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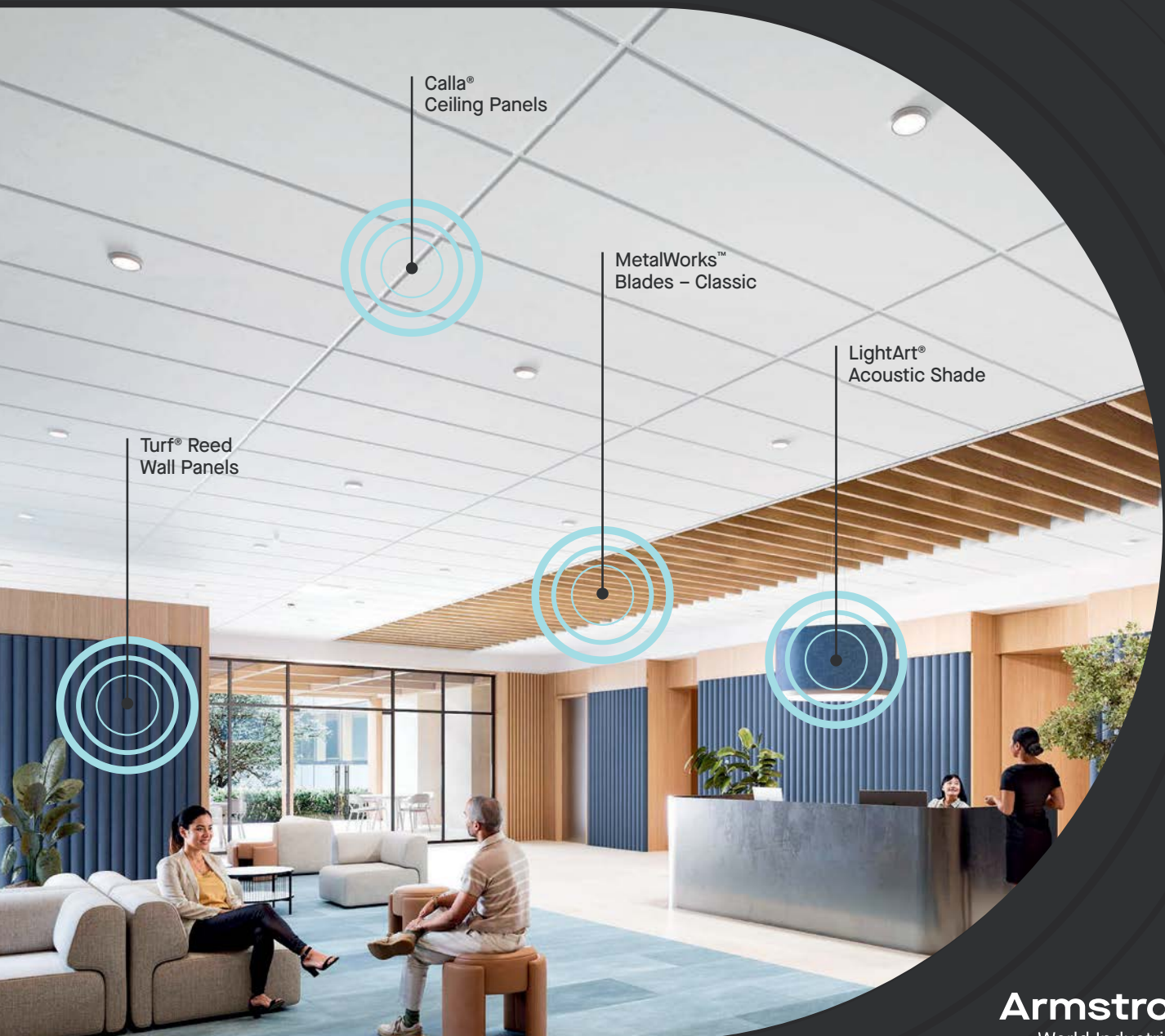


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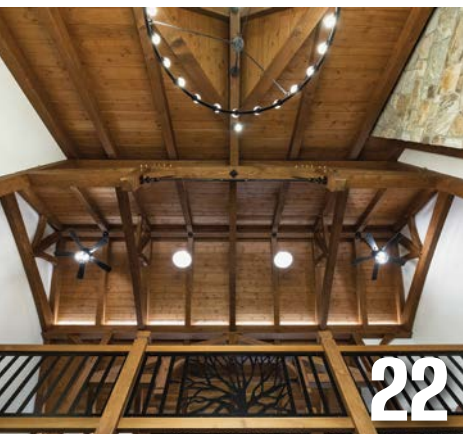
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50 FAILURES

Assess the Access
Jeffrey Sutterlin, PE,
and David S. Patterson, AIA



On the cover:

While ISO 13006 and ANSI A137.1 share similar goals, they are fundamentally different standards with distinct testing methodologies, performance requirements, and compliance criteria.

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At the 2026 CSI National Conference, October 7–9 in Phoenix, Ariz., you'll hear from three keynote speakers who take those challenges head-on to provide you with solutions.



Mark Begich, former U.S. Senator and Anchorage Mayor

Session: Workforce Development and the Built Environment

The competition for skilled workers is reshaping how projects get planned, staffed, and delivered. Drawing on his background in public service and commercial real estate, Begich will offer a ground-level view of workforce trends and their implications for the organizations that design, build, and operate the built environment.

Mark Begich



Nora Burns, chief curiosity officer, The Leadership Experts

Session: The Cost of Culture: Conversations That Prevent Conflict

Miscommunication on construction projects doesn't just create tension—it drives rework, delays, and margin loss. Using real stories gathered through her "undercover candidate" and "undercover employee" research, Burns will show how small shifts in everyday conversation can resolve conflict before it costs you.

Nora Burns



Trent Gillespie, CEO, Stellis AI

Session: AI as a Leadership Imperative

AI is already changing how businesses compete, and most organizations are behind. As a former Amazon AI leader, Gillespie will give construction leaders a practical roadmap for moving beyond experimentation using his AI SPRINT™ framework to embed artificial intelligence into strategy, operations, and daily decisions.

Trent Gillespie

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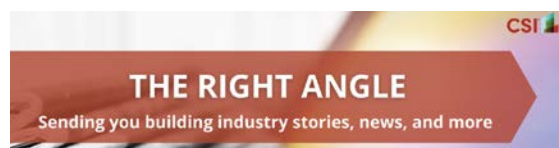
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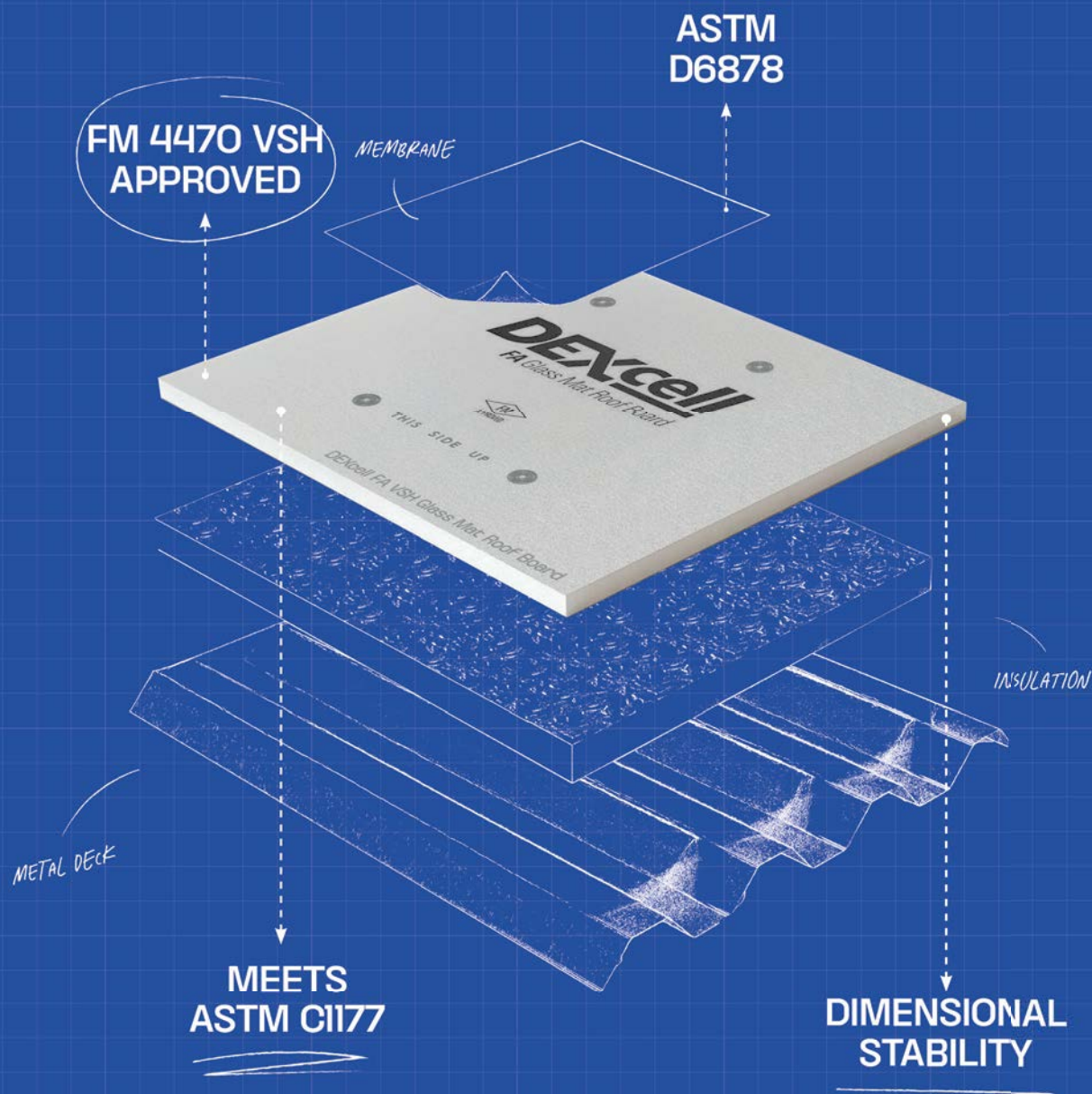


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Specifying Ceilings with PCM

An Energy-saving Solution for Complex Challenges



By Mick Dunn

PHOTOS AND DIAGRAMS
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Since phase change material (PCM) technology became available in ceiling panels about two years ago, the commercial construction industry has faced new and intensifying challenges. Fortunately, the number of opportunities for project owners, project teams, and the bottom line associated with energy-saving ceiling innovation has also grown during this period. Now more than ever, specifying PCM ceilings supports smart, responsible business for everyone from architects and installers to corporations and non-profit organizations.

Appreciating the value of PCM ceilings as an innovative, evolved technological solution starts with recognizing the changing dynamics that make today's building and renovation projects more complex and challenging:

- Budgets are tighter
- Timelines are shorter
- Crews are smaller, and labor shortages persist
- Occupant comfort and productivity have become higher priorities

- Thermal performance is no longer driven by the building envelope alone

The solution for overcoming recent challenges must also align with evergreen project demands and requirements, such as design intent, durability, and advancing sustainability commitments. Moreover, while not necessarily a new problem, aging building systems and infrastructure also play a role.

Lastly, but not least, the national environment is hyper-focused on the tremendous strain on the energy grid. According to the Federal Reserve Bank of Kansas City, over the past three years, annual electricity demand has grown by an average of 1.3 percent—more than twice the average rate during 2010 to 2019—and is expected to continue to grow.¹ Additionally, a recent U.S. National Power and Demand Study prepared for The American Clean Power Association (ACP) revealed that electricity demand in the United States is projected to surge by 35 to 50 percent by 2040.²



The nation is already facing capacity and infrastructure constraints. However, energy demands—driven by data centers, electrification, and industrial growth—continue to escalate. This comes with increased energy costs and a greater risk of power shortages and outages. Everyone, from governments and communities to facility owners and private residents, is feeling the pressure to reduce stress on the grid. And construction and renovation projects have become a focal point for critical energy solutions.

With their energy-saving potential, PCM ceilings are a key component in ensuring that projects successfully address today's most pressing challenges and meet critical environmental requirements.

Ceiling innovation based on time-tested technology

As detailed in this publication previously,³ the technology behind energy-saving ceilings is nothing new and is loosely based on the behavior

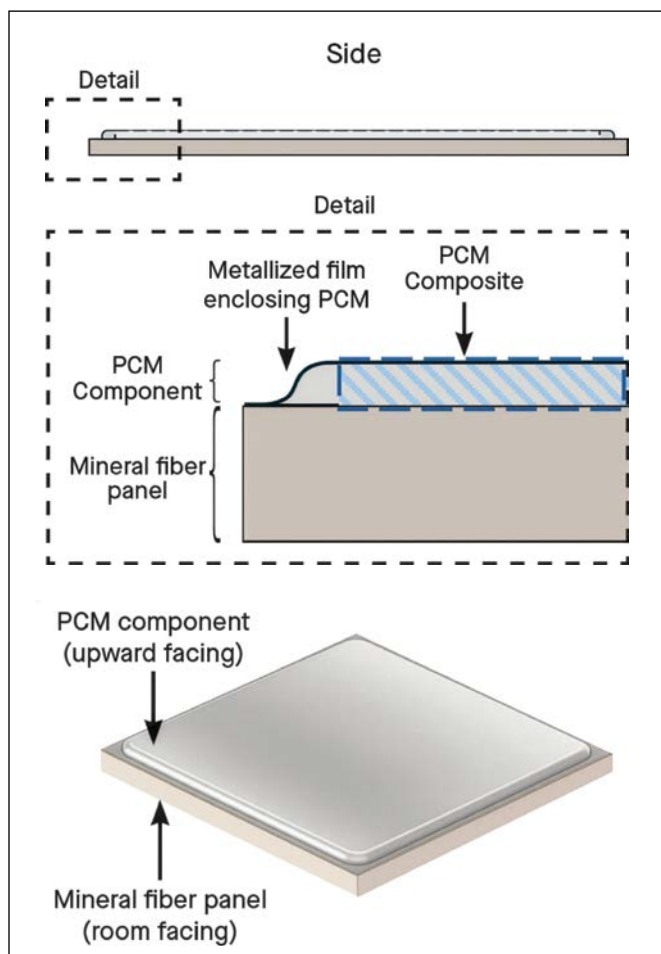
of ice as a phase change material. As ice absorbs energy (i.e. heat) inside the container to keep its contents cool, it changes to a liquid. If that liquid is exposed to an environment of 0 C (32 F) or lower, it will reverse the process, releasing heat and returning to its solid state. The innovation relative to ceilings is the use of inorganic, non-toxic, and non-flammable phase change materials that transition at room temperature (22 to 25 C [72 F to 77 F]) rather than at 0 C (32 F). Hidden discreetly on the back of the mineral fiber ceiling panels, PCM acts as thermal storage, or thermal mass, helping smooth out temperature swings and supporting energy efficiency and reducing peak demand.

PCM in the ceiling panels absorbs and releases heat as it changes phase in response to fluctuations in air temperature. As an area warms—typically during the day when it is occupied or receives sunlight—the crystallized PCM gradually dissolves, absorbing heat and cooling the space. The stored heat is released into the space as the room cools at night or during low-occupancy times, and the PCM re-crystallizes.

Since ceilings cover a large area, adding PCM is an ideal way to help passively regulate room temperature. The key term here is “passively.” The panels themselves do not require a power source, mechanical equipment, or routine maintenance. The PCM in these panels can help achieve thermal comfort—either heating or cooling a space—without contributing to an already taxed energy grid, as energy is transferred rather than consumed.

