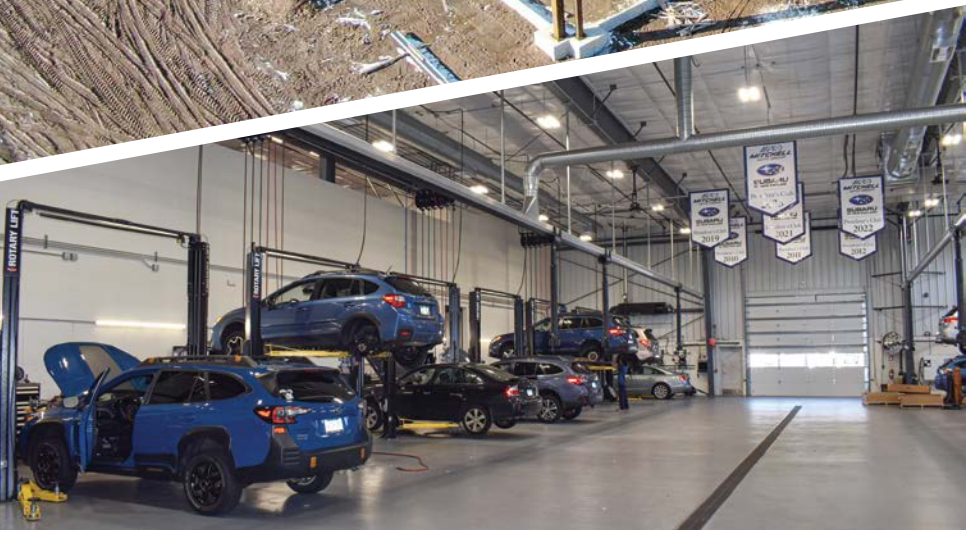




Architecture firm: POH+W Architects
Manufacturer: Alpolic
Metal installer: MillerClapperton
General contractor: CBI General Contractors







Architecture firm and metal installer: PDS Engineering & Construction Inc.
Manufacturer: Metallic Building Systems
General contractor: First Choice Builders LLC

RETAIL

Mitchell Subaru

Photos: Dan Jodice, courtesy MBCEA

This 32,000-sf Subaru dealership in Connecticut was built after the family-owned business outgrew its previous facility. Designed and managed in-house by PDS Engineering & Construction, the project combines modern customer experience with an eco-conscious approach, earning Mitchell Subaru certification as Connecticut's first Subaru Eco-Friendly Dealer.

The dealership features a two-story, vaulted showroom, a customer service lounge, indoor vehicle drop-off and delivery areas, a recycled-water car wash, and a 9,200-sf service department with an expanded 14-bay service area.

Its custom exterior combines masonry, glass, metal roofing, solar panels, sunshades, and Subaru-branded architectural elements to create a look unlike that of a typical auto dealership.







SPORTS AND REC

Jersey Meadow Golf Clubhouse

Photos: Geoffrey Lyon, courtesy MBCEA

Metal systems play a central role in the performance and appearance of the Jersey Meadow Golf Course Clubhouse in Houston, Texas, which combines the efficiency of a PEMB with refined architectural details.

The 9,300-sf building was designed by FG Architects and constructed by Brookstone Construction, with Red Dot Buildings serving as both the building supplier and erector, earning second place in Golf Inc. Magazine's 2025 Clubhouse of the Year.

A vertical-leg standing-seam roof with an R-38 liner insulation system provides exceptional thermal performance, helping to reduce energy use and improve comfort. ATAS wall panels and PAC-CLAD soffits, installed over stud and cold-formed metal framing, add a polished exterior finish in a subtle green hue that complements the course landscape. A rooftop clock tower, concealed mechanical area, and screen wall further give the compact clubhouse a distinctive, carefully detailed identity.

Architecture firm: FG Architects
Manufacturer and metal installer: Red Dot Buildings
General contractor: Brookstone Construction

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Architecture firm: GMCN Architects
Manufacturer and metal installer: Behlen Building Systems
General contractor: FC Construction

SPORTS AND REC

The Refinery Sports Complex

Photos: Jason Ryman, courtesy MBCEA

This state-of-the-art sports and events facility in Kansas was created to fulfill Cecil O'Brate's vision of giving young athletes and community members a place to grow, compete, and gather. Designed by GMCN Architects, supplied by Behlen Building Systems, and erected by FC Construction, the Refinery includes indoor soccer and baseball fields, basketball, volleyball, and pickleball courts, along with a restaurant and bar, retail space, and a convention center.

