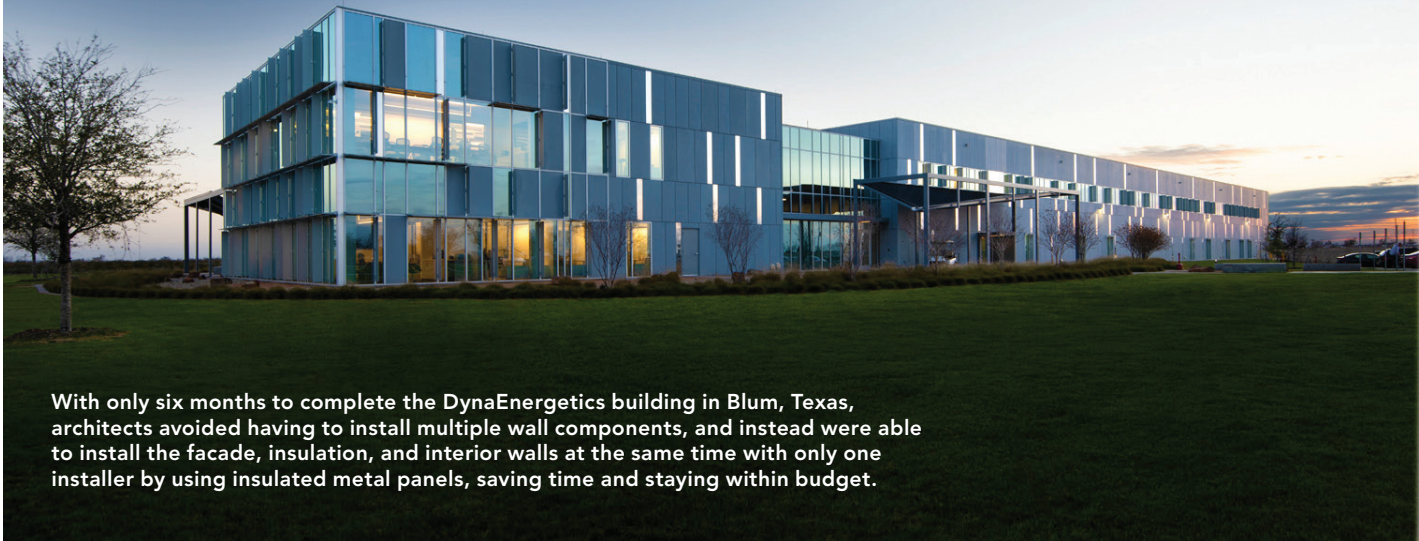


Photo courtesy of Kingspan Insulated Panels



With only six months to complete the DynaEnergetics building in Blum, Texas, architects avoided having to install multiple wall components, and instead were able to install the facade, insulation, and interior walls at the same time with only one installer by using insulated metal panels, saving time and staying within budget.

# Decision Point—Examining the Advantages of Insulated Metal Panels Against Tilt-Up

Understanding insulated metal panels in modern building construction

Sponsored by MCA's Insulated Metal Panel Alliance | *By Amanda Voss, MPP*

**B**uilding envelope material selections that improve building performance enable the design of a building to not only meet today's code criteria, but also to satisfy the demands of the future. The innovations of insulated metal panels (IMPs) compare very favorably against traditional material systems. Durability, thermal performance, and energy efficiencies are a gain when using IMPs versus a system such as tilt-up concrete. Practically, using IMPs allows for simpler, safer, and cost-efficient installation and maintenance for a building. Advances in IMP technology also offer benefits for aesthetics. Selecting IMPs for a project offers a great opportunity to earn sustainable certifications, provide material health and transparency documentation, and avoid the negative environmental consequences of construction.

## DEFINING IMPs

Breaking out beyond its traditional applications, architects and building owners are taking advantage of insulated metal panels' growing architectural options, aesthetics, structural integrity, energy efficiency, light weight, and low maintenance for a wide variety of projects. As insulated metal panels move into a space traditionally dominated by tilt-up—a method of construction where large concrete panels are cast on site and then raised into position with a crane—how do their material characteristics and performance stack up for the modern building?