PCM ceilings are especially well-suited for situations with wide diurnal temperature swings, such as desert climates. A recent example was at an elementary school in Coolidge, Ariz., where extreme daily temperature swings not only compromised the comfort of students and faculty but also placed heavy demands on the HVAC system. This resulted in significant energy use during peak thermal load periods, high energy costs, and wear-and-tear on the equipment.

Classrooms located beneath a large roof surface, with poor to average insulation, heated rapidly as the sun reached its peak. In a desert environment, a classroom of this size typically requires up to 3.6 t (4 tons) of cooling capacity. For this school, costly equipment upgrades were out of the question, as were complex renovations or major restructuring. Ceiling panels with PCM were installed as a drop-in retrofit using the existing grid, eliminating the need



Ceiling tiles are a factory-bonded assembly consisting of an upper PCM component and a lower mineral fiber panel. Each PCM component contains a proprietary PCM composite sealed within a durable metallized polymer film.

to modify ductwork, controls, or HVAC. The energy-saving properties of the PCM ceilings are now providing the school with a highly effective, passive solution to the extreme desert temperature swings. By reducing the peak cooling load, the facility is also experiencing improved student comfort while saving valuable HVAC energy.⁴

Load shifting and energy shaving

PCM ceiling technology is optimized through strategies to reduce the workload on HVAC systems. As demonstrated in the Arizona elementary school example, this can be achieved by considering natural cycling of HVAC systems in a reactive approach to rising and falling temperatures and by introducing technology to reduce system operation during peak times. However, thanks to advancing technologies and greater options for indoor climate control, PCM ceilings are increasingly integrated with load shifting and energy shaving as part of a proactive energy-saving strategy.

Load shifting moves energy use to off-peak times by, for example, cooling a space overnight or in the morning, when

energy costs and grid demand are lower, rather than during the mid-afternoon when the space is fully occupied and bathed in sunlight. In this situation, the type of thermal energy storage provided by PCM ceilings is crucial. The PCM in the ceilings will solidify in the pre-cooled environment overnight, then slowly melt as the space warms up throughout the day, reducing the cooling load needed.

Energy shaving reduces overall peak energy demand by using stored thermal energy from ceiling panels to lower HVAC system load during high-demand periods, thereby reducing the power required when energy use and costs are highest.

Load shifting and energy shaving complement each other to manage when energy is used and how much is needed at peak times. PCM ceilings integrate both approaches to reduce a facility's energy use, lower utility expenditures, improve efficiency, and, as importantly, elevate occupant comfort and well-being.

An example of optimizing PCM ceiling capabilities occurred at a modular office space within an unconditioned commercial manufacturing facility. In the intense desert heat of Phoenix, Ariz., the facility manager faced the challenge of keeping the office space comfortable for staff. Given the HVAC system's capacity constraints, this proved especially difficult during the hottest hours of the day. The uninsulated office ceiling served as a major heat-gain pathway, frequently causing indoor temperatures to exceed 29 C (85 F). Additionally, the existing rooftop A/C unit ran at maximum capacity throughout the day. Still, it consistently failed to maintain the desired 26 C (78 F) setpoint. PCM ceilings were installed in the office, and an overnight pre-cooling schedule was maintained, tapping into the A/C system when it had surplus capacity. Results of the strategy showed:

- Improved comfort—Hours above 26 C (78 F) setpoint were reduced by 25 percent, and peak temperatures were lowered by 0.89 C (1.6 F).
- Less HVAC use—Daytime use was reduced by 17 percent, and the cooling shift to overnight decreased the daily energy consumption.
- Optimal performance—This was delivered without the need for costly A/C equipment upgrades.⁵

Benefits beyond (but also within) the grid

The energy savings and associated benefits—such as reduced carbon footprint, improved thermal comfort, and relief for aging HVAC systems—set PCM ceilings apart. However, it is the “total package” that a growing number of facility owners, architects, contractors, and specifiers are coming to appreciate as PCM ceilings move from early adoption to attractive solutions for a diversity of projects.

Since the first iteration of ceiling panels with PCM was rolled out, there have been design improvements and

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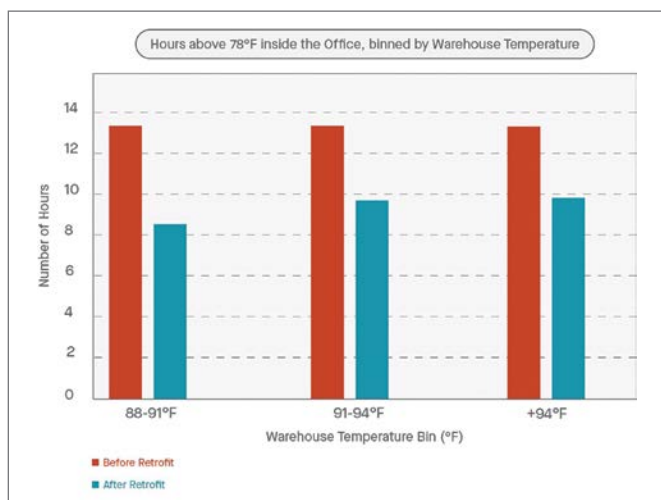
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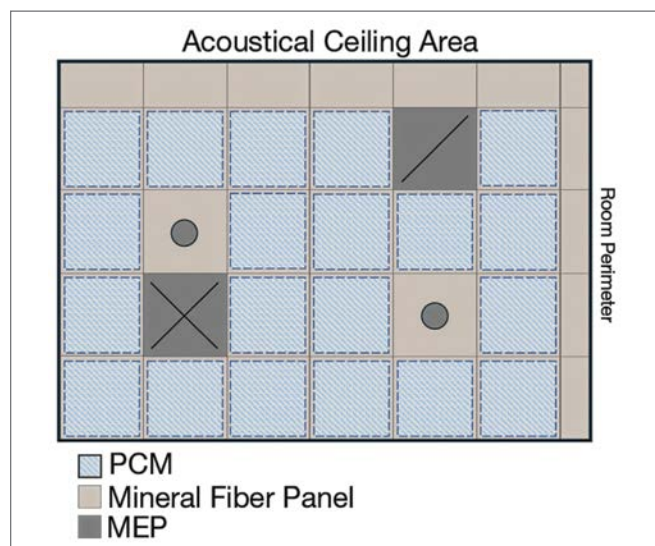
This diagram shows the number of office hours above 25.6 C (78 F) before and after a retrofit.

regulatory factors that further enhance their benefits. For example, recently introduced enhancements for certain PCM ceiling solutions include:

- Ceiling panels are now available in the original 610 x 610 mm (24 x 24 in.) and the newer 610 x 1,219 mm (24 x 48 in.) option. This allows them to be easily installed using a standard 14.3 mm (0.56 in.) or 23.8 mm (0.94 in.) grid system, providing an attractive solution for retrofits.
- Metalized film backer enables the panels to be free of PVC and Red List chemicals.
- Inclusion in the Integrated Environmental Solutions (IES) Virtual Environment energy-modeling software offers architects, consultants, and engineers a streamlined method of simulating the effect of PCM ceilings for optimizing building performance.

Additionally, in its preliminary technology assessment of PCM ceiling tile, the U.S. General Services Administration (GSA) noted they can reduce costs and energy consumption by lowering HVAC loads,⁶ and projects that incorporate PCM ceilings may now meet the eligibility criteria for the 48E Clean Energy Investment Tax Credit (ITC) through PCM's thermal energy storage properties. Projects using them may qualify for a 40 percent federal tax credit and an additional 10 percent tax credit if the project is deployed in an "energy community." Along with the ceiling panels, the associated grid, trim, and labor can also qualify for tax credits under ITC 48E.⁷

ASTM also supports the journey toward energy-saving ceiling consideration by providing a standardized test method for measuring the thermal storage properties of PCM products.⁸ While ASTM has not established a dedicated performance standard for energy-saving ceiling systems, ASTM C1784-20, *Standard Test Method for Using a Heat Flow Meter Apparatus for Measuring Thermal Storage Properties of Phase Change*



For modeling, it is suggested that specifiers assign PCM-area properties to approximately 50 to 80 percent of the total ceiling area and use standard mineral fiber tile properties.

Materials and Products, can be used to evaluate the thermal performance of PCM-integrated ceiling panels to enhance energy efficiency.

The relocation of a leading general contractor (GC) and construction firm in Spokane, Wash., was one of the first installations of PCM ceilings to take advantage of the ITC 48E tax credits. As a new tenant of the Scott Morris Center for Energy Innovation, the company had several statements to make—including its commitment to demonstrating the effectiveness of innovation in energy conservation and decarbonization—through its choice of construction materials. The use of PCM ceiling panels supported this, and by leveraging federal clean-energy incentives, the project reduced overall investment costs and achieved even stronger financial performance. Contributing factors increased the 48E tax credit for the renovation to more than \$269 per m² (\$25 per sf), representing approximately 37 percent of the final project's total savings.⁶

In recent enhancements to PCM ceilings, many of the early benefits must also be factored in. These include:

- **Exceptional acoustical performance**—Panels offer sound absorption with a noise reduction coefficient (NRC) of approximately 0.75 to 0.85 and sound blocking ceiling attenuation class (CAC) of approximately 39 to 40.
- **Improved indoor environmental quality (IEQ)**—This is achieved through sound control and also improved thermal comfort.
- **Ease of installation and retrofitting**—Lightweight and fitting into standard grid sizes, the panels can typically be installed or replaced by a single person with a ladder.
- **Environmental integrity**—The panels fit into the thermal comfort portion of the WELL Building Standard, can



Above: Three classrooms in this Palm Springs, Calif., school were retrofitted with PCM ceilings over a weekend, causing zero disruption to classes. The ceilings are performing exceptionally well in the desert climate, with initial results from the installation including 0.6 to 2.2 C (1 to 4 F) cooler temperatures during the hottest hours, up to 20 percent shaved HVAC demand in the afternoons, and 7 percent HVAC energy savings.

Below: Armstrong World Industries is in the second phase of PCM ceiling retrofit projects in approximately 10 of its own facilities in the eastern U.S.



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Five considerations for specifiers

While no two projects are ever alike, there are several considerations for specifiers making decisions about PCM ceilings.

Climate and building use patterns

It is important to ask, “Is the project located in a climate where PCM ceilings make sense and can actually improve thermal performance and energy savings?” Climates with similar day and night temperatures and hot, humid climates with not enough overnight cooling to reset the system are probably not the best fit. However, as noted in the examples above, climates with significant 24-hour temperature swings are ideal for PCM ceilings. Similarly, it is critical to look at the use of the space. Offices, educational spaces, and healthcare facilities are especially well-suited for PCM ceilings; spaces used 24/7 typically are not.

How will the ceilings be integrated with HVAC/indoor environment control strategies?

It is key that facility managers understand and are on board with consistently implementing strategies—such as pre-cooling or pre-heating load shifting—that optimize the energy-saving and thermal management potential of the PCM ceiling panels. In addition, consider investing in—or continuing to use—smart environmental control systems to automate load further shifting and natural cycling techniques.

Project size and ceiling coverage

For modeling purposes, most acoustical ceilings combine full, uncut tiles with cut tiles, as well as mechanical, electrical, and plumbing (MEP) penetrations and fixture penetrations. PCM ceilings are installed only in full, non-penetrated 610 x 610 mm (24 x 24 in.) or 610 x 1,219 mm (24 x 48 in.) grid openings, which typically constitute approximately 50 to 80 percent of the total ceiling area. For modeling, specifiers should assign PCM-area properties to that covered fraction and use standard mineral fiber tile properties.

Energy modeling

Energy modeling is becoming an increasingly common tool in commercial construction design. If it is not apparent whether the architect or engineer employed energy modeling, it is beneficial for specifiers to ask to ensure the right products are specified for the project.

Tax credit potential

Remember, the entire ceiling thermal energy storage system—the ceiling panels, associated grid, trim, and labor—may be considered in what qualifies for tax credits under ITC 48E. Moreover, these credits may be available to both for-profit companies and nonprofit organizations.

Currently, a limited number of PCM ceiling manufacturers serve projects across the North American, U.K., and European building sectors. Ceiling manufacturer resources and technical representatives are a good place to start for project-specific guidance on evaluating and specifying these solutions. If ceiling panels need replacement, it is also advisable, for quality and consistency, to return to the manufacturer who supplied the PCM ceiling panels for the original construction or retrofit project.

As facilities increasingly prioritize energy savings and related costs, architects, engineers, contractors, and specifiers who embrace PCM ceiling solutions should gain a competitive edge—directly impacting their business growth and bottom line.

When considered together, the other benefits of PCM ceilings paint a picture of a single solution that supports commercial construction in overcoming a multitude of modern-day challenges. Ease of installation and retrofitting helps address labor shortages and enables quick project turnarounds. Everything from tax credits to cost savings on energy and HVAC upgrades takes stress off already tight budgets. Enhanced thermal and acoustic performance helps ensure that occupant comfort and higher productivity remain a priority.

Lastly, when discussing how to make an impact on current and future national priorities, PCM ceilings have much to contribute. To put it all in perspective, if every commercial building in the United States cut back on HVAC use by just 10 percent during the critical 2 to 6 p.m. window, the collective action would save enough electricity to power approximately 1.1 million average American homes for an entire day. At a time when there are significant questions about whether the energy grid can support current needs that continue to surge, this impact cannot be underestimated. It can mean the difference between communities and perhaps even entire regions—areas that depend on schools, hospitals, and police protection—functioning normally or being at high risk of power shortages and outages during peak hours.

Across the board—whether in office space, a healthcare environment, a place of learning, or an industrial setting—PCM ceilings can be appreciated for their energy and cost

savings, and their longer-term impact on the bottom line. Plus, by enabling improved thermal comfort and IEQ, these ceiling solutions can become a critical factor in what is achieved in a given space—from conducting business and providing community services to education and healing. 

NOTES

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additional information

AUTHOR



Mick Dunn serves as the product manager for energy saving ceilings at Armstrong World Industries, where he specializes in integrating phase change materials (PCM) into the built environment. With more than 20 years of experience, he bridges advanced thermal storage technologies and market deployment, driving energy-efficient, sustainable building solutions and translating complex concepts into practical strategies. Prior to his current role, Dunn held technical and sales leadership positions focused on sustainable building technologies and thermal management. His expertise centers on the intersection of innovation and practical application in the commercial construction industry to support energy-efficiency goals.

KEY TAKEAWAYS

Phase change material (PCM) technology embedded in ceiling panels offers an innovative, interior-focused solution to enhance thermal

comfort and building energy efficiency. By absorbing, storing, and releasing latent heat during daily temperature cycles, PCM ceilings help mitigate strain on the electrical grid, reduce peak HVAC loads, and lower operational costs while integrating seamlessly into standard acoustic tile suspension systems.

MASTERFORMAT NO.

09 51 00-Acoustical Ceilings
09 54 00-Specialty Ceilings

UNIFORMAT NO.