The project's centerpiece is a 240 x 500-ft clear-span metal building with a 41-ft clear height, providing expansive, unobstructed space for athletic events.

The main structure was assembled on the ground and lifted into place using engineer-designed lifting and temporary-bracing systems. A second connected building consists of a single-slope building that incorporates a mezzanine, Kingspan panels, and a TPO roof system.

Despite evolving design details of the connecting structure, the team successfully integrated the buildings into a cohesive facility.









MANUFACTURING

IMC Metals America Upcast

Photos: Billy Costello, courtesy MBCEA

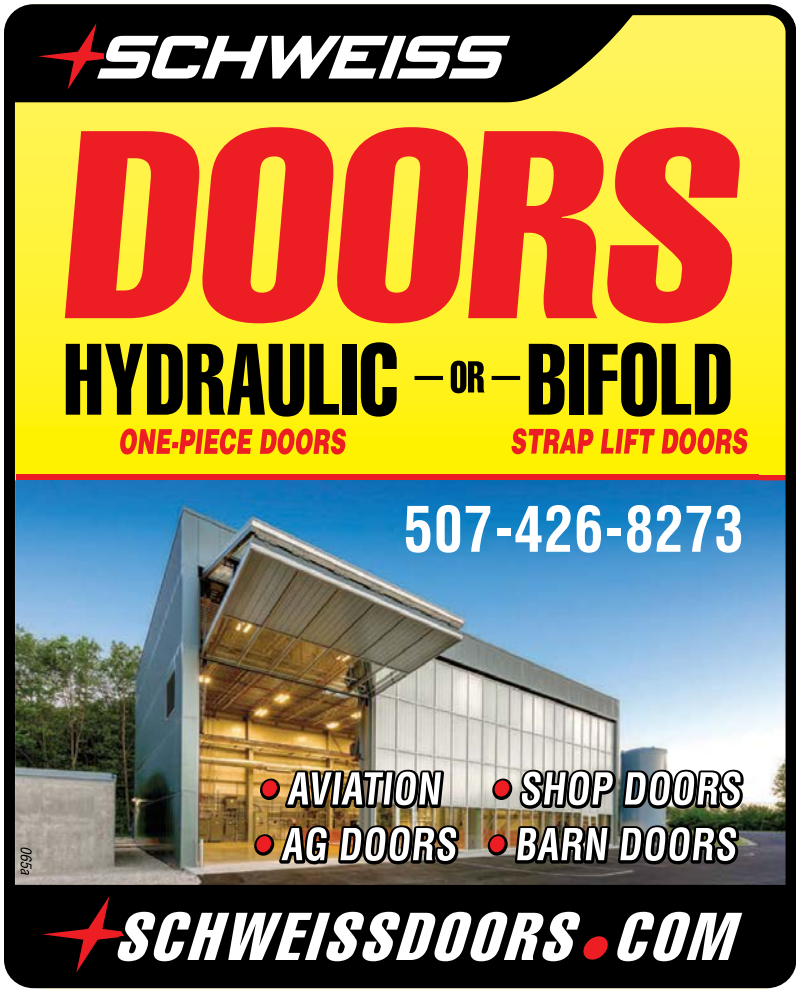
This 120,000-sf industrial facility serves as a smelting and processing plant for IMC and demonstrates the versatility of metal building construction through a hybrid system that combines conventional structural steel with PEMB components supplied by Schulte Building Systems.

A standing seam metal roof provides durable, low-maintenance protection across the specialized upcast, storage, and shipping areas, while R-panel metal walls create an efficient enclosure suited to the facility's industrial use.