## Meet the IMP

Insulated Metal Panels (IMPs) offer complete, lightweight enclosure systems for exterior walls and roofs. The panels combine metal skins and an insulating foam core.

## CONTINUING EDUCATION

AIA Continuing Education Provider 1 AIA LU/HSW  0.1 ICC CEU

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### Learning Objectives

After reading this article, you should be able to:

1. Debate the material benefits of selecting insulated metal panels (IMPs) in place of tilt-up, including design flexibility, envelope performance, and enhanced occupant comfort.
2. Dissect the installation and practical advantages of selecting insulated metal panels (IMPs), including ease of transportation, crew coordination and scheduling, handling, and time.
3. Calculate the energy savings resulting from improved thermal performance of insulated metal panels (IMPs).
4. Delineate the attributes of insulated metal panels (IMPs) that allow them to contribute to LEED, WELL, and other sustainability programs, as well as enable them to reduce the building's environmental impact.

To receive AIA credit, you are required to read the entire article and pass the quiz. Visit [ce.architecturalrecord.com](https://ce.architecturalrecord.com) for the complete text and to take the quiz for free.



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First developed by the National Aeronautics and Space Administration (NASA)<sup>1</sup>, these panels have superior insulating properties and their outstanding spanning capabilities and one-pass installation make them quick to install, providing unit cost savings when compared to other wall assemblies.

To deliver high-performance insulation, foam is injected, or poured, in place between two layers of metal skin. The insulation undergoes a chemical reaction, causing it to expand and bond to the metal skins, completely filling the interior cavity between the metal skins. The result is a factory-delivered, solid panel system that provides superior thermal value and resists moisture, insect, and rodent infiltration.

The most commonly used metal substrates for IMP faces are G90 galvanized steel or aluminum-zinc-coated steel, while some custom panels are made from stainless steel or aluminum. Architects are able to specify various panel insulation values, span lengths, and load/span capabilities.

IMPs are available in a wide variety of colors, widths, profiles, and finishes. “The realization of virtually any design for walls and roofs is possible,” says RC Antal, Director of Insulated Metal Panels for ATAS International. IMPs deliver profiled options: designers can choose walls that are ribbed, fluted, or planked. For flat walls, finishes can be flat, textured, or striated. Entire panels can also be curved and formed. Additional design features include joint reveal widths, formed corner panels, end



Photo courtesy of Nucor Insulated Panel Group

**IMPs provide temperature control for the Sima & Sons office and cold storage facility in Ravenna, Ohio. IMPs are exposed on the interior and function as the interior cooler walls, which allowed for simple, one-time wall installation for both interior and exterior.**

fold and treatments, heavier gauge flat facings, and integrated windows and louver systems. IMPs are available in a variety of high-performance coatings. Another offered finish feature is embossing, which creates surface texture on metal coils.

For the interior, a typical finish is a standard polyester 0.8 millimeter including the primer in a light-reflective and easy-to-maintain color. United States Department of Agriculture (USDA)-compliant finishes and stainless steel also are available for required applications, such as food

processing and storage.

In the field, IMPs are not only considered as the primary exterior finish, but now also are designed as the primary building envelope. Additionally, their enclosures can be clad with various secondary rainscreen materials, such as brick veneer.

#### Where They're Found

IMPs are used in virtually every building type, from offices and warehouses to healthcare facilities, manufacturing centers, transportation, education, and recreational buildings.

- **Commercial and Industrial:** IMPs are ideal for all types of commercial and industrial buildings including institutional, recreational, and government buildings, and manufacturing facilities. Projects from schools to retail centers to power plants benefit from the energy efficient insulation, lightweight construction, durability, and cost-effective, timely installation of single-component IMPs. IMPs also provide solutions for a variety of climate considerations, including temperature, humidity, airborne particles, and air movement.
- **Architectural:** Architectural IMPs have the normal attributes of those used in commercial and industrial builds, such as high insulation values, speed of build, and vertical and horizontal applications. Additionally, architectural IMPs include options such as custom shapes and widths, special custom colors and

Photo courtesy of Kingspan Insulated Panels



**Multiple colors, sizes and patterns of Insulated Metal Panels create a striking look for this warehouse, retail and commercial building in Brooklyn, New York. Patterns like this are not available with tilt-up, a form of precast construction.**



Photo courtesy of Kingspan Insulated Panels



IMP provided the best thermal envelope and reduced thermal bridging for this building at Portland Community College in Portland, Oregon, contributing to the building's LEED certification.

finishes, and custom fabrication, including, but not limited to, factory-banded corners, curved panels, and trimless ends. Architectural IMPs offer options that can incorporate panels that coalesce with windows, louvers, sunshades, or other integrated products to offer total building envelope solutions. Their flexibility provides architects the freedom to create unique building designs.