C3030-Ceiling Finishes

KEYWORDS

Division 09
Ceiling panels
Energy efficiency
Phase change material (PCM)
Thermal comfort

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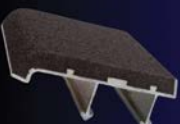
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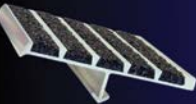
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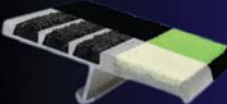
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Waterstops and Penetration

Specifying for Watertight Performance in Concrete

By Christopher Bennett, CSI, CSC, Ken Hercenberg, CSI, CCS, CCA, CDT, and Donald Koppy, AIA, CSI, CCS, NCARB, SCIP

PHOTO COURTESY KRYTON

The most effective waterstop is the one that is not needed—an outcome rarely achievable given the complexity of modern concrete construction. Successful waterproofing depends on system alignment, not individual products. In concrete structures, water intrusion rarely occurs through the concrete itself. Instead, failure concentrates at discontinuities such as joints, transitions, intersections, interfaces, penetrations, and protrusions. These locations represent intentional interruptions in otherwise continuous concrete systems and require deliberate design, specification, and execution to achieve durable, watertight performance. Waterstops are a critical component in achieving this goal.

Field experience and industry guidance consistently point to the same root cause of failure: a lack of coordination among the detailed design intent, specification requirements, and field execution. Understanding this is the starting point for specifying systems that perform.

What waterstops do and why they matter

A waterstop is a preformed or applied component installed at a joint, penetration, or similar discontinuity in concrete, forming a continuous seal across that discontinuity that resists the passage of water under hydrostatic pressure. Pre-embedded in deformation or construction joints and integrated with the concrete during placement, a properly installed waterstop prevents water leakage at the joint while also serving as a cushion to absorb shocks and impacts. When overall waterproofing requirements are not included in the specifications, the waterstop can be evaluated in isolation rather than as one element of a system. Clearly stated



system-performance requirements help prevent this isolated evaluation. When the performance target is defined and the assembly is installed correctly, the waterstop does its part to meet it.

Waterstops are used across a broad range of project types, including water conservancy and hydropower facilities, dams, culverts and sluice gates, tunnels, subways, civil defense structures, and below-grade commercial construction, including high-rise basements and parking structures. ACI 350, *Code Requirements for Environmental Engineering Concrete Structures*, published by the American Concrete Institute (ACI), requires waterstops in joints where watertightness is critical. Their performance, however, depends on the overall system.

Selecting for behavior, not familiarity

Several waterstop types are available, and product selection should be driven by joint behavior and site conditions rather than product habit or familiarity. Waterstops are classified by mechanism as barrier, swellable, injectable, adhesive (bonded strip), and crystalline.

They are further categorized by position: internal, fully embedded within the concrete section, or external, applied at the concrete surface. Each carries distinct installation requirements, and both categories include rubber and thermoplastic product options.

Barrier

Embedded polyvinyl chloride (PVC) or other thermoplastic waterstops function as physical barriers across joints. They require continuous placement and proper field welding and are highly sensitive to both position within the concrete section and the quality of consolidation around them.

One subset, movement (bulb-type) waterstops, is designed specifically to accommodate expansion and contraction across the joint. Select them based on the magnitude and direction of anticipated movement; an undersized or mismatched product will not perform regardless of installation quality.

Swellable

Hydrophilic waterstops expand upon contact with water, sealing the joint. However, these products must be confined and protected from premature exposure to moisture before concrete placement—a common and costly installation error. Typical



building conditions generally favor non-bentonite swellable products. Bentonite-based hydrophilic waterstops can perform extremely well in specific applications, but under repeated wetting and drying cycles and under lower hydrostatic head, they warrant careful evaluation before specifying.

Swellable products include strips with a protected bentonite core, polymer strips for non-moving joints, and one-component polyurethane sealants that swell upon contact with water.

Injectable

Injectable joint systems use a perforated or valved hose cast into the joint and are injected with grout or resin after the concrete has cured. They are a specialized option, selected where the consequences of a leak justify the added cost—water-retaining structures, tunnels, and below-grade occupied space—either alone or as redundancy behind an embedded waterstop. The governing selection criterion is whether the system is re-injectable or single-use. Re-injectable systems allow ports to be reopened as settlement, thermal cycling, or long-term movement reopens pathways, which is the entire argument for the added cost; single-use systems offer one attempt. That distinction should be addressed early, while the owner, design team, and contractor are still discussing what happens if the joint leaks in year 15. Left unspoken, it defaults to whoever selects the product, usually on price, and usually toward single-use.

Adhesive (bonded strip)

Adhesive waterstops are self-adhering butyl or modified-bitumen strips applied to the joint face

Bentonite-based hydrophilic strip waterstops are flexible and can be installed to contour substrate surfaces like this H-Pile.

PHOTO COURTESY CETCO



Expanding hydrophilic strip waterstops should be adhered in place to assure minimum concrete cover per the manufacturer's recommendations.

PHOTO COURTESY CETCO

of the first placement, bonding to the hardened concrete and then to the subsequent pour. They install without field welding, tolerate irregular geometry, and are often the most practical option at cold joints, at transitions between an embedded waterstop and sheet waterproofing, and in congested reinforcement where a rigid profile cannot be positioned or consolidated around. Their performance is governed almost entirely by bond, which means substrate condition and installation temperature carry the same weight the manufacturer's data sheet gives to material properties: a clean, dry, sound surface is a specification requirement, not a field courtesy. They are a non-movement solution—specify them where the joint is not expected to move and hydrostatic head is moderate, and pair them with a movement-rated product wherever it is.

Crystalline

Crystalline products are reactive chemistry rather than a physical barrier, supplied as a slurry, dry-shake, or integral admixture that reacts with moisture and available calcium hydroxide to grow insoluble crystals within the pore structure and fine cracks. Applied at the joint, they can reduce permeability through the adjacent concrete and self-seal microcracks up to a manufacturer-stated width, which is genuinely useful redundancy at construction joints and at the interface around penetrations. Two limits deserve specification attention. First, the reaction depends on available free lime, and high-SCM low-carbon mixes leave measurably less of it—an assumption worth verifying against the actual mix design rather than the product literature. Second, crystalline chemistry seals cracks that have stopped moving; it does not accommodate joints that are still working. Treat it as a supplement that improves the concrete's own resistance, not as a substitute for a waterstop at a joint with anticipated movement.

Installation: Preparation and placement

Proper installation is as important as proper selection. Before concrete is placed, the construction joint must be clean and free of debris, laitance, form release, and standing water, and the waterstop must be positioned, spliced, and secured in accordance with the manufacturer's written instructions. Surface moisture requirements vary by mechanism—adhesive strips and swellables need a dry, sound substrate to develop bond, while crystalline products are generally applied to a saturated surface-dry (SSD) substrate. In every case the objective is the same: full, intimate contact between the waterstop and the surrounding concrete.

Horizontal waterstops require careful placement sequencing, because fresh concrete must flow beneath the lower flange and displace the air trapped there. Assign a vibrator operator to consolidate the concrete under and around the waterstop as placement proceeds. Inadequate consolidation is among the most common waterstop failures. Voids adjacent to the waterstop create water pathways regardless of the product's intrinsic performance.

Specifications should establish clear placement criteria, including minimum concrete cover requirements, alignment tolerances, and coordination with reinforcing steel to avoid conflicts that force the waterstop out of its intended position. Continuity across the full length of the joint is non-negotiable. Splices, transitions, and intersections—including changes in plane and jogs in otherwise straight runs—should be detailed explicitly in the construction and submittal documents, and factory- or shop-prefabricated intersections should be required wherever feasible. Field-fabricated splices are a common point of failure and should be minimized.

Penetrations: A primary source of leakage

Pipe penetrations, conduits, and embedded hardware introduce localized disruptions that are often more difficult to reliably seal than linear joints. These difficulties stem from differential movement between the concrete and the embedded element, interface shrinkage and cracking as the concrete cures, and limited access for installation, inspection, and future remediation.

Penetrations must be treated as systems, not isolated details. Specifications should address each of the following elements:

- Sleeves or formed openings should be the default approach wherever possible. A sleeve provides additional tolerance for differential movement and material shrinkage. It prevents rigid bonding of the penetrating element to the concrete—bonding that virtually guarantees interface cracking under thermal or structural movement.
- Annular space design deserves explicit specification attention. The space between the sleeve and the penetrating element must accommodate sealing materials and allow proper installation. Tight-fit conditions that restrict access to the annular space are a recurring cause of inadequate sealing.
- Multi-stage sealing systems provide redundancy and performance depth. A properly detailed penetration seal will typically incorporate backing material where applicable, a non-shrink grout or microfine cement fill, and a flexible or hydrophilic sealant as the final waterproofing layer. Each component addresses a different failure mode; eliminating any one of them increases risk.



A swelling waterstop expands on contact with water to form a watertight seal at concrete joints, helping prevent infiltration over time.

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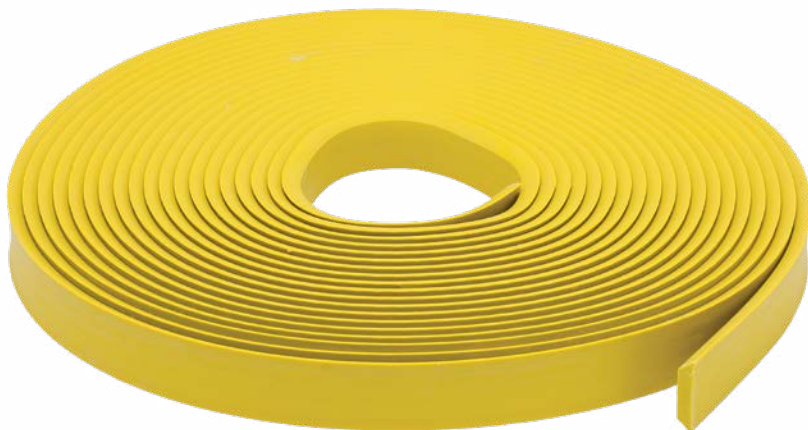
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In any structure built to keep water out, waterstops do the heavy lifting.
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- Surface preparation at penetrations is as important as material selection. The substrate must be clean, sound, and free of laitance and contaminants before sealing materials are applied. This requirement should be explicitly stated in specifications and verified in the field.

Specification strategy: From products to systems

The persistent lesson from field failures is that waterproofing specifications written around product selection alone will underperform. Specifications must address the complete system, from design intent through field verification.

It means clearly defining joint behavior—distinguishing movement joints from non-movement joints—and, where possible, quantifying expected movement to validate product selection. It means requiring continuity, with specific language addressing splicing, transitions, intersections, and changes in plane. It means establishing placement criteria beyond “install per manufacturer’s instructions” to include tolerances, cover requirements, and coordination with other trades.

Penetrations must be addressed with the same level of detail as joints, not with a generic note requiring watertight seals at all penetrations. Compatibility governs whether the assembly performs as a system: every material in contact with another—waterstops, sealing compounds, concrete admixtures, and adjacent waterproofing assemblies—should be confirmed chemically and physically compatible, and documented as such, before construction begins.

Lastly, specifications should include meaningful inspection and verification requirements: pre-placement inspection of waterstop systems, observation during concrete placement, and post-installation verification where conditions allow. Performance is achieved through coordination, not delegation.

additional information

AUTHORS



Christopher Bennett, CSI, CSC, is founder and CEO of Portland-based Bennett Build, a North American concrete consultancy that helps real estate owners deliver high-quality concrete and flooring systems with pronounced reductions in cost, embodied carbon, risk, and schedule.



Donald Koppy, AIA, CSI, CCS, NCARB, SCIP is a master construction specifier/architect with more than 40 years of experience. He is licensed in eight states, leading nationwide projects with expertise in coordination with BIM.



Kenneth Hercenberg, CCS, has more than 40 years of experience, specializing in project manuals, building envelopes, code reviews, and sustainability. Opinions expressed by Hercenberg are his own and do not reflect the thinking of current or past employers.

KEY TAKEAWAYS

Water intrusion in concrete structures rarely occurs through the material itself; rather, it concentrates at discontinuities such as joints, interfaces,

and penetrations. Successful waterproofing depends entirely on comprehensive system alignment—bridging design intent, specification requirements, and strict field execution—rather than relying on individual products. To ensure durable, watertight performance, specifiers must select waterstops based on specific joint behavior and site conditions, detail factory-prefabricated intersections, enforce proper concrete consolidation to avoid voids, and treat pipe penetrations as multi-stage.

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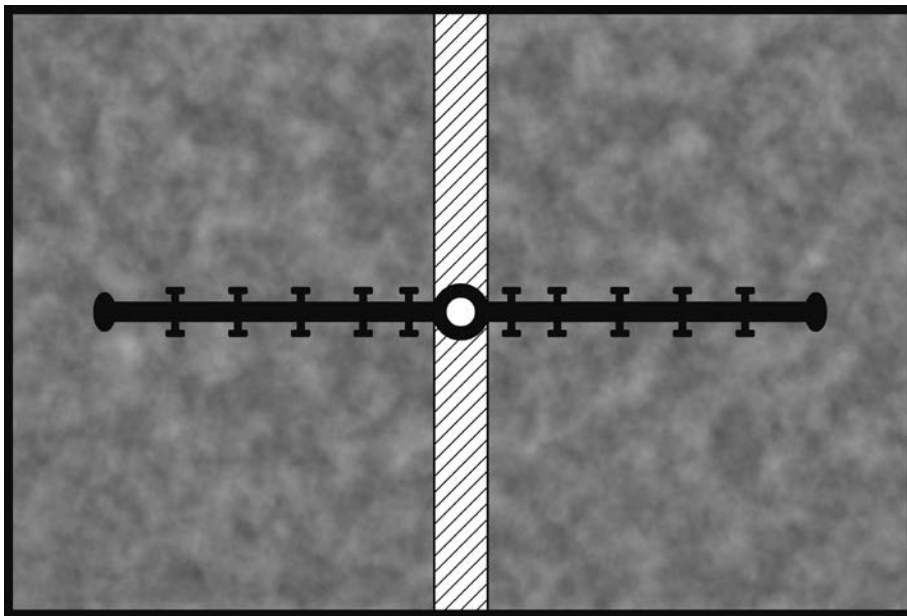
03 15 13—Waterstops
03 30 00—Cast-In-Place Concrete
07 13 26—Self-Adhering Sheet Waterproofing
07 92 00—Joint Sealants

UNIFORMAT NO.

A10—Foundations
A1010—Standard Foundations

KEYWORDS

Divisions 03, 07	Multi-stage sealing systems
Annular space design	Waterstop elastic deformation
Concrete consolidation voids	Waterstops
Injectable joint systems	



Ribbed centerbulb (RCB) waterstops are highly versatile, suited to expansion, contraction, and construction joints wherever significant movement is expected.

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Conclusion

Waterstops and penetration details are among the most consequential elements in the long-term performance of watertight concrete structures. Failures at these locations rarely stem solely from defective materials. Instead, they reflect a gap between design intent and field execution, an incomplete specification of system

requirements, and an underestimation of the dynamic nature of concrete joints and interfaces.