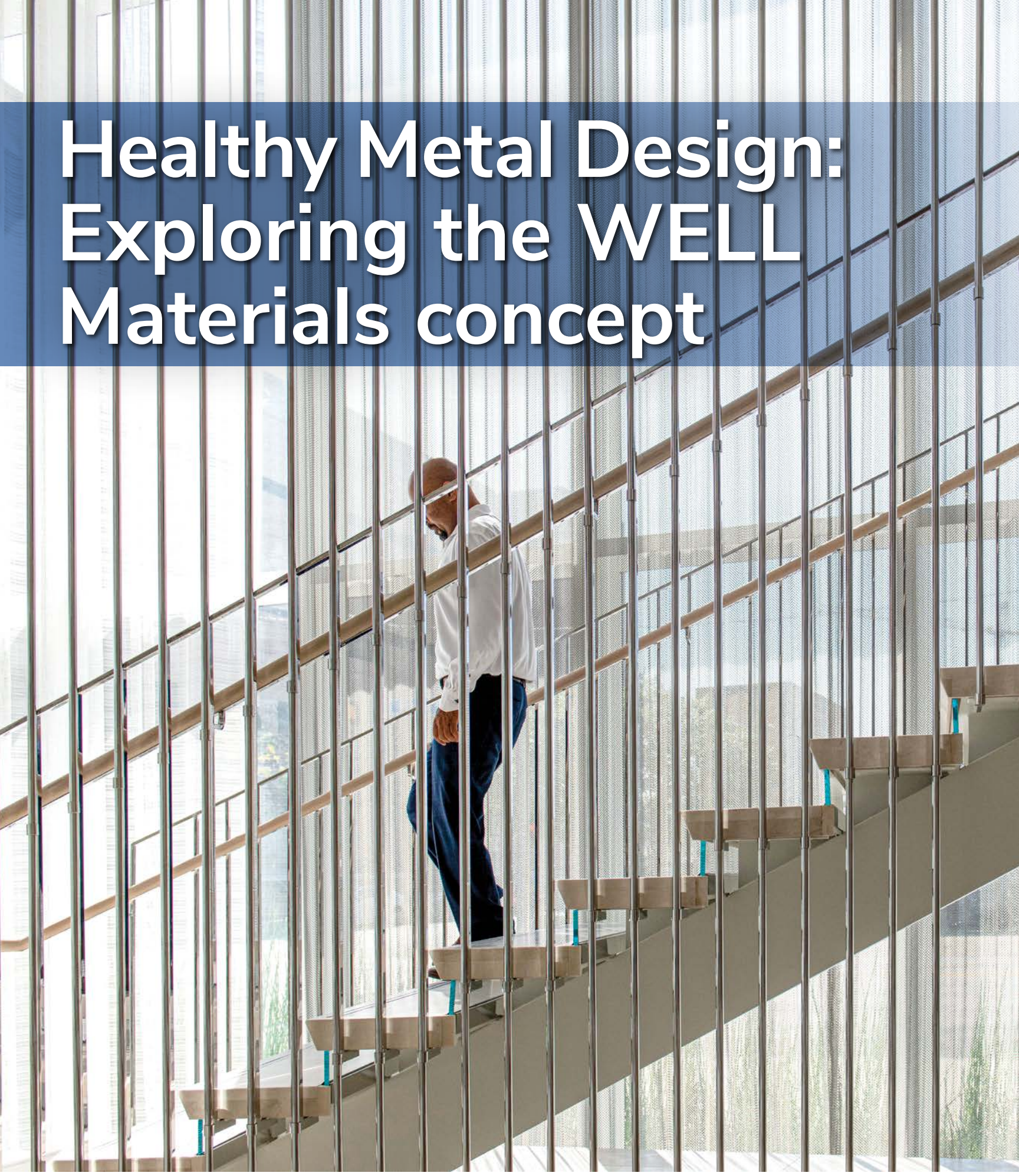
Metal framing also supports the project's heavy-duty operational demands, including two 84-ft-span crane beams running 500 feet through the Upcast building. Installed to exacting 3/8-in. tolerances, the crane-beam system enables the safe, precise handling of materials throughout the manufacturing process.