- **Cold Storage:** Insulated Metal Panels are considered the ultimate solution for climate-controlled facilities. Whether the need is for manufacturing, processing, storage, or distribution of perishable food or other materials, an IMP wall can meet the demands. Available in

panel thicknesses from 2-6 inches, a wall can be designed to meet multiple specific thermal performance requirements. Additional features include the panel's long-spanning capability, flat and ribbed-shaped panels, high-performance coatings, as well as special joint designs and details to meet safe hygiene and contamination requirements.

#### Insulated Roofs

IMPs form a high-performance roofing solution that offers exceptional thermal performance, unparalleled ease-of-installation, and gives the designer freedom to create building profiles rich in character. As a roofing material, IMPs provide the highest level of insulation, simplest maintenance, and longest life, coupled with the quickest installation for low- and high-rise commercial and industrial roofing applications. The two-step installation process limits worker exposure to accidents and reduces the number of steps and materials required. These factors increase the speed of installation and slash schedule downtime while providing a roof with superior insulation properties that can last more than four decades.

#### IMPs and the Building Enclosure

Selecting IMPs means delivering a fully integrated solution for the building enclosure, as the panels arrive on site providing a full vapor and water barrier and continuous

insulation. "IMPs are star performers, delivering four control layers all in one panel," says Antal.

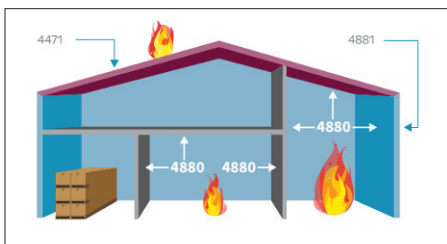
IMPs provide all four control layers within a single component, meaning they do not require the use of supplemental air, water, vapor, or thermal control layers. IMPs provide a "Perfect Wall" due to the location of their control layers. Water, air, and vapor control layers are all located on the exterior of the structure, with thermal control located outboard of the other control layers. This creates optimal enclosure performance and limits issues that can plague buildings, like moisture accumulation or air transfer. Because of this construction, IMPs can be used and expected to perform in all climate zones: cold, mixed, hot, humid, dry, or marine. IMPs also work for the demands of all interior environments: office, commercial, residential, institutional, pools, museums, art galleries, and data processing centers. Depending on climate zone and special requirements, IMPs can be used with supplemental cavity insulation subject to ratios listed in the International Building Code.

IMPs can also be used as a rainscreen barrier wall system and can be integrated with other wall and roof systems while still maintaining proper control layer continuity. Because of their inherent performance, IMPs offer a streamlined choice to meet the growing body of code requirements, including safety, fire, sustainability, performance, and building health. IMPs also meet or exceed multiple sustainable design criteria that contribute toward a project earning green building certifications.

#### Guaranteeing Performance: Understanding Codes and IMPs

Placing a product in a building means betting the future of the structure on that product's performance. IMPs are subject to Chapter 26 International Building Code (IBC) requirements, including the 4471 approval standard for roofs (fire and uplift), the 4880 approval standard for walls and roofs (fire only), and the 4881 approval standard for exterior walls (fire and structural). As a metal composite material, IMPs are also governed by Chapter 14, NFPA 285 Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Wall Assemblies Containing Combustible Components. Preventing fire, and keeping any fire damage to a minimum, is a primary industry and regulatory concern. U.S. codes

Graphic courtesy MCA



An enhanced focus on verifying fire performance of all individual components, and components joined together as a system, has made U.S. fire testing regulations some of the most stringent.

require that a fire test incorporates every one of the components of the wall assembly, just as the product is to be used in the field, instead of testing individual components only.