A comprehensive approach—grounded in system thinking, informed product selection, proper detailing, and active field coordination—provides the most reliable foundation for durable, watertight construction. No single product can substitute for that alignment. 🌈



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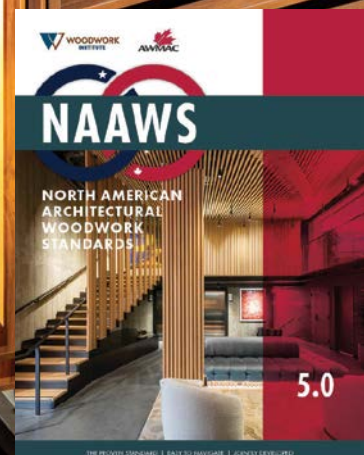
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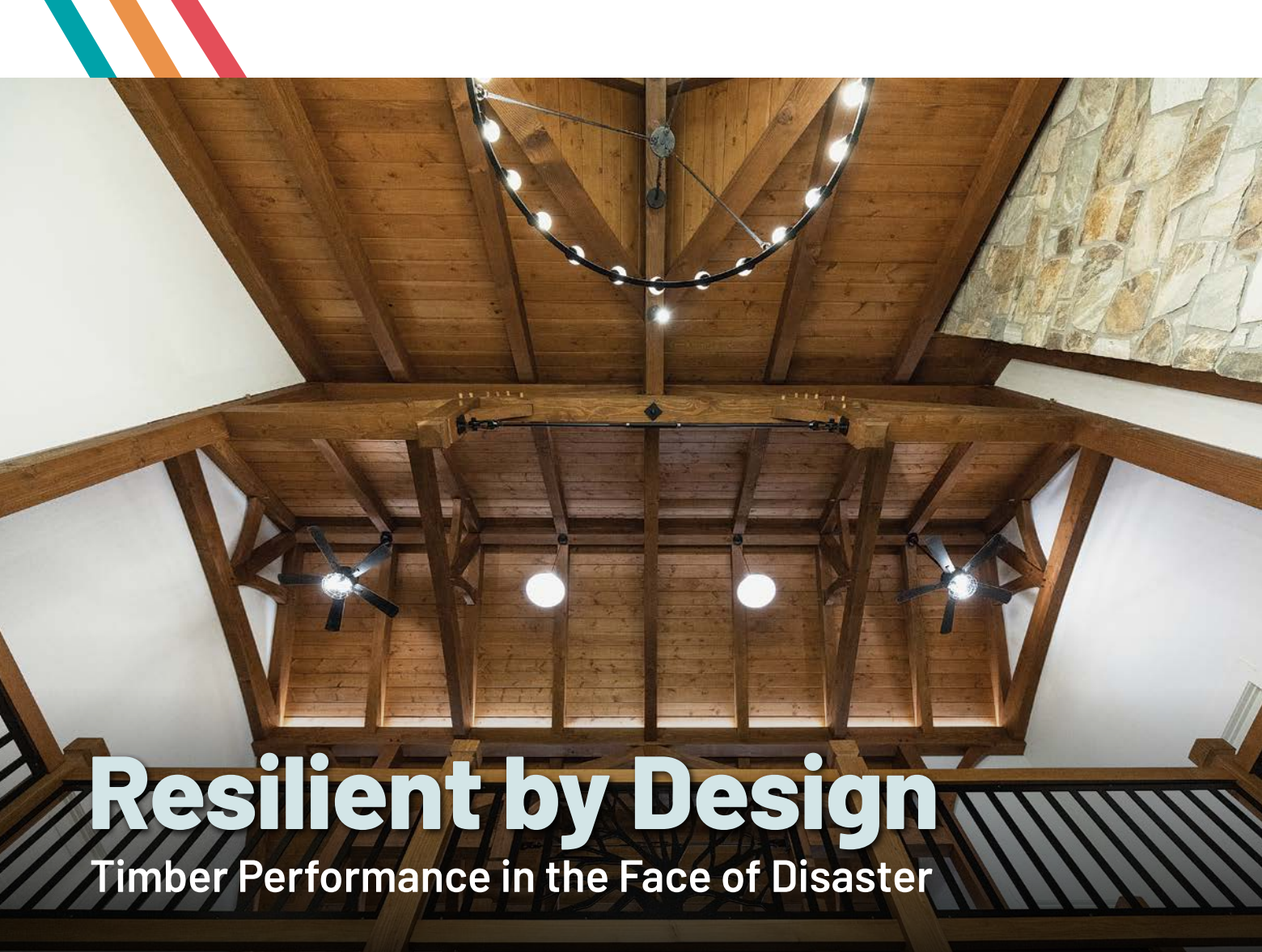
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Resilient by Design

Timber Performance in the Face of Disaster

By Mike Banta

PHOTOS BY JANA BANNAN/
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Certain forces affecting the built environment are beyond human control, including meteorological volatility such as hurricanes and extreme wind events. At the same time, increasingly stringent fire- and life-safety requirements have raised expectations for structural systems performing under multiple hazard conditions. For decades, steel and concrete have been the default materials for meeting these demands. However, in recent years, timber construction has emerged as a viable engineered system capable of meeting prescribed wind-load criteria and code-required fire-resistance standards, offering construction professionals a viable solution for mitigating risk and protecting both buildings and occupants.

In the eye of a hurricane

As Earth's most intense storms, hurricanes generate winds of up to 250 km/h (155 mph) and torrential rain, typically affecting the Gulf Coast region, the Southeastern U.S., and the Caribbean.

However, these disastrous storms can also affect the Mid-Atlantic and New England regions. When they make landfall, the resulting floodwaters, widespread destruction, and utility interruptions often paralyze entire regions for days and even weeks. Damage to personal and public property frequently amounts to tens of billions of dollars.

Building codes and standards are designed to improve wind resistance and structural integrity, reducing the impact of such storms on the built environment. These standards present construction professionals with a long list of considerations when establishing a basis of design, including high wind resistance, impact protection, secure fastening, and material density that can withstand uplift and debris.

Historically, timber has not been commonly used as a structural system in regions vulnerable to extreme wind events; however, it has proven advantageous in hurricane-prone areas, largely due to its inherent performance properties.



Timber construction has emerged as a viable engineered system capable of meeting prescribed wind-load criteria and code-required fire-resistance standards.

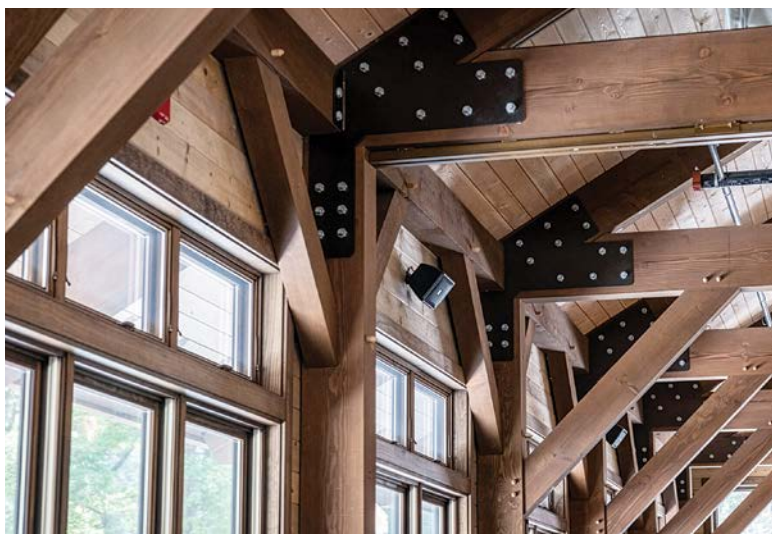
Flexibility and strength

Timber frame systems possess inherent ductility, the material's ability to deform significantly under tensile stress. This property allows controlled movement under high wind loads, reducing the risk of any brittle cracking or failure commonly associated with more rigid materials such as concrete. As large timber beams and posts bend slightly under the load of strong winds, they retain their integrity and distribute the force across the structure, absorbing impact and resisting the storm.

Douglas fir, a high-density wood commonly used in timber framing, demonstrates an exceptional strength-to-weight ratio and a high modulus of elasticity. These properties make it ideal for structural applications such as beams, joists, and columns. Because of its high density, it has excellent nail- and screw-holding power, which is crucial for resisting wind uplift and shear forces. Additionally, its density makes it resistant to damage and scratches, and with proper maintenance, it will resist rot and decay for decades.

High-performance connections

Using advanced CAD modeling software and CNC machinery, timber frame connections can be designed and engineered with extreme precision to resist wind loads. Specialized connectors such as high-wind ties, hold-down devices, and tension rods are designed to resist uplift and lateral forces. They provide a continuous load path from the roof to the foundation, ensuring the structure acts as a



cohesive unit and can absorb and dissipate energy during extreme events. This allows them to meet the most demanding engineering criteria and the most stringent building codes while maintaining high performance, keeping timber frames intact in the face of a hurricane.

Energy-efficient and weather-resistant

Timber is hygroscopic, meaning it can absorb moisture from the air and release it. In doing so, it regulates humidity within a building by moving moisture into its cells, then releasing vapor to reach equilibrium with the subsequent drier air, reducing the risk of mold growth and preventing resulting structural damage.

Small lumber naturally expands and contracts with changes in temperature and moisture.

As large timber beams and posts bend slightly under the load of strong winds, they retain their integrity and distribute the force across the structure, absorbing impact and resisting the storm.



Timber frame connections can be designed and engineered with extreme precision to resist wind loads.



Timber is hygroscopic, meaning it can absorb moisture from the air and release it.



While Hurricane Ian destroyed other buildings in the area, TerraNova's viewing pavilion resisted the damaging winds and rain despite being directly in its path.

However, heavy timber, a construction classification for dimensionally large timber, and mass timber, engineered by bonding smaller wood elements together, resist these effects. This minimizes cracks in the material, which would otherwise leave timber members vulnerable to twisting, warping, and reduced strength in extreme conditions.

Preventing water infiltration during a storm is essential to minimizing structural damage and saving interior rooms, furniture, and possessions. Today's timber frame structures are typically built with modern insulation and weatherproofing techniques. These advancements make them airtight and strong against the heavy rains that hurricanes can produce from all angles.

Heightened safety features

Storm shutters, reinforced foundations, and wind-resistant roofing are common on the Florida Gulf and the Gulf Coast. When incorporated into timber buildings, these measures further enhance structural resilience and overall performance under extreme loading conditions. For example, a 2022 extreme wind event highlighted the structural performance of timber under hurricane conditions.

TerraNova Equestrian Center is a world-class training and competition facility in Myakka City, Fla. It features state-of-the-art arenas, an Olympic-level cross-country course, and luxury stabling. Amidst the complex sits a two-story, open-air VIP viewing pavilion built with timber frame construction. Designers identified the structure's open form and elongated proportions as conditions that would promote wind capture and elevated wind loads. They carefully engineered and constructed it to meet the stringent Miami-Dade building codes, in place to combat Florida's volatile hurricane season. Soon after completion, Hurricane Ian, a Category 4 storm, tested the pavilion's engineering as it moved through the area. While other buildings in the area were destroyed, TerraNova's viewing pavilion resisted the damaging winds and rain despite being directly in its path.

Timber under fire

Unlike hurricanes, which are regionally concentrated, fire is a pervasive threat to all building types, regions, climates, and environments. Although perhaps counterintuitive,

timber exhibits inherent fire resistance, particularly when combined with supplementary measures that enhance and complement its performance. But it is important to note: timber does not resist fire by not burning—it provides fire resistance by burning in a controlled, insulating manner that keeps the structure standing. Its intrinsic properties make it a practical and effective choice for building applications.

Charring process

When timber is exposed to fire, its outer layer undergoes charring. The char layer is a poor conductor of heat, creating a protective barrier. In a cross-section of a timber beam, only a fraction of the total mass of the member is exposed and therefore chars. This barrier insulates the inner wood, slowing heat penetration and preserving structural integrity for much longer than small lumber, and often exceeding steel or concrete's performance in fire. Additionally, char rates across species do not vary greatly, simplifying specification choices when designing for fire resistance. Certain commercial applications may call for stain additives that enhance fire resistance. At the same time, some design professionals specify timbers that are oversized for structural requirements but meet a higher fire rating.

Predictable behavior

Fire-rated floor, wall, and roof assemblies play a vital role in whether a structure performs as designed during a fire event. But once specified,



heavy timber's response to fire is well documented, unlike some materials that may behave unpredictably under intense heat. This predictability allows for effective design and engineering, facilitating the incorporation of safety measures that meet stringent building codes and regulations. The National Fire Protection Association (NFPA) and the *International Building Code (IBC)* provide prescriptive requirements for heavy timber fire safety in their respective standards. Recently, the *IBC* released many revisions and updates to mass timber building height allowances and associated fire safety requirements.

Timber does not resist fire by not burning—it provides fire resistance by burning in a controlled, insulating manner that keeps the structure standing.

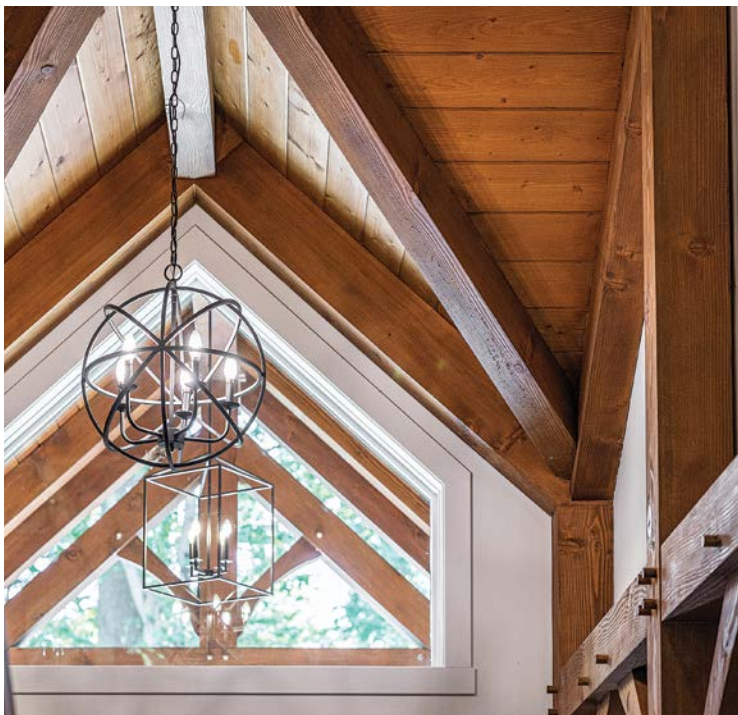


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Timber's unique fire-resilient behavior positions it as a strong candidate for code compliance in new construction.

These standards specifically address the fire performance offered by timber:

- ASTM E119, *Standard Test Methods for Fire Tests of Building Construction and Materials*, and UL 263, *Fire Tests of Building Construction and Materials*, concerning fire-testing of construction methods and materials.

- ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials*, tests the surface burning characteristics of various building materials.
- IBC 2021 and IBC 2024 include specific provisions for mass timber construction types with fire-resistance provisions.

Comparative advantage

The predictable fire performance of heavy and mass timber enhances its appeal as a versatile construction material. Despite the perceived advantages of building with steel and concrete, timber's unique fire-resilient behavior positions it as a strong candidate for code compliance in new construction.

Defensive measures

The inherent properties of timber provide comprehensive protection against both natural and human-caused disasters. In the presence of extreme wind and fire hazards, timber demonstrates resilience through its structural capacity, flexibility, and controlled response. When sustainability is a key consideration, timber stands out as a leading construction material due to its renewability, its ability to sequester atmospheric carbon, and its comparatively lower embodied carbon relative to steel. In addition to its aesthetic versatility, timber offers a compelling solution for diverse building applications across a range of risk scenarios. 



additional information

AUTHOR



From a young age, **Mike Banta** was fascinated by the exposed structural elements of timber framing and admired the timbers' longevity and character. For more than 20 years, he has been designing timber frame structures. He has advanced expertise in structural steel and other

architectural materials, including cross-laminated timber, glue-laminated timber, and reclaimed and recycled timber. He is also experienced in mechanical, restorative, and sustainable design; technical drafting and detailing; CNC programming; prototyping; and quality control. He currently serves as general manager of Mid-Atlantic Timberframes in Lancaster, Pa.