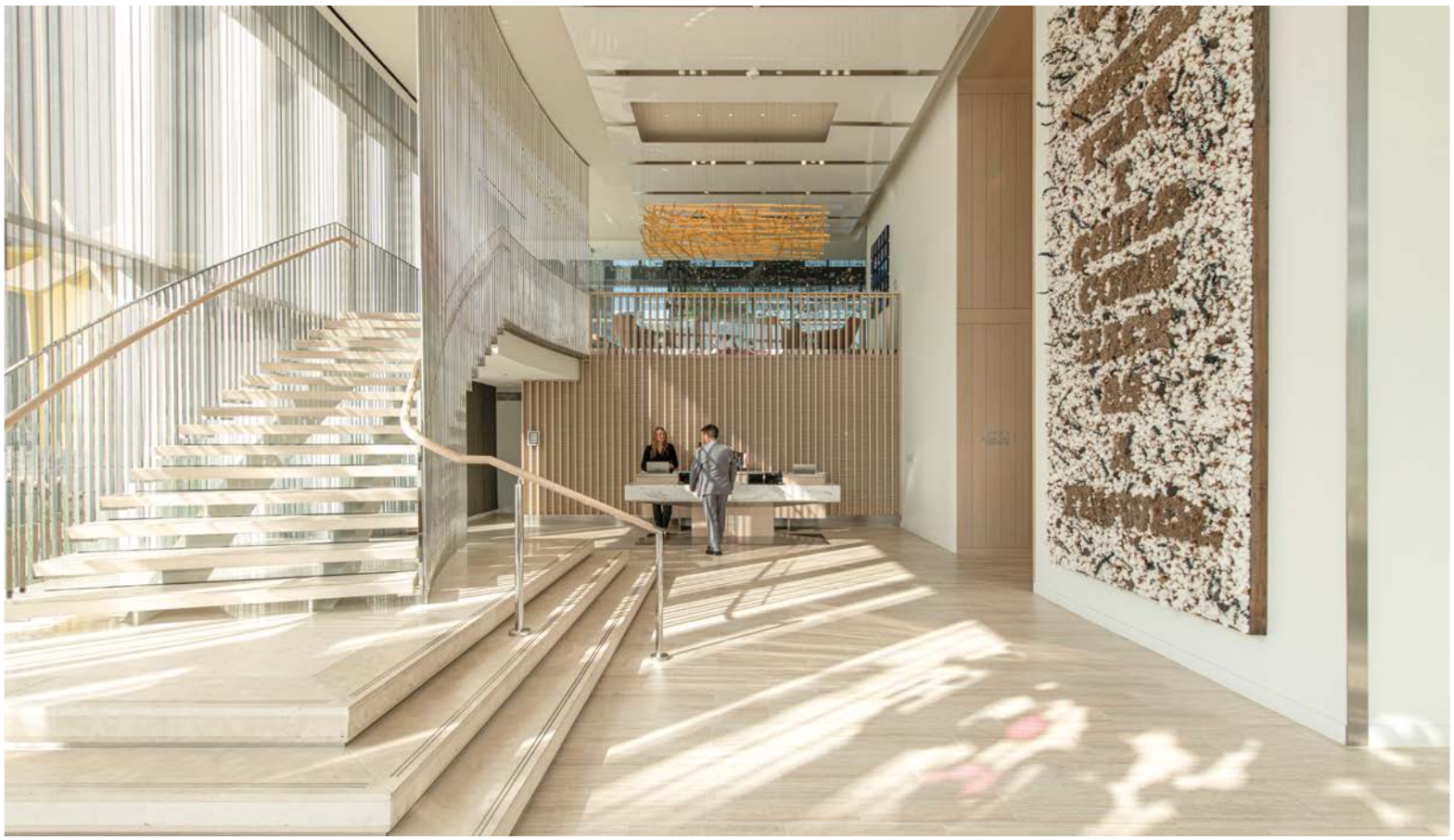
Architecture firm: Joe Hiller
Manufacturer: Schulte Building Systems
Metal installer: Brenton Grey Company
General contractor: Hoke Enterprises Inc.





Healthy Metal Design: Exploring the WELL Materials concept





Material selection is central to a project's performance and crucial to building a space that serves its intended purpose while minimizing chemical exposure.

In this exclusive Q&A series, Metal Architecture talks with International WELL Building Institute experts about what it takes to create spaces that support people's overall quality of life.

A recognized global authority on health and wellness in the built environment, IWBI's WELL Standard is an evidence-based roadmap that organizations worldwide use to measure and improve health, with 10 concepts that define the criteria for occupant health and well-being.

Metal Architecture's May issue covered WELL Light's role in supporting visual, circadian, and mental health, while the June/July issue explored how WELL Movement integrates physical activity into building and community design.

The mindset behind WELL Materials aims to reduce human exposure, whether direct or through environmental contamination, to chemicals that may impact health during the construction, renovation, furnishing, and operation of buildings. It promotes the use of products that are safer for building occupants, maintenance staff, people throughout the product supply chain, and the environment.

In this instalment of "Healthy Metal Design," Rodolfo Perez discusses the WELL Materials concept and the importance of material selection for healthier buildings.