Although foam has fallen under the intense scrutiny of U.S. building codes, the scrutiny has paid off with safety. The use of IMPs containing foam plastic insulating materials, when they comply with the appropriate fire test requirements for both the components individually and the assembly itself, have been shown to exhibit excellent fire performance.

Engineering safety factors are determined by building codes, industry practices, general engineering principles, or ICC-ES Acceptance Criteria. For IMPs, overall panel strength is determined by the following laboratory tests:

- ASTM E72 -10 – Standard Test Methods of Conducting Strength Tests of Panels for Building Construction, and/or
- ASTM E330 – E330M-14 – Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.

When an IMP panel meets required certifications and codes, that means the entire assembly has been put to the test. Everything from the metal facings and metal gauge's thickness and tensile and yield properties; to foam core properties, including cohesion (how well foam sticks to itself when pulled apart), compression (how well foam holds up under pressure), and adhesion (how well foam sticks to metal skins); to panel design (joint engagement –male/female interlock depth, joint strength –geometry of male/female interlock, width of panels –distance between side joints, thickness –distance between skins); and finally, to attachment methods (clip strength, clip fit and placement within joint, load bearing area of clip, pullout strength of fasteners, pullout resistance of structural supports) is analyzed.

### The Competition: Tilt-Up Concrete

Tilt-up is a method of enclosure construction that uses large concrete panels, cast on site, that are raised into position with a crane. Concrete tilt-up products are a popular solution because of their general availability, durability, and fire resistance.

Constructing a tilt-up enclosure is a two-step process. First, the slabs of concrete that



This multi-tenant, mixed-use building on a prominent corner in Vaughan, Ontario, features insulated metal panels in dark bronze which complement the wooden panels.

Photo courtesy of Metal Construction Association's IMP Alliance



This building was built with precast, or tilt-up, construction, which requires a two-step installation process: large concrete panels are cast on site, which are placed in position by a crane.

will form load-bearing sections of a building envelope or elevation, are cast horizontally on a concrete slab-on-ground. These slabs, referred to as panels, are tilted up with a crane after the concrete has reached necessary strength. The crane then sets the panels on prepared foundations. The designed wall

line is formed from a series of these panels.

The American Concrete Institute (ACI) publishes concrete codes as well as guide and report documents. Under ACI 318 and the IBC, tilt-up is regarded as a form of precast construction. ACI 551.1R offers further guidance and description for tilt-up techniques.

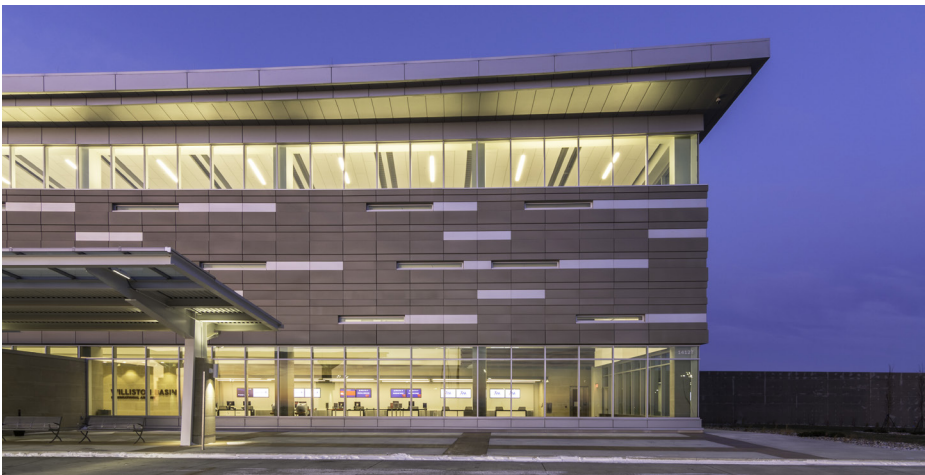


Photo courtesy of Metal Construction Association's IMP Alliance



This concrete tilt-up building was limited to solid colors. The paint has no long-term warranties.

Photo courtesy of Kingspan Insulated Panels and Nucor Insulated Panel Group; Brennan Photo + Video



The Williston Basin International Airport in North Dakota is clad with insulated metal panels in an award-winning design.