KEY TAKEAWAYS

Heavy timber and mass timber can withstand extreme wind and fire through a combination of material properties and engineered design. Timber's ductility allows it to absorb and distribute wind forces, while high-wind connectors, hold-downs, and continuous load paths help resist uplift and lateral loads during hurricanes.

In fire conditions, large timber members develop a predictable char layer that slows heat penetration and protects the structural core. Code-recognized fire-resistance design, appropriate member sizing, tested assemblies, and protective materials allow timber systems to meet rigorous life-safety requirements. Timber offers numerous sustainability advantages, including renewable sourcing, carbon storage, and lower embodied carbon potential.

MASTERFORMAT NO.

06 13 00—Heavy Timber Construction

UNIFORMAT NO.

B10—Superstructure
B1030—Structural Frame

KEYWORDS

Division 06
Fire-resistance design
Heavy timber
Hurricane resilience

Mass timber
Structural connections
Wind resistance

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Avoiding Compliance Gaps in Ceramic Tile Specifications

By Katelyn Simpson

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Ceramic tile is one of the most widely used finish materials in commercial construction. Architects, interior designers, contractors, distributors, and specifiers routinely evaluate products manufactured across North America, Europe, Asia, and South America for use in the United States. As global sourcing continues to expand, so does the challenge of verifying that tile products meet the specific standards and project specifications expected in the U.S. market.

One of the most common misconceptions in the tile industry is the assumption that ceramic tile tested to international standards automatically satisfies U.S. requirements. However, compliance with international tile standards, such as ISO 13006, does not necessarily demonstrate compliance with the American National Standards Institute (ANSI) A137.1, *Standard Specifications For Ceramic Tile*, the primary product standard referenced throughout the U.S. tile industry.

For specifiers, this distinction is critical. Misunderstanding the differences between the standards can lead to rejected submittals, installation performance concerns, liability exposure, disputes over product representation, and costly project delays. Understanding the differences between ISO and ANSI requirements and how to document compliance in specifications properly has become increasingly important as imported tile products continue to dominate portions of the U.S. market.

The role of ANSI A137.1 in the U.S. tile industry
ANSI A137.1 serves as the foundational product specification for ceramic tile used in the United States. The standard establishes performance requirements, product classifications, definitions, test methods, and acceptance criteria for ceramic tile products intended for floor, wall, countertop, and exterior applications.

The standard is deeply integrated into the U.S. tile industry ecosystem. It is referenced throughout installation standards, project specifications, and industry guidance documents. Tile installation methods published by the Tile Council of North America (TCNA) rely on compliance with ANSI product standards, while many architectural specifications reference them. The standard is directly cited as a minimum requirement for ceramic tile products.

In commercial construction, compliance with ANSI A137.1 often forms the basis for evaluating whether a product is suitable for its intended application. The standard addresses a range of performance characteristics that establish expectations for durability, safety, and long-term performance, including water absorption, breaking strength, bond strength, dimensional characteristics, surface abrasion resistance, chemical, frost, and crazing resistance, and dynamic coefficient of friction (DCOF). Together, these requirements provide a consistent framework for evaluating ceramic tile products within the U.S. and help ensure products are appropriate for their intended applications.

ISO 13006: A different standard system

Internationally, many ceramic tile manufacturers evaluate products using ISO 13006, the globally recognized ceramic tile standard. The standard categorizes ceramic tile products and establishes performance criteria using ISO test methods rather than ASTM procedures commonly referenced within ANSI A137.1.

Although the two standards appear similar at first glance, they represent separate standard systems. ANSI A137.1 and ISO 13006 were developed independently, use different testing methodologies, and establish different acceptance thresholds for several properties. As a result, compliance with one standard does not inherently demonstrate compliance with the other.

This distinction is often overlooked during product sourcing and submittal review. A manufacturer may provide a test report showing compliance with ISO 13006, while the project specification requires compliance with ANSI A137.1. Without careful review, project teams may mistakenly assume the provided documentation satisfies U.S. and project requirements.

The issue becomes particularly significant on projects involving imported tile products, where



While ISO 13006 and ANSI A137.1 share similar goals, they are fundamentally different standards with distinct testing methodologies, performance requirements, and compliance criteria.

ISO documentation may be the primary or only compliance information initially provided.

Similar goals, different methodologies

Although ANSI A137.1 and ISO 13006 evaluate many of the same general performance characteristics, the standards are not directly interchangeable. While both systems assess properties such as strength, dimensional characteristics, and durability, they often use fundamentally different test methods and acceptance criteria. In some cases, the procedures differ so significantly that results cannot be directly compared or converted. As a result, compliance with ISO standards does not mean compliance with ANSI requirements.

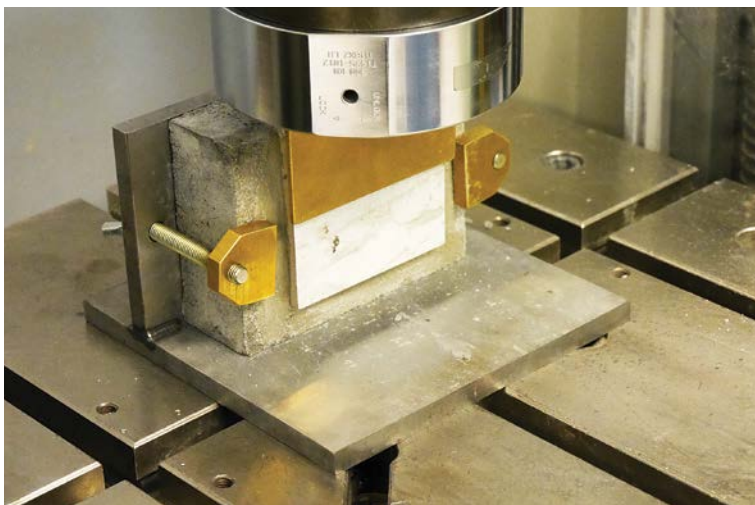
For specifiers, the key takeaway is that a product cannot be assumed compliant simply because testing exists. The specific standard, test method, and acceptance criteria all matter.

Key areas where ANSI and ISO differ

Different test methods

One of the most significant distinctions between ANSI A137.1 and ISO 13006 is the use of different testing methodologies.

Even when evaluating similar product properties, the methods themselves may differ substantially in sample preparation, loading conditions, calculations, equipment configuration, or acceptance criteria.



Bond strength performance testing is an example of a measurement that is included in ANSI standards but not ISO.



ANSI and ISO use completely different test methods of measuring breaking strength.

Breaking strength is one commonly cited example. ANSI A137.1 and ISO 13006 use different test methods to determine breaking strength. Consequently, results generated under one system cannot be directly converted or compared with those from the other.

This distinction is especially important when reviewing laboratory reports during submittal evaluation. A test report may appear technically complete while still failing to demonstrate compliance with the required U.S. standard.

Requirements included in ANSI but not ISO

Certain performance characteristics required under ANSI A137.1 are not addressed within ISO 13006.

Examples include:

- Bond strength—ANSI A137.1 specifies bond-strength requirements for ceramic tile. Bond strength performance is particularly relevant for

evaluating how tile products interact with installation materials and contribute to long-term system performance and durability.

- Dynamic coefficient of friction (DCOF)—Slip resistance is a major consideration for commercial flooring applications. ANSI A137.1 references DCOF requirements through ANSI A326.3, *Dynamic Coefficient of Friction (DCOF) of Hard Surface Flooring Materials*. ISO 13006 does not include an equivalent DCOF requirement; ISO-only testing may not provide the slip-resistance data typically expected within U.S. specifications.
- Mosaic tile requirement—ANSI A137.1 includes specific criteria for mosaic tile products that ISO 13006 does not address. This can create compliance gaps when mosaic products are imported.

Different acceptance thresholds

Even when ANSI and ISO evaluate the same property, the acceptance criteria may not align.

In some categories, ANSI A137.1 establishes more stringent thresholds than ISO 13006. A product that passes ISO requirements may not satisfy ANSI criteria for the same property.

This creates potential challenges for specifiers comparing products based on documentation generated under these different standards systems.

Implications for project specifications

For design professionals, these differences highlight the importance of clearly defining compliance requirements within construction documents.

Most commercial tile specifications already require compliance with ANSI A137.1. The challenge lies in verifying submitted products actually meet those requirements.

Imported tile products are frequently accompanied by ISO testing documentation and claims that ISO and ANSI standards are effectively equivalent. Without careful review, these assumptions can lead to approval of products that are not evaluated to the specific standards referenced in the project specifications. Substitutions and value-engineered alternatives can create similar concerns when supporting documentation is not thoroughly reviewed.

When ANSI A137.1 compliance is required, specifications should explicitly state:

- The required ANSI standard edition
- Applicable ASTM or ANSI test methods
- Product classifications

- Performance thresholds
- Slip resistance requirements where appropriate
- Required third-party testing or certification documentation

Clear language helps minimize ambiguity during bidding, procurement, and submittal review.

Evaluating submittals and test reports

Specifiers and design professionals reviewing tile submittals should carefully evaluate the basis of compliance presented within manufacturer documentation.

Several questions can help identify potential issues:

- Does the report specifically refer to ANSI A137.1?
- Are ASTM test methods identified?
- Is the testing current and representative of the submitted product?
- Was testing performed by an accredited laboratory?
- Are all required properties addressed?
- Are DCOF results included where required?
- Is the product classification appropriate for the intended application?

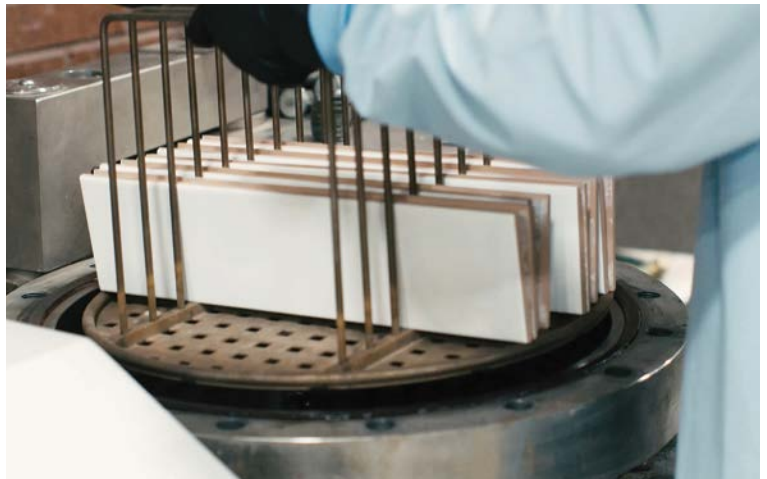
A laboratory report demonstrating ISO compliance alone may not be sufficient for U.S. commercial projects. In some cases, supplemental testing may be required to confirm products are compliant with ANSI requirements.

The importance of third-party verification

Independent third-party testing plays an important role in reducing uncertainty regarding the compliance of products.

Accredited laboratories provide objective verification that products meet specified requirements and help identify discrepancies between marketing claims and actual performance before materials reach the jobsite.

Third-party certification programs may provide additional assurance in specific areas. One example in the tile industry is the Porcelain Tile Certification Agency (PTCA), which verifies compliance with the water-absorption limit required for porcelain tile classification under ANSI A137.1. In this standard, porcelain tile is defined as ceramic tile with a water absorption of 0.5 percent or less, as tested in accordance with ASTM C373, *Standard Test Methods for Determination of Water Absorption and Associated Properties by Vacuum Method for Pressed Ceramic Tiles and Glass Tiles and Boil*



Crazing resistance is one of the performance measurements under ANSI standards.

Method for Extruded Ceramic Tiles and Non-tile Fired Ceramic Whiteware Products.

This is a key distinction because products marketed as “porcelain” do not always meet the technical definition established by ANSI A137.1. Independent certification in this context provides an additional layer of confirmation that test results align with the classification requirements embedded within the standard itself.

Together, accredited laboratory testing and targeted certification programs reinforce the same objective: confirming products meet the performance and classification criteria defined by the applicable ANSI or ISO standards before they are specified and installed.

Risk management through better project documentation practices

From a specification standpoint, clearly documenting compliance requirements can help reduce project risk.

Potential consequences associated with improper compliance assumptions include:

- Product rejection during submittal review
- Delayed procurement schedules
- Installation disputes
- Questions regarding slip resistance
- Warranty conflicts
- Liability concerns related to product representation
- Costly replacement or remediation work

These risks are amplified on large commercial projects, where imported materials are sourced from multiple parties in the supply chain.

By clearly defining standards and requiring appropriate supporting documentation, specifiers can achieve more predictable project outcomes.



The dimensions of tiles, such as length, width, and thickness, must pass a quality assurance (QA) process to ensure they fall within permitted manufacturing tolerances.

The growing importance of industry standards knowledge

As tile products continue to evolve, understanding standards and testing procedures is becoming increasingly important for design professionals.

Modern tile products include large-format panels, gauged porcelain tile panels/slabs, specialty surface finishes, resin-backed products, and complex mosaics. These products often involve performance considerations extending beyond traditional ceramic tile evaluation.

At the same time, global sourcing is expanding the diversity of products entering the U.S. market.

This increases the need for specifiers to distinguish between international product documentation and actual compliance with U.S. requirements.

Understanding the differences between ANSI and ISO standards is therefore not a technical issue. It is a critical component of managing risk, maintaining specification integrity, and ensuring installed performance.

Conclusion

Global tile manufacturing and international trade have created a marketplace where products are routinely evaluated under multiple standards systems. While ISO 13006 and ANSI A137.1 share similar goals, they are fundamentally different standards with distinct testing methodologies, performance requirements, and compliance criteria.

For specifiers, the assumption that ISO-tested tile automatically satisfies U.S. requirements can create significant project risk. Careful review of test documentation, explicit specification language, and appropriate third-party verification are essential to confirming compliance.

Ultimately, specifying ceramic tile for U.S. commercial projects requires more than simply requesting test reports. It requires understanding which standards apply, how they differ, and how compliance is properly verified. 

additional information

AUTHOR



Katelyn Simpson is the director of laboratory services at IPA Laboratories, where she oversees third-party testing and certification programs for ceramic tile, installation materials, natural stone, and related products. With 20 years of experience in the tile and materials testing industry, she has a

strong technical background in ceramic and materials engineering, earned through her degree from Clemson University. Simpson has been actively involved in the development and advancement of industry standards through her leadership roles as committee manager for the ANSI A108 Committee, the U.S. TAG to ISO TC189, and the TCNA Handbook Committee, and her active participation on numerous ASTM committees. She is recognized throughout the industry for her expertise in product performance standards, compliance testing, and technical education related to ceramic tile and installation materials.

KEY TAKEAWAYS

A common misconception in the tile industry is assuming that ceramic tiles tested to ISO 13006 standards automatically

comply with American National Standards Institute (ANSI) A137.1 requirements. While both standard systems share similar goals, they were developed independently and use fundamentally different testing methodologies, sample preparations, and acceptance thresholds. Relying solely on ISO documentation for U.S. commercial projects can lead to significant compliance gaps, rejected submittals, and liability exposure, underscoring the importance of precise specification language and accredited third-party verification for risk management.

MASTERFORMAT NO.

09 30 00—Tiling
09 30 13—Ceramic Tiling

UNIFORMAT NO.