MA: When specifying architectural metal products, how should designers evaluate the paints, powder coatings, anodized finishes, sealants, and adhesives associated with those products to meet WELL Materials requirements?

RODOLFO: Paints, adhesives, and sealants that need curing can contain significant amounts of VOCs that pose respiratory hazards, since they are wet-applied products. Coatings and finishes, in general, may contain substances that can pose human and environmental hazards, such as PFAS, heavy metals, and legacy chemicals, particularly when coatings chip or disintegrate after prolonged exposure to friction or an aggressive environment.

In general, acknowledging that there is no single perfect solution for performance, health, cost, and environmental impact across the production and use of a material, designers and architects can use

By Ciara Lalor-Lindo

Photos courtesy HKS Inc.

Halls Arts Residence Tower.



HKS Salt Lake City office relocation.

data to make informed decisions that align with their design goals.

Manufacturers that are willing to disclose the substances (e.g. chemicals) present in a product, using documents such as Health Product Declarations or Declare labels, as well as third-party certifications that verify the absence of certain substances (sometimes even in the manufacturing process), can help architects and designers to make better decisions.

Refer to WELL standards X01, X05, and X06.

MA: Which components of a system (including pretreatments, primers, topcoats, backer coats, protective films, and field-applied touch-up coatings) need to be disclosed or evaluated? How does WELL distinguish between a metal substrate and its applied finish when assessing material-health compliance?

RODOLFO: As best practice, as many components of the system as possible should be evaluated. A good starting point is to work from the outside in, prioritizing exposed surfaces because they are most likely to result in human exposure. Components containing volatile compounds should also be assessed.

For WELL, building products are evaluated upon arrival at the project site. Therefore, components or coatings applied separately on-site, including field-applied primers, topcoats, or touch-up coatings, should be evaluated independently of the factory-finished product. For a coated metal product, this means the metal substrate and its applied finish may need to be considered separately, depending on how the product is supplied and finished at the project site.

Key terms

Legacy chemicals
Substances that have been commonly used in the past, such as asbestos and PCBs, that are banned or heavily restricted in a significant number of countries due to their impact on human health and the environment.

Volatile organic compounds
Carbon-based substances or relatively low-weight compounds that can volatilize and potentially be inhaled at room temperatures.

Fair labor in building products
Building materials and products made by manufacturers that uphold fair labor rights and work to prevent modern slavery across their own operations and supply chains.

Refer to WELL standards X01, X05, X06, X07, and X08.

MA: Where do you see the most common specifications or construction-stage pitfalls on WELL projects, and how can architects address them early in the design process?

RODOLFO: One of the most common pitfalls is a breakdown in communication between the design and construction teams. A project may specify materials and products that support its WELL goals, only to have substitutions, change orders, or installation decisions during construction compromise the original design intent.

The best way to address this is through early and ongoing coordination. Engaging contractors early in the design process can help confirm material availability, establish clear criteria for substitutions and change orders, and identify potential installation challenges before construction begins. A construction-stage charrette or similar working session that brings together the architect, owner, contractor, building team, WELL consultant, and other key stakeholders can also help ensure everyone understands the project's material-health goals and their role in achieving them.

It's also important to look beyond the specified products and consider how they will be installed. The installation process can introduce another set of materials and exposures, for example, through adhesives, sealants, coatings, or other on-site products. Thinking through those requirements early can help avoid inadvertently introducing substances the project aims to minimize, while also considering the health of the people performing the installation.

Finally, documentation is critical. Teams should maintain clear records of product selections, support documentation, and any substitutions or change orders throughout construction. That helps ensure that what is ultimately installed aligns with the project's WELL requirements—and that the team has the documentation needed to demonstrate it.

MA: For renovation, adaptive-reuse, and historic-preservation projects, what should design teams know about the potential for lead-containing coatings on existing metal windows, railings, stairs, structural steel, radiators, and ornamental elements?



Meet the expert

Rodolfo Perez, PhD, operates at the vital intersection of structural data, environmental chemistry, and global public health policy. As a core lead within IWBI's Standard Development team, Rodolfo orchestrates the evolving criteria for two of the most heavily regulated and contested, high-stakes vectors in the built environment: Materials and Water. Rodolfo holds an MS and a PhD in Environmental Engineering from the University of Wisconsin-Madison. He obtained two bachelor's degrees from the Catholic University of Chile, one in Industrial and Chemical Engineering and the other in Aesthetics.