### Decision Point: IMPs and Tilt-Up

#### Aesthetics

For concrete tilt-up applications, options are limited to solid colors, which are field applied. The paint has low to medium durability, with no long-term warranties. As the colors and finishes are generated in the field, controls are not exact.

IMPs offer long-lasting, durable finishes generated in a controlled environment. The panels have finish warranties of up to 35 years or more, and can use PVDF (Kynar), FEVE (Fluoropolymer based), SMP (silicone modified polyester), Polyester, and Plastisol finishes. Standard 1.0 mil and high build systems offer different finishes, including mica, metallic, weathered metal, wood grain, and prismatic. Long-lasting, low-maintenance paint finishes in a multitude of

colors provide design flexibility.

Tilt-up concrete can offer a range of textured finishes. Aesthetic options vary from smooth to exposed aggregate to plank finishes. IMPs offer both smooth and stucco finishes. However, tilt-up wall profiles are more difficult to create in the field. Precast offers greater flexibility, but IMPs are a natural fit where a specific profile is desired. The roll forming manufacturing process allows for greater creative expression, making IMPs the most practical solution to profile.

Both IMPs and tilt-ups are capable of ornamentation and additional product integration. They can also both accommodate curved wall construction.

#### IMPS IN THE FIELD

Insulated metal panels (IMPs) are one of

only a few types of building product that can provide an entire building enclosure in one prefabricated product. An insulated metal panel system can be used on its own to provide a complete enclosure, can be added over a lightweight structure and interior finish in new construction, or can be added over an existing enclosure to provide a new level of enclosure performance.

#### Initial Advantages: Cost and Installation

Insulated metal roof and wall panels can save costs in materials and labor, due to their single-unit composition and quick installation. “They effectively replace complicated, multi-component assemblies,” says Lisa Fischer, marketing manager at Kingspan. Preformed metal panels are typically lower in installed cost than those of tilt-up, precast, or brick. That’s because metal panels can often be installed faster than other building materials, resulting in construction cost savings. Because of their reduced comparative weight, IMPs systems can also save money by lessening structural steel requirements, since less support structure is needed. IMPs arrive on site with built-in thermal breaks, continuous insulation creating high R-values, and connecting panel interlocks, all in a single-element format allowing for faster installation.

Insulated metal panels can be installed more quickly because their installation is also not dictated by weather conditions. This all-weather capability minimizes construction delays, permits fast-track scheduling, gets the building dried-in more quickly, and allows the other trades to proceed with their interior work. Ease of handling and transportation, enhanced job site coordination, and single crew and trade coordination all speed the experience.

Average labor and material unit costs for tilt-up are between \$80 and \$100 per square foot for a core and shell project. IMPs total from \$35 to \$55 per square foot for a complete system.

#### IMP Installation Notes

Panel fabrication and installation are critical components for a successful project. It is imperative that IMPs have good alignment and follow tolerances, especially for those panels with minimal profiles. “Spend time reviewing the structure before erection of the panels,” recommends Arnold Corban, Kingspan. Manufacturer provided installation drawings should always take precedence over generic installation guides. Drawings give guidance for the unique conditions on the project.

Photo courtesy of Kingspan Insulated Panels

## CASE STUDY



**Location:** Cibolo, Texas  
**Building Owner:** AISIN Texas Corporation  
**Size:** 463,800 sq. ft.  
**Date Completed:** 2022

Aisin Corporation, one of the world's largest manufacturers of automatic transmissions, recently opened its first plant in the state of Texas. Located in Cibolo, the \$400-million, 463,800-square-foot plant produces high-quality and high-performance automatic and hybrid transmissions.

KAI Enterprises, the design and build firm, chose insulated metal panels to complete the nearly 500,000-square-foot facility. More than 98,000 square feet of profiled micro-rib and smooth panels

were used on the project.

The profile panels provide a unique aesthetic through a ribbed profile while delivering supreme thermal performance at the same time. The IMPs' fully engineered joint design allows for profile integration, creating a striking appearance that is a perfect aesthetic compliment to the flat panel offering selected. The flat panels create an architectural-focused and modern building envelope solution. The use of pearlescent micas and metallic colors generate a dynamic finish. By combining these two profiles in a single project, the architects achieved aesthetic dynamics that add design depth to large industrial designs.