C2030.20—Tile Flooring

KEYWORDS

Division 09	ISO 13006
ANSI A137.1	Porcelain tile certification
Ceramic tiling	
Flooring	



Protective Coatings for Data Center Design

By Federico Olivares

PHOTO © HUGO KURK/GETTY IMAGES/COURTESY PPG

A single hour of data center downtime can cost a company hundreds of thousands of dollars. As rising AI workloads push these facilities even harder, the margin for error keeps shrinking. To keep pace, the construction industry is rethinking the materials that help power, preserve, and protect data centers.

Coatings manufacturers have become an essential part of this ecosystem, alongside builders, software providers, and utilities. Their advanced technologies protect nearly every critical component within a data center, guarding against corrosion, fire, electrostatic discharge, and energy loss.

Protecting mission-critical assets such as servers, power systems, and the electrical infrastructure that keeps these facilities online is essential to maintaining continuous uptime and preventing costly disruptions. But that is only part of the equation. The buildings themselves must be designed to withstand decades of demanding environmental conditions while supporting uninterrupted operation. Structural steel, exterior wall systems, roofing components, and other critical building elements require coating systems that offer far more than aesthetics, but also resist corrosion, weathering, and potential fire exposure while contributing to long-term durability and performance.

Increased demand driven by fast-moving timelines

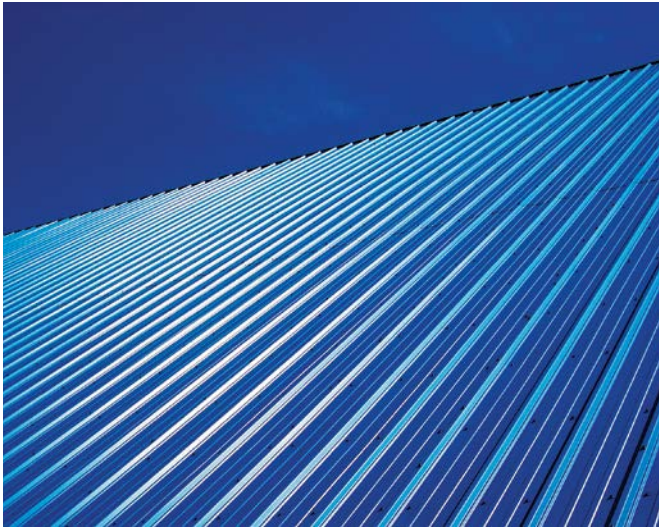
The acceleration of data center construction is creating significant needs for both building materials and electrical systems. At the same time, manufacturers across the supply chain are working to meet surging demand for structural steel and components, including enclosure systems, switchgear, battery storage, and cooling equipment. These pressures are creating procurement challenges, extending project timelines, and stalling builds, particularly as developers race to bring new capacity online.

Using coating systems from a single manufacturer across the full range of substrates and applications helps ensure each layer works together seamlessly, streamlining the specification and procurement process and enabling builders to meet established—and often aggressive—construction timelines.

Beyond accelerating specification and construction, project stakeholders who leverage this integrated approach not only optimize durability and performance but also streamline communications and processes for warranties, technical support, and post-installation service through a single point of contact.

The new, higher-performance benchmark

Data centers require significant power, generate intense heat, and must operate continuously. In fact, the ambitious



Infrared-reflective (IR) coatings that redirect solar heat are particularly effective in protecting exterior building components.

PHOTO COURTESY PPG

data center uptime target is 99.9 percent, allowing only a few hours of service interruption each year.¹ The expectation is even greater for business-critical applications relying on real-time data and round-the-clock digital services, such as healthcare, finance, and telecommunications, systems that are increasingly reliant on data center support.

That level of continuous operation leaves virtually no tolerance for downtime and generates extreme heat loads and energy density within tightly controlled environments. In modern data centers, coatings used for power generation systems, cooling infrastructure, and even the building's exterior do not serve isolated functions; rather, they are part of an interconnected system that must perform in sync with little margin for error.

As hardware becomes more complex and data center spaces house more equipment, effective heat management is a major operational challenge. Overheating can accelerate component degradation but also increase energy consumption and operational cooling costs. Advanced coatings help regulate thermal build-up to protect sensitive equipment and maintain stable temperatures. Specialized thermal-resistive, insulative, and infrared-reflective (IR) coatings that redirect solar heat are particularly effective in protecting exterior building components from heat build-up, an essential advantage for facilities already bearing a significant heat load.

In addition, the sustainability profile of data centers has become a decisive factor in whether new facilities are approved, permitted, and ultimately accepted by the communities that host them. Metrics widely used in the industry help owners, operators, and developers benchmark performance on various data points, prompting consideration of specifiers for coatings and building materials.



Manufacturers across the supply chain are working to meet surging demand for equipment such as battery storage.

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Key sustainability metrics

High energy demands, water consumption, cooling requirements, and increasing pressure to adopt decarbonization strategies are reshaping how data center performance is defined and regulated. As these facilities grow in scale and complexity, sustainability is no longer an optional design consideration but a measurable requirement driven by both operational efficiency goals and pressure from local communities and government entities.

Data center developers and specifiers can use a variety of performance benchmarks to evaluate facility efficiency and environmental impact. Common sustainability metrics include:

- Power usage effectiveness (PUE)—Measures overall energy efficiency of the facility.²
- Energy reuse effectiveness (ERE)—Evaluates how effectively waste energy is recovered and reused.²
- Carbon usage effectiveness (CUE)—Quantifies greenhouse gas emissions relative to energy consumption.²
- Water usage effectiveness (WUE)—Tracks water efficiency in cooling and operations.²
- Cooling efficiency ratio (CER)—Assesses the efficiency of cooling systems relative to energy use.²

Failure to meet any of these requirements impacts operational costs and efficiency, regulatory and compliance risks, and reputational and environmental impacts.

LEED considerations

While LEED certification remains relatively uncommon among data centers, interest in it is rising, making these metrics increasingly relevant, especially among hyperscale operators and sustainability-focused enterprises.

While fewer than five percent of U.S. data centers have achieved LEED certification,³ new projects are increasingly



The soaring demand for data processing, storage, and AI workloads is accelerating data center construction.

PHOTO © ERIK ISAKSON/GETTY IMAGES/COURTESY PPG

incorporating aligned strategies without pursuing full certification. As local communities push for more environmentally sound development—and governments enact tougher efficiency and emissions regulations—owners and developers must work toward meaningful, targeted reductions in overall water and energy use and greenhouse gas emissions.

Collectively, meeting these requirements is challenging, given that the physical environment in contemporary data centers is more valuable and demanding than ever, consuming significantly more power, generating more heat, and housing equipment that must not exceed temperature or humidity limits.

Other notable certifications

Additional industry-leading certifications from Underwriters Laboratories (UL) and the Institute of Electrical and Electronics Engineers (IEEE) provide independent verification that coatings can withstand the rigorous demands of data center applications.

UL certifications

For building materials used in data centers, including structural systems, interior partitions, and electrical infrastructure, coatings are frequently evaluated against UL safety and performance standards that inform specification decisions:

- **UL 94, the Standard for Safety of Flammability of Plastic Materials for Parts in Devices and Appliances:** Ensures coatings resist ignition and limit flame propagation, reducing fire risk on plastic or composite components.
- **UL 263, Fire Tests of Building Construction and Material:** Confirms coated structural assemblies maintain their fire-resistance rating, safeguarding critical infrastructure.



For building materials used in data centers, including structural systems, interior partitions, and electrical infrastructure, coatings are frequently evaluated against UL safety and performance standards that inform specification decisions.

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- **UL 746C, Standard for Polymeric Materials - Short Term Property Evaluations:** Validates thermal and dielectric stability for coatings applied to electrical panels and busbars.
- **UL 723, Steiner Tunnel Test / ASTM E84, Testing and Certification Solutions for Building Materials and the HVAC industry:** Measures flame spread and smoke development, supporting compliance with building codes and NFPA codes and standards. ASTM E84 is a 10-minute fire test evaluating the surface burning characteristics of building materials.

Other codes and standards related to fire protection and corrosion should be considered by specifiers selecting protective coatings for the structural elements of data centers and their exteriors:

- **UL 1709, Rapid Rise Fire Tests of Protection Materials for Structural Steel:** Evaluates the ability of fire-protective coatings to withstand the rapid temperature increases associated with hydrocarbon fires. While more common in industrial and energy applications, coating systems that meet these criteria are important for data centers with large backup power or energy storage systems.
- **UL 10C, Positive Pressure Fire Tests of Door Assemblies:** Supports the fire performance of coated doors and openings, helping the physical door infrastructure within a data center contain a fire and helping to prevent it from spreading between rooms.
- **ASTM B117, Standard Practice for Operating Salt Spray (Fog) Apparatus:** Commonly used to evaluate the corrosion resistance of coated metal components exposed to challenging environments. While not a building code requirement, specifiers can use this type of corrosion testing data to identify protective coating systems that have passed salt-spray tests when selecting them for exterior and structural applications.

- *ASTM D2247, Standard Practice for Testing Water Resistance of Coatings in 100% Relative Humidity*: An important consideration for the specification of exterior components, the test assesses blistering, softening, adhesion loss, and degradation of protective coatings. While not a direct predictor of field performance, it provides a standardized method for comparing coating systems where long-term exposure to humidity or moisture is a design consideration, inside data centers or out.
- *FGIA/AAMA 2603, 2604, and 2605, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels*: Performance specifications for architectural coatings applied to aluminum extrusions and panels. These standards evaluate weatherability, color retention, chalk resistance, and durability, helping specifiers select appropriate coating systems based on environmental exposure and service-life expectations.
- *Cool Roof Rating Council (CRRC)*: The organization provides independent ratings for the radiative properties (solar reflectance) and thermal emittance of exterior building materials, including those suitable for data centers. The council helps specifiers evaluate roof and wall systems intended to reduce heat gain and improve energy performance.
- *ASHRAE 90.1*: Establishes minimum energy-efficiency requirements for commercial buildings. Reflective roof and wall coatings can contribute to code compliance by reducing solar heat gain and supporting lower cooling loads in data centers.

Author's note: Testing parameters and definitions are summarized from standardized methodologies outlined by UL Solutions (UL),⁴ ASTM International (ASTM),⁵ the Fenestration & Glazing Industry Alliance (FGIA),⁶ the Cool Roof Rating Council (CRRC),⁷ and ASHRAE.⁸

Coatings for exteriors and structural components

With these codes, standards, and performance criteria establishing clear benchmarks for durability, weatherability, and energy efficiency, specifiers can begin translating requirements into material and coating system decisions. For the building envelope and structural systems, this typically centers on selecting protective coatings for coil-coated and extruded aluminum components, which play a critical role in long-term facility performance from the outside in.

Coil coatings

Coil coatings are commonly specified for metals used in roofing, wall panels, louvers, equipment enclosures, and other exterior building components, forming the first line of defense against environmental exposure. Applied to steel or aluminum in a continuous, automated process before the



metal is fabricated into building components and systems, these coatings provide a durable finish designed to help withstand UV rays, moisture, temperature fluctuations, and corrosive conditions.

For data centers, the performance of exterior components is particularly important given their long service lives and continuous operation requirements. High-performance coil coating systems can help maintain the appearance and integrity of metal building products used on exterior applications. In addition to corrosion and weather resistance, quality coil coatings offer color retention and resistance to chalk, scratches, and marks.

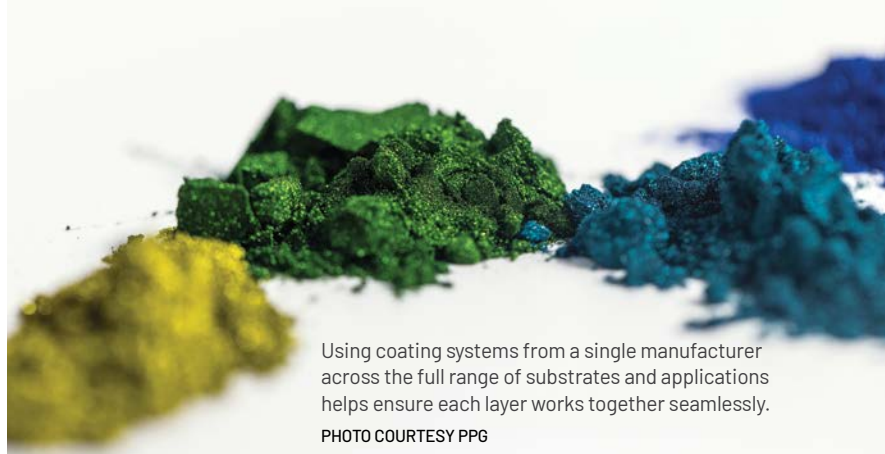
Cool roof and wall technologies

Specifiers now have access to infrared (IR) coil coatings that reflect solar radiation away from building exteriors. This allows for darker colors for building exteriors that absorb significantly less heat. In data centers, where cooling systems continuously manage heat generated by servers, storage equipment, and other critical infrastructure, reducing heat gain through the building envelope is important for overall energy efficiency. Limiting the amount of exterior heat entering the facility reduces the burden on HVAC systems tasked with maintaining precise interior conditions. In this way, reduced heat absorption lowers a data center's overall cooling loads and associated costs. It can help minimize the urban heat island effect for facilities built in more densely populated areas. In fact, according to



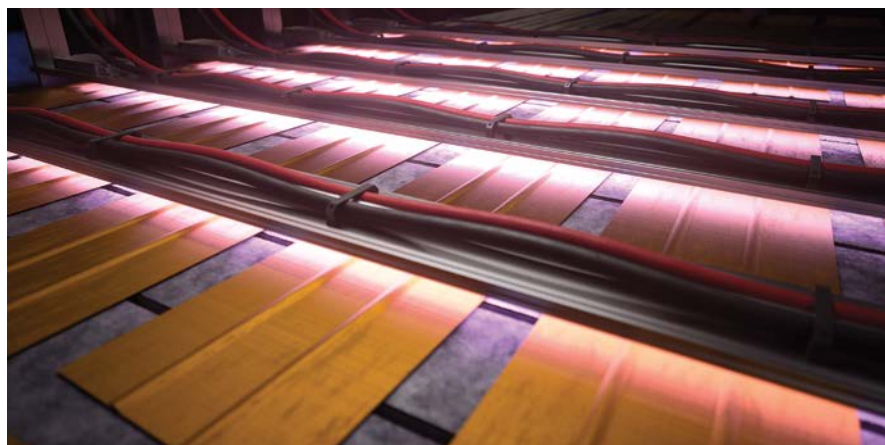
Limiting the amount of exterior heat entering the facility reduces the burden on HVAC systems.

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Using coating systems from a single manufacturer across the full range of substrates and applications helps ensure each layer works together seamlessly.

PHOTO COURTESY PPG



While fewer than five percent of U.S. data centers have achieved LEED certification, new projects are increasingly incorporating aligned strategies without pursuing full certification.

PHOTO COURTESY PPG

the CRRC, the average energy savings from a cool roof range from 7 to 15 percent of total cooling costs. Cool roofs can also help prolong the life of air conditioning systems by reducing strain during hot weather.⁹

Cool coil coatings can be formulated to meet requirements for LEED, CRRC, California Title 24, ASHRAE 90.1, and numerous state and local voluntary codes for specifiers seeking to satisfy a particular standard or performance benchmark.

Premium, architectural-grade powder coatings

For architects designing modern data center building envelopes, hyper-durable powder coatings offer a balance of long-term exterior durability and color retention with added sustainability advantages. These advanced solutions meet stringent standards, such as FGIA/AAMA 2605, for architectural extrusions and aluminum components, including window frames, panels, and curtain walls. These powders help protect exterior metals on data centers from harsh UV rays, extreme temperatures, and rust.