RODOLFO: The potential can be significant in older buildings because lead was historically used in many coatings, including those applied to metal surfaces. Design teams should identify and test potentially lead-containing coatings early, particularly where existing windows, railings, stairs, structural steel, radiators, or ornamental elements will be disturbed. Until testing shows otherwise, it is prudent to assume older coatings may present a hazard.

Removal is not always the best option, especially in adaptive reuse and historic preservation projects. In some cases, lead-containing coatings can be stabilized and encapsulated, allowing historic elements to remain in place while reducing exposure risks. Teams should also plan carefully for construction, since sanding, scraping, cutting, or otherwise disturbing these coatings can create risks for workers and occupants. Any stabilized or encapsulated surfaces should be properly maintained and regularly inspected.

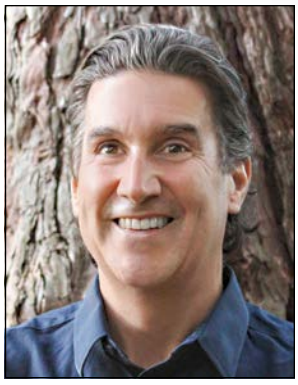
Refer to WELL standards X02 and X03.

Designing for health at every stage

Based on our IWBI expert's responses, healthier metal design involves more than selecting a durable finish. By evaluating materials and coatings for potential health risks, seeking transparent product information, and coordinating decisions through installation and construction, project teams can help reduce exposures for occupants, workers, and others across the supply chain. Documenting product selections and any changes along the way helps ensure that the materials ultimately installed support the project's WELL Material goals. MA



Roofing standards are raising the bar for metal



By Alan Scott

Intertek tests a metal roof's resilience against fire.
Photo: Ethan Grove/ Intertek

Building codes have always established the minimum requirements necessary to protect safety. Increasingly, however, owners expect their buildings to do more than simply survive a storm. They want their roofs, for example, to reduce property damage, protect occupants, and return buildings to service quickly after hurricanes, hailstorms, wildfires, and other severe weather events.

That shift in expectations is driving an important evolution in roofing standards. Research from the Insurance Institute for Business & Home Safety (IBHS), combined with updates to model building codes, IBHS's Fortified program, and ASCE 7, is helping the industry move beyond minimum code compliance toward more resilient roof assemblies.

"One of the biggest misconceptions is that meeting code automatically means a roof is optimized for resilience, especially away from the hurricane coast," says Ian Giammanco, managing director of standards and data analytics at IBHS. "Building codes establish a minimum standard, but our research shows that relatively modest improvements can significantly reduce damage."

For architects and specifiers, that message is particularly relevant to metal roofing systems. Long valued for durability and longevity, metal roofs are increasingly specified not only for their service life but also for their ability to enhance resilience, energy efficiency, wildfire resistance, and integration with renewable energy.


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Despite an increase in the frequency and severity of high wind events, owners expect their buildings to do more than simply survive a storm.

Photo: parkerspics / Adobe Stock

From products to performance

One of the most significant changes in roofing design is the shift away from focusing on individual roofing products toward evaluating the performance of the entire roof assembly.

"Fortified goes beyond minimum code requirements by focusing on vulnerabilities that research has repeatedly shown lead to storm damage," explains Julie Lowrey, director of Fortified Engineering at IBHS. "Every Fortified designation requires independent third-party verification to ensure those requirements have actually been met."

Although many Fortified requirements were developed for residential construction, the engineering principles readily translate to commercial metal buildings.

For metal roof assemblies, resilience depends on much more than just the roof panels. The structural deck, water-resistive or air/water control layer, insulation attachment, clip spacing, perimeter securement, flashing details, penetrations, and installation quality all contribute to the roof's performance during severe weather.

For example, while Fortified guidance for residential construction emphasizes sealing wood roof decks to reduce water intrusion in the event of roof-cover damage, commercial metal roof assemblies can achieve a similar level of redundancy by incorporating a continuous water-resistive barrier over the structural metal deck and beneath the insulation and roof covering. If the exterior roof covering is damaged during a severe storm, this secondary layer can limit water intrusion, reducing damage to interior finishes and contents, allowing for quicker recovery and resumption of use.