Aside from aesthetics, the panels have another benefit in common – thermal efficiency. As temperatures across the nation continue to rise, the use of IMPs is a way to future-proof buildings to reduce energy consumption. IMPs provide an air- and watertight continuous insulation barrier that seals the building enclosure and helps increase energy efficiency, making it a preferred building envelope approach for manufacturing centers. Texas cities set temperature records following a relentless heat wave during the summer of 2023. In June, Corpus Christi logged a heat index of 125 degrees. Readings in Laredo, Del Rio, San Angelo, and Junction were also the highest ever recorded, according to the National Weather Service. The facility's thermal efficiency and full vapor and water barrier provided by the selected IMPs helped Aisin cut down on building cooling costs amid the Texas heat.

The best fabrication will not satisfy the customer if the installation does not match that same level of quality. Guidelines to govern installation tolerances, which establish acceptable visual quality for preformed metal installations, look like the following:

1. Panels and trim shall be installed true to line and level (if horizontal) or plumb (if vertical). Exposed fasteners shall be installed in straight lines and at the locations shown on the approved drawings.
2. Field measurements to check tolerances shall be by means of commercially available squares, tape measures, or levels that are in good working condition. Measurements shall be made with panels positioned without restraint (if checking fabrication tolerances) and with sufficient support to prevent significant distortion or deflection.
3. Panels should be progressively installed so that overall misalignment or tolerance issues are not focused on a single panel on the wall.

IMPs provide exceptionally strong building enclosures. It is not uncommon for these panels to successfully achieve spans of 10 feet

or more between supports. For structural support, the width and thickness of the panels or the support spacing can be adjusted. The gauge of the metal facings can affect spanning capability, resistance to thermal stress, and flexural buckling. The composite bond of IMPs produces a building unit that is much stronger than the individual components, even with very light gauge facings. IMPs are not classified as "load-bearing" panels in the sense of axial loading. They can be used on a load-bearing wall, but only if the axial load is carried by other construction not by the panels. Many insulated panels have a progressive tongue-and-groove interlock joint, being hard-fastened to the structure only along their leading edge. These side joint fastened panels can exhibit low resistance to racking type loads.

### Ongoing Advantages: Maintenance and Flexibility

Besides first costs, costs that accrue over the life of a product should also be taken into account when determining full costs. With IMP products, ongoing maintenance costs are reduced as a result of continuing improvements in paints and coatings. Finishes will not crack or peel, which significantly

reduces the potential of water penetration while increasing finish performance and weather integrity. IMPs require less maintenance than other exterior systems. Today's IMPs retain their luster for decades, ensuring that the building maintains its aesthetic appeal and its property value for the long term. This longevity makes a difference when it comes time to sell the building. Facilities clad with IMP or metal composite material (MCM) systems retain their curb appeal and never look dated, often reducing the need for pre-sale refurbishing costs.

IMPs also facilitate easy renovations and building enhancements. The panels are flexible and can adapt to structural retrofits, accommodating new layouts or additions. They also can be easily disassembled for reuse.

### Decision Point: IMPs and Tilt-Up

Fabrication and installation time combined is comparable between IMPs and tilt-up. However, IMPs arrive on site factory finished and prepared to act as a fully functioning enclosure. They also cost less. IMPs are less subject to weather delays than tilt-up.

As a retrofit solution, IMPs excel, given their light weight and design flexibility.



Photo courtesy of Kingspan Insulated Panel



IMPs created with a sustainable manufacturing process have lower embodied carbon and reduce operational carbon for years to come with high thermal efficiency, helping Caledon Industrial Park in Caledon, Ontario, on its quest to achieve LEED Silver certification.

Photo courtesy of Kingspan Insulated Panel



Vaulta Storage, clad with insulated metal panels, brings a modern, stylish vibe to the busy streets of Toronto, offering more than 2,100 climate-controlled storage units to customers.

### IMPS IMPACT ON THE BUILDING

Insulated metal panels can fulfill all the required air, thermal, and water control functions to create a high-performing building enclosure. Designing with IMPs means realizing buildings with more consistent thermal properties and increased occupant comfort.