Extrusion coatings

Extruded aluminum components are widely used across data center envelopes and structural components, including curtain wall assemblies, window and door frames,

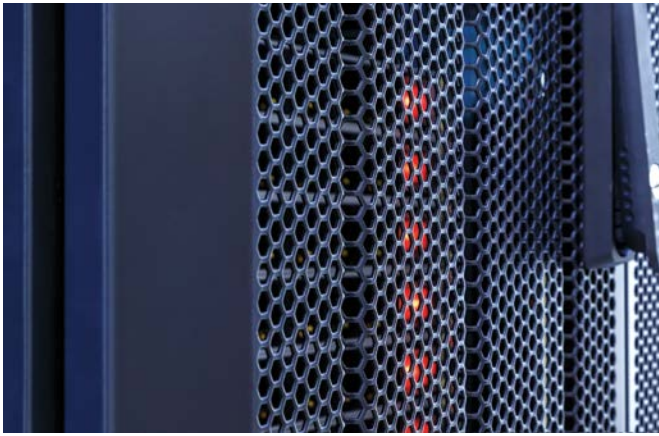
sunshades, louvers, and other architectural metal elements. They can also be specified for equipment enclosure systems to protect sensitive electronics.

Additionally, because these components are in direct contact with primary structural framing and are part of the facade, their surface protection plays a critical role in the overall continuity and performance of the exterior.

Extrusion coating systems are engineered specifically for shaped metal components, where complex geometries and exposed surfaces require uniform coverage and consistent film build. Applied in controlled factory environments, these coatings ensure repeatable quality across large production runs while supporting a wide range of aesthetic requirements, including color, gloss, and specialty finishes.

For specifiers, extrusion coatings are typically evaluated against established FGIA/AAMA performance standards. These evaluations assess resistance to weathering, UV exposure, corrosion, and mechanical wear, all of which are important when specifying for a data center build. Coatings meeting established performance benchmarks help ensure coated aluminum components maintain their appearance and integrity in demanding exterior environments over extended service lives.

While envelope and structural applications are among the most visible specifications on a data center project, specialized



Data centers require significant power, generate intense heat, and must operate continuously.

PHOTO © ISTOCK/COURTESY PPG

coating technologies are also used throughout the facility's electrical, mechanical, and power systems. These may include:

- EMI-shielding coatings
- Anti-static and fire-resistant coatings
- Dielectric powders
- Thermal-resistive coatings
- Insulative coatings
- IR-reflective coatings
- Corrosion-resistant coatings
- Protective coatings for uninterruptible power supply (UPS) batteries
- ESD-safe flooring systems

Advanced coatings for power and protection

As demand for data centers accelerates, architects and specifiers must balance durability, energy efficiency, safety, and speed to market. Coating systems contribute to all these priorities, helping protect structural components, support

building envelope performance, and safeguard critical infrastructure. When supplied by a single coatings manufacturer with a broad range of technologies, specifiers can streamline specifying and sourcing and optimize protective performance across building components and assemblies.

Data centers are among the most demanding environments in infrastructure, where even minor disruptions can cascade into costly outages. As facilities grow in scale and power density, the materials protecting their critical systems must perform at an equally high level, including the high-performance industrial coatings used to safeguard the physical structure and its components. Partnering with a coatings supplier offering a robust supply chain and deep application expertise can also help keep construction timelines on track, an increasingly important advantage as developers race to bring new capacity online. 🌈

NOTES

¹ See "Breaking Down Data Center Tier Level Classifications," CoreSite, coresite.com/blog/breaking-down-data-center-tiers-classifications

² Refer to "Data Center Metrics," SDI Alliance, 2020, knowledge.sdialliance.org/archive/data-center-metrics

³ Read more at "Data centers achieve a new level of high-tech: Energy efficiency," Consulting-Specifying Engineer, 2020, csemag.com/data-centers-achieve-a-new-level-of-high-tech-energy-efficiency/

⁴ See UL Solutions, ul.com

⁵ Refer to ASTM International, astm.org

⁶ Read more at Fenestration & Glazing Industry Alliance, fgiaonline.org

⁷ See Cool Roof Rating Council, coolroofs.org

⁸ Refer to ASHRAE, ashrae.org

⁹ Read more at "How to Talk About Cool Roofs and Walls to Your Customers," Cool Roof Rating Council, coolroofs.org/resources/contractors

additional information

AUTHOR



Federico Olivares serves as global strategic marketing and data center strategy leader at PPG Industrial Coatings, where he spearheads data center strategy and global marketing initiatives. He brings more than two decades of Fortune 200 leadership experience in marketing, strategy, and innovation.

KEY TAKEAWAYS

The soaring demand for data processing, storage, and AI workloads is accelerating data center construction, placing a higher premium on advanced protective coatings to ensure a 99.9 percent facility uptime target. Utilizing a single coatings manufacturer across the building envelope, structural steel, and electrical components helps streamline procurement, meet aggressive construction timelines, and simplify warranty support. Further, data centers increasingly require specialized thermal-resistive, infrared-

reflective (IR), and hyper-durable powder coatings to manage extreme heat loads, optimize energy efficiency metrics and comply with stringent fire-safety and architectural standards.

MASTERFORMAT NO.

05 05 13—Shop-Applied Coatings for Metals

09 96 00—High-Performance Coatings

UNIFORMAT NO.

B2010—Exterior Wall Veneer

B3010—Roofing

KEYWORDS

Divisions 05, 09

Cool roofs

Cool walls

Data centers

Extrusion coating systems

High-performance coil coatings



Selected by the professionals who specify, design, and build the spaces around us, the inaugural *The Construction Specifier* Readers' Choice Product Award winners represent solutions that have earned the industry's confidence. From innovations that enhance performance and sustainability to products that simplify installation, maintenance, and compliance, each honoree reflects the practical priorities that shape today's projects. Chosen through a reader-driven voting process, these products stand out not only for what they promise but also for the value they deliver in real-world applications. In the following pages, we profile the winning entries and the companies behind them, highlighting ideas that help specifiers make informed product decisions. 

PGT WinGuard Vinyl Line

MITER Brands



Experience the next level of protection, performance, and style with the WinGuard® Vinyl line from PGT. Built for those who refuse to compromise on safety or aesthetics, WinGuard Vinyl windows and doors combine cutting-edge laminated glass technology with superior energy efficiency and remarkable durability. Rigorously tested to withstand extreme weather conditions—including hurricanes and severe storms—these products not only help protect what matters most but also elevate the look and feel of any home or commercial property. With a variety of customizable styles, finishes, and advanced features, WinGuard Vinyl seamlessly blends robust security with modern design, providing confidence, comfort, and peace of mind season after season.

HONORABLE MENTIONS

Milgard V400 Tuscany Series
MITER Brands

Adhesion Prime
Technoform

Mate Series: Perspectives in Design

3A Composites

Developed in response to global design trends and extensive architect feedback, the ALUCOBOND® PLUS Matte Series:

Perspectives in Design collection offers an elevated, organic finish with reduced gloss. This curated series features seven

distinct finishes—Ecrú, Dune, Earthen, Pebble, Flint, Eclipse, and Aegean—each serving as a unique lens to define the built environment with a sophisticated palette. Beyond its refined aesthetic, the series supports sustainable building goals. ALUCOBOND® PLUS is 100 percent recyclable following separation, offering a reliable path toward LEED certification without compromising fire safety, durability, or stringent *International Building Code (IBC)* standards.



MetroView 4-SSG Window Wall

Kawneer

MetroView® 4-SSG Window Wall is an innovative, unitized window wall system providing architects with a clean, all-glass aesthetic and the performance and flexibility that today's buildings demand. Ideal for new construction for multi-family projects, condominiums, and hotels, the system offers the tallest floor-to-ceiling sizes of any Kawneer window wall system, delivering a unique aesthetic aligned with current trends. Engineered for high performance, it is designed to support high thermal efficiency, seismic performance, hurricane impact resistance, sound insulation for noisy environments, and unitized slab-to-slab construction. Buildings across every region will benefit from exceptional performance, sleek aesthetics, and fast installation.



Every detail. Every day.

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to serve our customers at a level that others simply can't match.

That's the power of MITER Brands

MILGARD®
V400 Tuscan® Series



MILGARD®
C700 Fiberglass Series*



PGT®
WinGuard® Vinyl Series



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MILGARD®
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PGT® WINDOWS
and DOORS

* MILGARD® C700 Fiberglass Series Casement Window and Sliding Glass Doors

Reframe what's possible
[miterbrands.com](https://www.miterbrands.com)



Lightweight Slate Roof System

North Country Slate

A lightweight natural slate roof for new construction and re-roofing. System is 40 percent lighter than traditional slate, weighing less than 6 lbs./sf, and has two critical components: slate shingles and an interlayment. The shingles are 0.25 to 0.625 in. thick, 12 to 14 in. long, and installed with a 4-in. overlap, compared with the 10.5- to 13.5-in. overlap of a traditional system. The 21-in.-wide interlayment is made of high-density polyethylene and installed between each course as a weather and UV barrier, reducing the quantity of slate required. Savings include overall weight, labor, and shipping. The system meets or exceeds FM 4473, Impact Resistance Testing of Rigid Roofing Materials by Impacting with Freezer Ice Balls, for Class 3 Hail Impact, UL 790 Class A Fire Resistance, and Miami-Dade County's test standard for 110 mph wind/rain protection.



FF102/50 Intumescent Fire Block

Tenmat

The FF102/50 Fire Blocks are rigid, high-expansion intumescent strips encased in aluminum foil. The FF102/50 can be mechanically fixed both horizontally and vertically within concealed cavities containing air gaps up to 2 in. (1.75 in. open space between the face of the fireblock and the cladding). The open space between the FF102/50 and the cladding allows airflow and moisture to dissipate. In the event of a fire, the intumescent material rapidly expands to seal off the cavity and prevent the spread of flames and heat. The products have undergone extensive fire testing, including NFPA 285, Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Wall Assemblies Containing Combustible Components, at Intertek and Underwriter Laboratories (UL), and are NYC OTCR/DOB-approved materials in accordance with NYC Building Code, Section 718.2.6.1.



HB One Backer CI - Direct-to-Stud Application

HydroBlok



As energy codes drive greater use of continuous insulation (c.i.), wall assemblies have become more complex and labor-intensive. HB One Backer CI simplifies construction by allowing direct-to-stud installation in approved non-shear wall applications—eliminating a traditional layer across 80 percent of the wall surface—while maintaining familiar construction sequencing. For stucco, the system combines a secondary WRB, continuous insulation, lath, scratch coat, and non-shear substrate into a single five-in.-one panel. The result is reduced materials, fewer trades, faster installation, and a simpler path to energy code compliance. HB One Backer CI is recognized for code compliance by the International Code Council (ICC), with documentation for direct-to-stud application evaluation forthcoming.

HONORABLE MENTIONS

StoCast Brick & Wood
Sto Corp

BirdSmart Bird Safe Glass
Vitro Architectural Glass



Renovate to impress, insulate to perform.

Mass wall retrofits just got easier. ROCKWOOL Smartrock® combines stone wool insulation and smart vapor control in a single, easy-to-install solution, and is a winner of the Construction Specifier Environmental Stewardship award!



Thermal control:

Continuous insulation for long-term thermal performance



Smart vapor control:

Integrated smart vapor retarder controls vapor movement



Airtightness:

Provides an airtight layer when properly detailed



Efficient installation:

Two integrated products creates a fast and easy install



Smartrock was specified for our space because I want to use the smartest products in my homes. Having a product that keeps my homes warm and safe from condensation is incredibly important to me.

Bryan Uhler, Pioneer Builders Inc., Port Orchard, WA



Learn more about Smartrock solutions for mass wall construction at rockwool.com/smartrock



Best New

DVM S2+

Samsung HVAC



The Samsung DVM S2+ is an AI-powered VRF solution designed for commercial applications, including offices, retail, hospitality, healthcare, and multitenant buildings. Its onboard AI Core continuously learns and adapts to optimize comfort, energy efficiency, and system performance without cloud connectivity. Integrated AI controls enable intelligent compressor operation, adaptive defrost, and refrigerant leak detection for enhanced reliability and safety. Operating in temperatures as low as -22 F (-30 C) and using low-GWP R-32 refrigerant, the DVM S2+ delivers sustainable, dependable, and future-ready climate control while helping reduce operational costs through optimized energy management.

HONORABLE MENTIONS

WINDOOR Pass-Through Awning Window

MITER Brands

Elkay Pro Filtration™ Bottle Filling Station

Zurn Elkay



MILGARD C700 Casement & Sliding Glass Door

MITER Brands

The new MILGARD Windows and Doors C700 Series windows and patio doors represent the next generation of fiberglass window design. Designed for what's next, the C700 Series features clean sightlines and modern frame profiles that integrate seamlessly with contemporary architectural styles and enhance curb appeal. The C700 Series incorporates MILGARD's innovative SmartTouch hardware, allowing windows to unlock and operate with a single motion while meeting rigorous forced-entry codes for enhanced security. In addition, C700 windows and doors are tested and built to meet ENERGY STAR version 7.0 requirements, providing exceptional energy efficiency across climate zones. Every product is backed by MILGARD's industry-leading warranty.

Veris™ Modern Grain Entryways

Therma-Tru Doors



Veris Modern Grain Entryways blend Therma-Tru's industry-first fiberglass with sleek Veris glass and aluminum framing to create a mixed-material entryway system that blends industrial strength with warm, natural finishes. Available in hinged and pivot configurations, each system offers bespoke selections in operation, configuration, stain, glass, and privacy levels. Walnut-grain fiberglass panels featuring AccuGrain technology provide a look and feel virtually indistinguishable from real wood, while the aluminum frame resists warping and deterioration. Backed by a lifetime limited warranty and a 10-year finish warranty, Veris Modern Grain Entryways deliver modern style, performance, and design flexibility.

Structural & Core Systems



Low Embodied Carbon Steel Studs and Track

MarinoWARE

MarinoWARE cold-formed steel structural and non-structural studs and tracks advance environmental stewardship through rigorous material transparency and sustainable manufacturing. Using electric arc furnace (EAF) production, these products feature a Product-Specific Type III EPD that documents a significantly reduced embodied carbon footprint. A third party-verified EPD optimization assessment establishes clear pathways for continuous reductions in life-cycle impact. Backed by the industry's first third-party verified Health Product Declaration (HPD), this framing system delivers verified material health data to support sustainable construction and simplify LEED qualification.



PVKIT Solar Mounting Solution

S-5!

PVKIT is a rail-less, solar mounting solution engineered for metal roofs. Designed for clean integration, it delivers a sleek, low-profile installation that supports strong design intent and efficient rooftop performance. At Vaisala's U.S. Headquarters in Louisville, Colo., PVKIT helped create an energy-producing vertical standing seam wall facade without penetrating or damaging the metal panels—preserving roof integrity and warranties. Pre-assembled with only three components, it simplifies installation while reducing hardware, freight, and visual clutter. It also cuts system weight by 85 percent and improves overall load distribution by 25 percent. Backed by extensive third-party testing, PVKIT delivers durability with architectural appeal.



HONORABLE MENTION

Alternating Tread Stair

Lapeyre Stair



StyleCraft

When Schedules Don't Wait,
StyleCraft Delivers.

- ✓ Premium look and feel.
- ✓ Design Flexibility - wide range of finishes.
- ✓ Scratch, heat, and stain resistant.
- ✓ 20, 45, 60, and 90-minute fire ratings.
- ✓ Low maintenance, easy to clean surface.