"Resilience is fundamentally a systems issue," Lowrey says. "High-performing materials alone do not provide resilience unless they are properly installed as part of an entire resilient roofing system."

That system's approach also applies to the details that too often receive less attention during design. Post-storm investigations consistently show that roof edges, corners, flashing details, and attachment points are often the first to fail because they experience the highest wind pressures. Once those areas are compromised, wind and water can rapidly expand the extent of damage.

Designing for multiple hazards

Roofing standards are also advancing to address a broader range of hazards.

Historically, wind drove many roofing code provisions because of its direct life-safety implications. Today, however, insured losses from hail, severe convective storms, wildfire, and extreme rainfall are increasing across much of North America.

From 2015 to 2024 in the U.S., 190 separate billion-dollar disasters killed at least 6,300 people and caused approximately $1.4 trillion in damage. 2024 was also a record 14th consecutive year where the U.S. experienced 10 or more billion-dollar disasters, and the fifth consecutive year in which 18 or more billion-dollar disasters impacted the U.S. (NCEI/NOAA).

"The conversation has shifted from simply replacing damaged roofs to improving how roofs perform during future events," Giammanco says. "Strengthening the roof system is one of the most effective ways to reduce damage and improve resilience."

Properly engineered standing-seam and other metal roofing systems are well-suited to this multi-hazard approach. While they provide excellent wind performance when designed for site-specific wind pressures, many metal roof assemblies qualify as Class A roof coverings in wildfire-prone regions, offer exceptional durability through repeated weather events, and provide long service lives (which also makes them ideal platforms for rooftop photovoltaic systems).

IBHS emphasizes, however, that even the highest-quality roofing system can underperform if key design details are overlooked. Wind exposure, design wind speed, fastening schedules, clip spacing, and perimeter securement all influence real-world performance.

Looking beyond minimum code

Roofing standards will continually progress as researchers gain a better understanding of how buildings perform during real storms.

Giammanco notes that advances in data analytics, remote sensing, and building performance monitoring continue to help researchers move beyond qualification testing toward performance-based design that better reflects the hazards buildings face. At the same time, ongoing work to better characterize factors such as regional hail hazards could eventually influence future editions of ASCE 7 and model building codes.

For their part, metal roofing systems contribute much more than weather protection. Today's assemblies support resilience, energy efficiency, renewable energy integration, reduced lifecycle costs, and long-term building performance.

For architects and specifiers, the broader lesson is that resilient roofs are no longer defined solely by the roof covering. They are the product of well-designed assemblies that integrate durable materials, thoughtful detailing, quality installation, and multiple layers of protection. MA

Alan Scott, *FAIA, LEED Fellow, LEED AP BD+C, O+M, WELL AP, CEM, is an architect and consultant with over 38 years of experience in sustainable building design, and is the Resilience Leader with CannonDesign. Be sure to follow Alan on LinkedIn at linkedin.com/in/alanscottfaia.*

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From sports to entertainment haven

By Ciara Lalor-Lindo

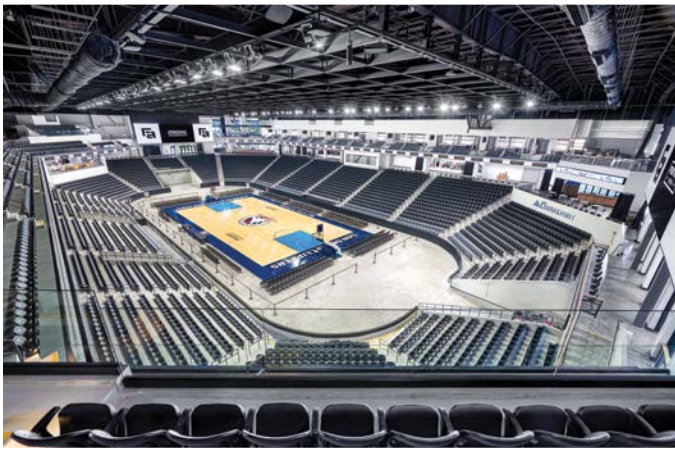
Photos courtesy
Nucor Building Systems

In Oceanside, Calif., the newly expanded Frontwave Arena has become a sports and entertainment destination, providing San Diego's North County residents with a place to enjoy everything from soccer and hockey to family shows and concerts.