### Insulating Capabilities of IMPs

Keeping the outside out and maintaining the comfort inside is the fundamental job of the building envelope. The ANSI/ASHRAE/IES Standard 90.1: Energy Standard for Buildings Except Low-Rise Residential Buildings shows

a clear trend for continuous insulation, specifically in Zones 5, 6, 7, and 8. Continuous insulation is the best method to improve thermal performance. Properly installed, it increases the effective R-value of the wall system. Continuous insulation additionally blocks thermal bridging—heat transfer—created by common types of exterior wall construction.

As a turnkey option, delivering a full vapor and water barrier—along with continuous insulation—IMPs are an easy way to meet growing code requirements, says Cassie Robertson, preconstruction manager, DPR

Construction. IMPs generally use a foamed-in-place or polyisocyanurate foam plastic insulation, at thicknesses of 2-4 inches, achieving R-values in place of up to 45. This type of material can provide a thermal resistance value (R-value) of 7 per inch (nom.), compared to values of between 2 to 4 for fiberglass or mineral wool. High R-values are a driving reason behind the popularity of foam plastic insulation materials.

Supplementary insulation may be added to IMPs based upon a WUFI analysis, which evaluates the action of heat and moisture in walls, to meet other specified requirements. WUFI is a computer program that can tell how moisture and heat flow affect building materials over time. Insulated metal panel systems, by virtue of their joint geometry address thermal bridging in a more robust manner than typical “site built” assemblies for walls and roof, a design asset for maintaining thermal performance. Thermal bridging occurs when there is a break in a building’s insulation, so it is important to carefully consider the joint detailing when selecting a system.

### Water and Air Barrier Capabilities of IMPs

The most important non-structural and non-fire performance aspect of any wall system is its ability to control rainwater. Historically, a widely used method of controlling rainwater was to install claddings over insulated metal panel systems, providing a continuous water control layer coupled with a continuous drained air gap over this water control layer. Because of its successful history of past performance in rainscreen applications, IMPs are widely recognized for their water- and air-barrier capabilities.

Two major ASTM standards are used to evaluate air and water performance of IMP wall assemblies: ASTM E28 -04(2012) Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen and ASTM E331-00(2009) Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference. The following ASTM standards are used to evaluate air and water performance of IMP roof assemblies: ASTM E1680-11 Standard Test Method for Rate of Air Leakage Through Exterior Metal Roof Panel Systems (Specialized adaptation of E283) and ASTM E1646-95 (2011) Standard

Test Method for Water Penetration of Exterior Metal Roof Panel Systems by Uniform Static Air Pressure Difference (Specialized adaptation of E331).

To best leverage the insulating and water and air barrier capabilities of insulated metal panel systems, it is important to pay close attention to how the system interfaces holistically. Paul Collyer, Vice President of Business Development, Cornerstone Building Brands, Denver, Colorado, emphasizes that, when dealing with any type of barrier wall, it is important to maintain continuity of control layers—specifically air, vapor, water, and thermal. “Proper details showing how the barrier system should interface with penetrations, material transitions, etc. are critical to proper envelope performance,” Collyer says.

#### Decision Point: IMPs and Tilt-Up Envelope Performance

Insulated metal panels (IMPs) are one of only a few types of building product that can provide an entire building enclosure in one prefabricated product. IMPs and tilt-ups with added cavity insulation both provide excellent liquid water management.



Photo courtesy of the Metal Construction Association

This five-story, 100,000-square-foot, Class A self-storage facility in St. Petersburg, Florida, was clad with IMPs. The thermal benefits from IMPs help keep the building cool in the Florida heat.

Photo courtesy of Nucor Insulated Panels Group

## CASE STUDY



**Location:** Salt Lake City, Utah  
**Contractor:** Hensel Phelps Construction  
**Date completed:** October 2022

In the center of downtown Salt Lake City, the Hyatt Regency Salt Lake City adjoins the Salt Palace Convention Center. The 26-story building houses 700 hotel rooms, meeting spaces, ballrooms, dining venues, bars, a rooftop terrace, and more. Each guest room is designed with floor-to-ceiling windows to showcase a beautiful view of the city's skyline. The hotel is within walking distance to the city's vibrant Main Street, Temple Square, Capitol Theatre, City Creek Center, Vivint Arena, and many more attractions.