Single-acting high pressure laminate (HPL) doors balance performance, aesthetics, and value.

Standard lead times as low as two weeks.

eliasoncorp.com



Building Systems

DVM S2+

Samsung HVAC

The Samsung DVM S2+ is an AI-powered VRF solution designed for commercial applications, including offices, retail, hospitality, healthcare, and multitenant buildings. Its onboard AI Core continuously learns and adapts to optimize comfort, energy efficiency, and system performance without cloud connectivity. Integrated AI controls enable intelligent compressor operation, adaptive defrost, and refrigerant leak detection for enhanced reliability and safety. Operating in temperatures as low as -22 F (-30 C) and using low-GWP R-32 refrigerant, the DVM S2+ delivers sustainable, dependable, and future-ready climate control while helping reduce operational costs through optimized energy management.



HONORABLE MENTION

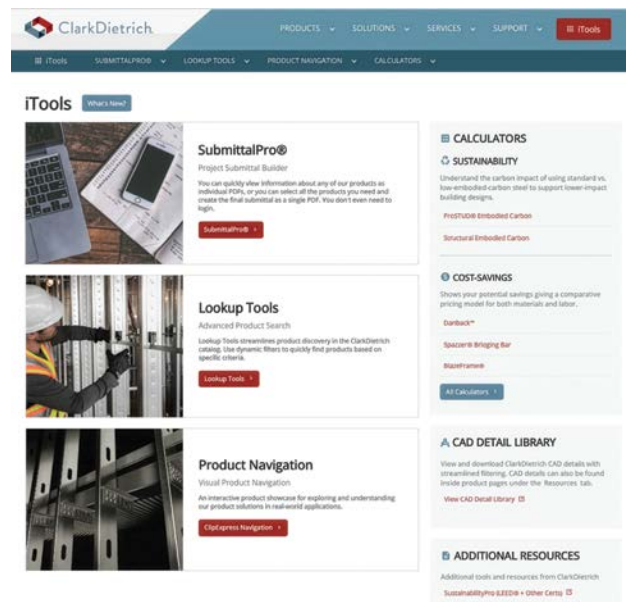
EZ Path Series 84+ Fire-Rated Pathway

Specified Technologies

Architectural Software & Tools

iTools

ClarkDietrich



Launched in 2013, ClarkDietrich's iTools was developed to help architects and contractors evaluate purchasing decisions and assist in product selection for steel-framing projects. The cost-saving calculators use applicable project data to give instant comparative pricing models for both materials and labor for many ClarkDietrich steel-framing products. iTools provides direct links to product pages, LEED request forms, product literature, and technical data sheets. Updates in 2026 include redesigned Lookup Tools, interior wall lookup integration with BIMsmith Forge, new sustainability calculators to help evaluate embodied carbon of steel framing, and more. iTools is available in both desktop and mobile formats at itools.clarkdietrich.com.

Readers Choice Product Award Winner

★★ HONORABLE MENTION ★★

StoCast is a high-performance architectural finish solution that replicates the look of wood and brick while delivering superior durability and moisture resistance. Engineered with lightweight, prefabricated resin shapes, StoCast minimizes installation time and structural load compared to traditional materials. Its reinforced composition resists impact, cracking, and UV exposure, maintaining long-term aesthetic integrity in demanding environments. Compatible with multiple Sto systems, StoCast provides design versatility without compromising performance, offering architects a resilient, low-maintenance alternative to conventional cladding materials.



sto

<https://www.stocorp.com/stocast-is-unreal>

HONORABLE MENTION

Firestop Clash Manager

Specified Technologies

Interior Systems & Finishes

Environmental Stewardship



2060SC Series Heavy-Duty Soft-Close Pocket Door Frame Kit

Johnson Hardware



Made in the USA, 2060SC delivers reliable performance under heavy, long-term use in commercial applications, including condos, offices, hotels, health care, and senior living facilities. Installs with solid-core wood, metal, and laminate doors (not included) up to 10 ft high, 5 ft wide, and weighing up to 330lbs. For 2 in. x 6 in. timber walls or 6 in. steel framed stud walls with Steel Stud Adapter Kit. Packaged for easy transport and quick installation, 2060SC works in single- and two-converging-pocket-door applications. Adaptable for non-standard wall thicknesses and header cuts down for smaller doors. All-steel split studs maximize wall rigidity. Soft-close hardware prevents door slamming, and a quick-release tab on hangers allows door removal without cutting the wall.

Smartrock

ROCKWOOL

ROCKWOOL Smartrock is a stone wool insulation board designed for continuous insulation (c.i.) on the interior side of concrete and masonry exterior walls. It includes INTELLO PLUS by Pro Clima as an integrated smart vapor retarder. This allows Smartrock to adapt to changing humidity conditions and dry in both directions, while also creating an airtight layer when properly sealed. Smartrock is a Class A fire-rated material in accordance with ASTM E84, Standard Test Method for Surface Burning Characteristics of Building Materials, and is classified as a non-combustible material in accordance with IBC Section 703.3.1. Smartrock is produced from natural and recycled materials. It delivers long-term thermal performance, reducing building energy use and mitigating associated carbon emissions over the life of the assembly.



HONORABLE MENTION

OneDek Insulated Roof Deck
All Weather Insulated Panels

HONORABLE MENTION

Stylecraft Fire-Rated HPL Door
Eliaison

Readers Choice Product Award Winner

★★ HONORABLE MENTION ★★

StyleCraft elevates commercial interiors with a refined balance of performance, safety, and design. Engineered with a 5-ply bonded core and premium high-pressure laminate, it delivers exceptional resistance to impact, heat, and wear while meeting WDMA Extra Heavy-Duty standards. Backed by certified fire ratings of 20, 45, 60, and 90 minutes, it delivers uncompromising protection you can trust. With 20+ stocked high-pressure laminates and access to hundreds more, including custom graphics, StyleCraft can be tailored to match any environment's aesthetics. With sophisticated finish options, low-maintenance surfaces, and lead times as short as two weeks, StyleCraft embodies enduring quality, precision craftsmanship, and architectural versatility.

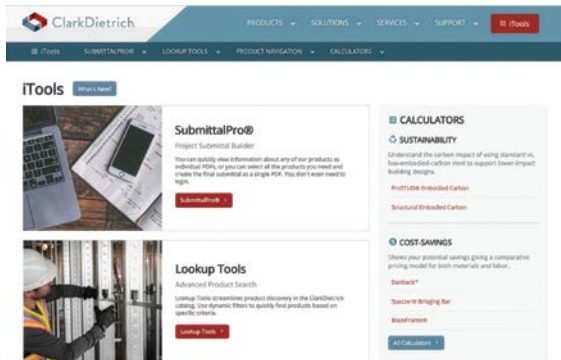


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iTools

ClarkDietrich



Launched in 2013, ClarkDietrich's iTools was developed to help architects and contractors evaluate purchasing decisions and assist in product selection for steel-framing projects. The cost-saving calculators use applicable project data to give instant comparative pricing models for both materials and labor for many ClarkDietrich steel-framing products. iTools provides direct links to product pages, LEED request forms, product literature, and technical data sheets. Updates in 2026 include redesigned Lookup Tools, interior wall lookup integration with BIMsmith Forge, new sustainability calculators to help evaluate embodied carbon of steel framing, and more. iTools is available in both desktop and mobile formats at itools.clarkdietrich.com.

Milgard V400 Tuscany Series

MITER Brands



The V400 Tuscany® Series offers premium vinyl windows and patio doors designed for lasting comfort, energy efficiency, and timeless style. Even sightlines and wider frame profiles create a classic, elegant aesthetic. The V400 Tuscany Series incorporates MILGARD's innovative SmartTouch hardware, allowing windows to unlock and operate with a single motion while meeting rigorous forced-entry codes for enhanced security. The product line is available in a variety of window and door styles, configurations, and color options, including traditional and modern finishes. Energy-efficient glass options meet ENERGY STAR standards, while robust hardware and an industry-leading warranty ensure durability and peace of mind.

Alternating Tread Stair

Lapeyre Stair

Lapeyre Stair invented and patented the alternating tread stair, providing a safer, space-saving solution for vertical access in industrial environments. When space is limited and safety is non-negotiable, our alternating tread stairs outperform fixed ladders and steep ship stairs, offering superior ergonomics and compliance with Occupational Safety and Health Administration (OSHA) and International Building Code (IBC) standards.



HONORABLE MENTIONS

PGT WinGuard Vinyl Line

MITER Brands

Solarban® 70 Solar Control Low-e Glass

Vitro Architectural Glass

SpeedFlex™ TTG Track Top Gasket

Specified Technologies



It's not just a certification, it's proof of expertise.

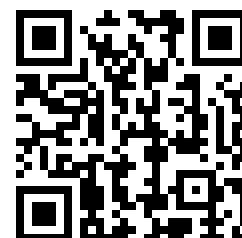
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Assess the Access

In addition to accommodating the various loadings anticipated from surrounding exterior and interior environments, a functional exterior enclosure must not only be constructable under the anticipated installation sequencing for a project, but each system of the enclosure must also be designed for routine maintenance and/or its eventual replacement.

Integration of adjacent enclosure systems is typically established during design and refined throughout the submittal process. Optimally, coordination of final detailing and system integration is further refined through quality control (QC) procedures, pre-installation meetings, mock-ups (where appropriate), and, lastly, the actual installation of each component or system. Successful coordination requires open communication and ongoing dialogue among each project team responsible for the various components of the building enclosure.

However, as is often the case, when this coordination is not established early and maintained throughout construction, the potential for constructability or accessibility conflicts associated with the involvement of different trades increase significantly.

Additionally, even a well-developed construction process can be short-circuited by project schedule pressures or unanticipated lead times, resulting in improper sequencing of various systems. Once realized, integration and accessibility issues caused by improper sequencing and coordination can be costly and time-consuming to rectify, and thus be overlooked or addressed by compromising the installation.

A direct example was encountered on a recent project where a perimeter screen wall was designed to hide rooftop mechanical equipment from view. Detailing of this screen wall assembly was limited in the design drawings, and coordination of this work relied on a mere mention in an obscure note on the roof plan. The hollow structural section (HSS) support structure and metal panel cladding for the screen wall were installed by separate trades, as was the single-ply membrane roof assembly. Despite their proximity and direct interfaces, the installation of these building components was not properly coordinated.

Consistent with typical industry practice, roof flashing was detailed to extend vertically and terminate 203.2 mm (8 in.) above the horizontal roof surface at penetrations of the vertical HSS support members. Due to sequencing issues and unanticipated material lead times, the metal panel cladding was installed prior to the roof assembly. Unfortunately, the



A lack of coordination on this project resulted in insufficient clearance to install the flashing in accordance with the specified roof design, and the roofing membrane being terminated at HSS penetrations using a bead of sealant due to limited height and access created a non-warrantable and unserviceable condition.

metal panel installation did not account for the overall thickness of the tapered insulation at the screen wall, leading to the bottom of the metal panel system being installed at a consistent height relative to the level metal deck. This lack of coordination resulted in insufficient clearance to install the flashing in accordance with the specified roof design, and the roofing membrane being terminated at HSS penetrations using a bead of sealant due to limited height and access, creating a non-warrantable and unserviceable condition.

Ultimately, the screen wall cladding was removed, the HSS support structure was modified to accommodate proper flashing installation, and new metal cladding was installed, resulting in a costly and avoidable outcome. 



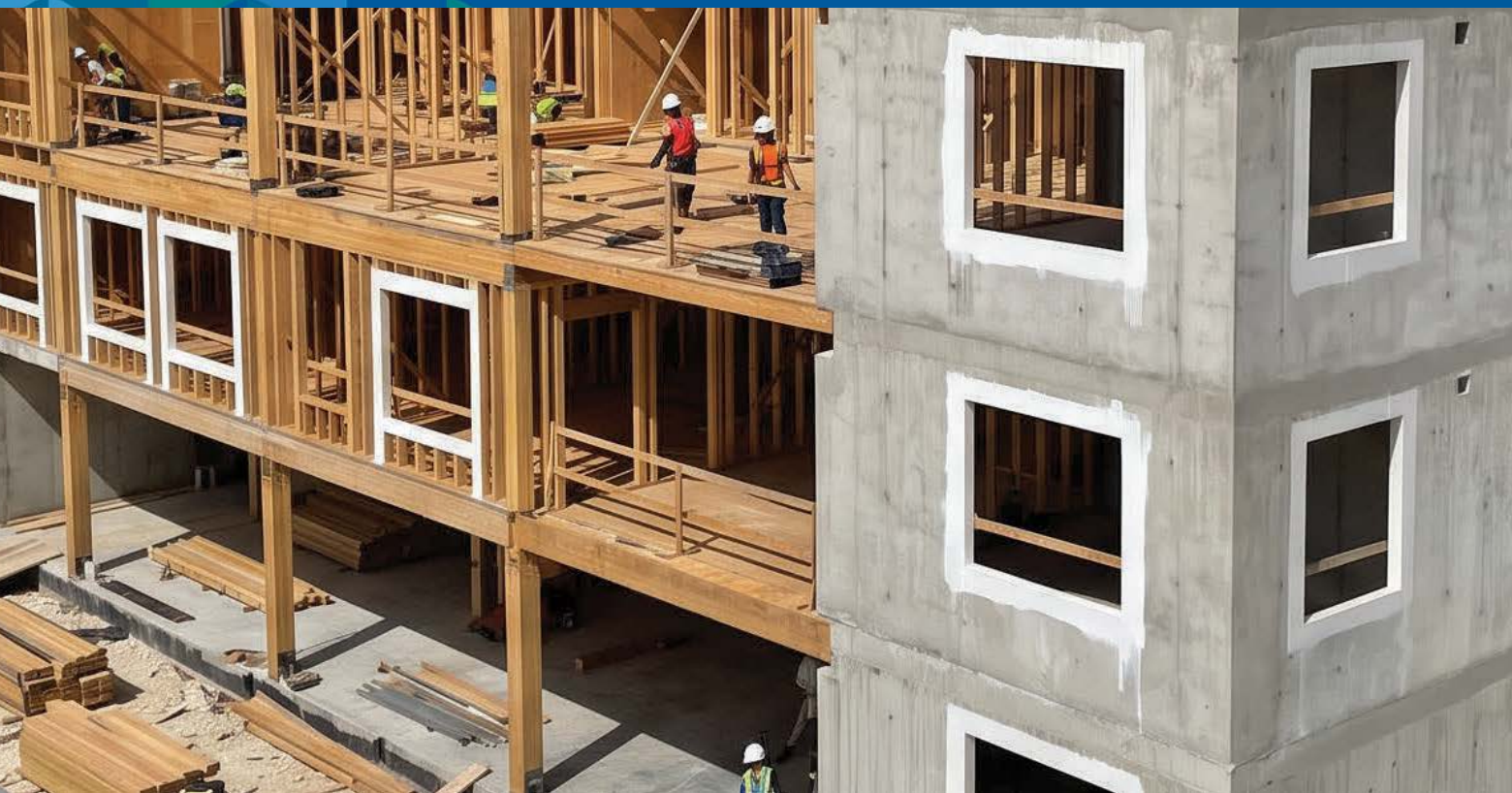
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The opinions expressed in Failures are based on the authors' experiences and do not necessarily reflect that of *The Construction Specifier* or CSI.

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- ✓ Open web studs designed to be lighter and easier to handle than traditional studs, increasing safety and productivity

STRUCTURAL FRAMING

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