The 170,000-sf space, with 85,000 square feet provided by Nucor Building Systems, can accommodate up to 7,000 patrons and includes five bars, four full-service concession stands, a plaza, and 16 luxury suites. The venue is home to MASL's San Diego Sockers and NBA's G-League San Diego Clippers, and is a hub for many other North County sports.

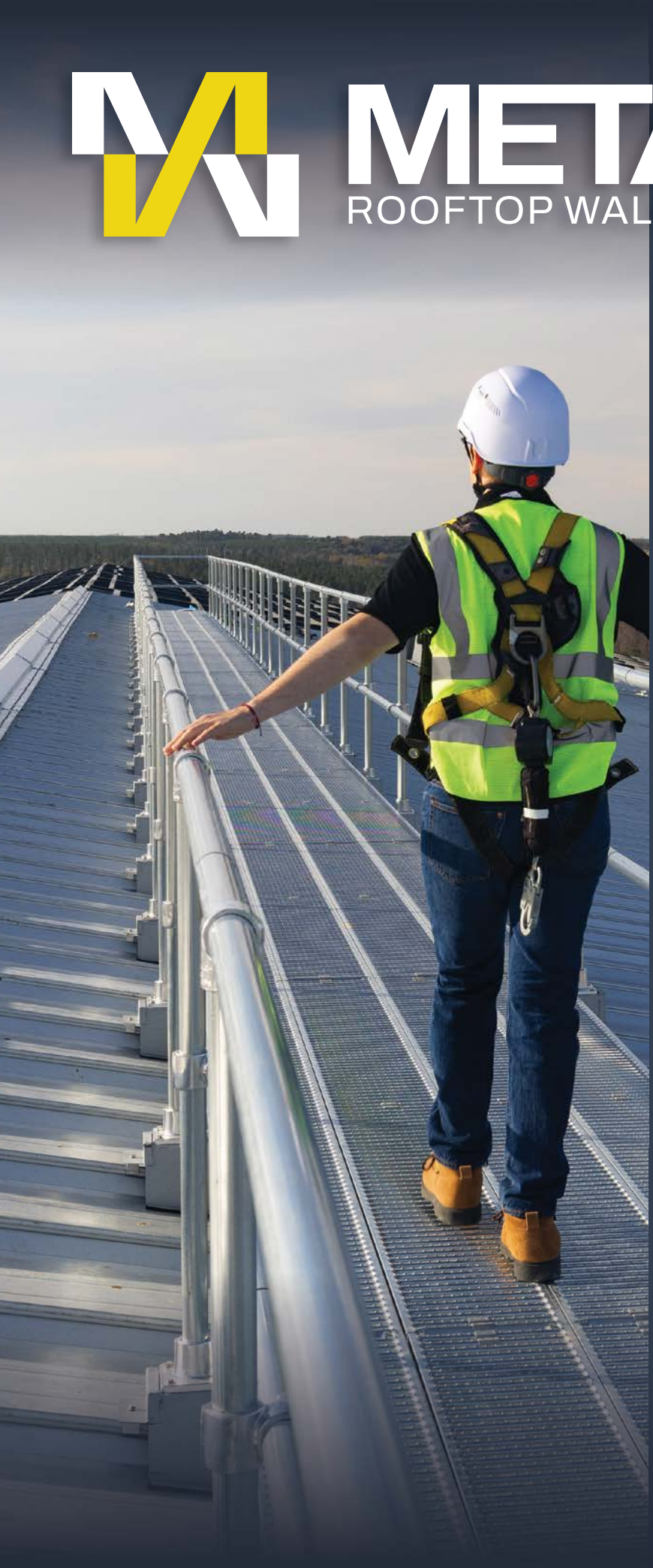
During the building phase of the expansion, the scope changed from solely serving as a sports arena to a full-blown entertainment haven. This deviation presented a challenge, given that the steel had already been fabricated to fit the initial scope. The final solution incorporated a 215-ft clear-span structure designed to preserve unobstructed sightlines while expanding the venue's functionality.

The original design showed minimal rigging potential, and would no longer serve the space. Luckily, the metal building systems provider was able to create a new design featuring visible rigging support throughout the coloseum and a reinforced beam system that flawlessly integrated with the pre-existing fabricated steel.





Insulated metal panels were used throughout the project. On the arena walls, they were employed to meet thermal envelope requirements – particularly useful when hosting hockey games. On the roof, crisp, white IMPs were used to create a sleek, seamless look. MA



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