During the design phase, the project team needed an exterior cladding solution that could accommodate a fast-paced construction

schedule, requiring material with a simple, fast installation. In addition, the team sought material that would seamlessly integrate with the glass curtainwall design, the facade's defining feature.

Designers chose IMPs to meet the multiple demands. “There was a lot less lay down area for materials on the jobsite, so using products that could be delivered on time and installed quickly was pivotal,” said Steven Huck, District Sales Manager for CENTRIA.

Crews installed an IMP which consolidates six wall components into one product, creating distinct architectural wall profiles capable of matching any building design. Of key importance for the hotel, the IMPs integrated seamlessly with the glass wall, window, and louver systems. Selecting an IMP allowed for this design freedom without compromising thermal performance. Since the building envelope system consolidated six components into one, waste was reduced and installation simplified.

“Choosing an IMP had a lot to do with the panel's ability to integrate seamlessly with the glass curtainwall,” said Huck. “Given the height of the building, we were able to cut back on labor resources by only having to go around the building one time, with one product.”

Where the convention center hotel attached to the main building, designers chose selected IMPs which combined the best of aesthetics, performance, sustainability, and value. The lightweight wall panel system provided flexibility with long lengths, various finish options, and allowed for vertical installation to add visual appeal.

Crews broke ground on the Hyatt Regency in 2019, and the hotel opened its doors in October 2022.



Photo courtesy of Nucor Insulated Panels Group



The Cannon, an entrepreneurial hub in Houston, Texas, called for more than 90,000 square feet of insulated metal panels (IMPs) for walls and roofing.

Photo courtesy of Kingspan Insulated Panels



Designers of the University of Arizona Medical Center South Campus building in Tucson, Arizona, chose IMPs to meet short construction deadlines, high design standards, and demanding environmental conditions.

While the use of concrete also provides some thermal mass for a building, IMPs provide superior thermal resistance, with an in-place R-value of up to 45. IMPs are also impervious to water. There is no loss of performance due to sagging or compression with IMPs, and a virtual elimination of thermal bridging.

IMP provide superior air infiltration performance and vapor diffusion management. This can also be achieved with tilt-up

structures, but only after sandwich and cavity systems are installed.

Tilt-up and pre-cast concrete panels require no modifications for fire resistance. IMPs are suitable for all construction types when used in accordance with the International Building Code (IBC). Of note, however, is the performance of IMPs in high wind load areas and seismic areas. Here, IMPs offer superior reliability and disaster resistance over tilt-up.

## IMPS AND SUSTAINABILITY

As an advanced engineered material, the steel behind IMPs is the material of choice for engineers and architects because of its strong performance characteristics, durability, reliability, versatility in design, and consistency as a product.

While certain natural materials, like wood, may appear to have a more favorable CO<sub>2</sub>e profile, this can be misleading as all impacts should be considered in responsible material selection. It is also important to consider the effect of service life on this analysis. A structure which lasts half as long as another should be considered as having twice the impact for comparison purposes. With many green advantages over other materials, metal can reduce energy consumption, improve air quality and thermal comfort, help comply with energy codes, and minimize environmental impacts. Steel lasts longer, requires less maintenance, and is completely recyclable, unlike many other construction products. Pioneering new production methods that include manufacturing steel from green hydrogen have helped to further reduce embodied carbon content of certain insulated metal panel products by up to 25 percent.

Steel also sidesteps the waste associated with other types of construction, including wood construction, because it is cut to order and is infinitely recyclable. A key step to avoiding embodied carbon is reuse. Metal is the only known construction material that can be recycled indefinitely with little impact on material properties. This allows it to be repurposed in the same exact form, a process called closed-loop recycling. Not only are excess and scrap metals such as steel and aluminum readily and easily recyclable, it remains financially viable to recycle metal. This ensures that envisioned impact reductions actually will happen, instead of only existing “on paper.” Sixty to 80 million tons of steel scrap is recycled each year into new steel products in the U.S. alone.

“The excellent recyclability of steel is one of its strongest environmental attributes,” says Trisha Montalbo, senior consultant, thinkstep, Boston. “Additionally, with respect to carbon footprint and demand for nonrenewable energy resources, most of the metal wall assemblies were preferable to the concrete-based assemblies.”

Shop-fabricated metal components reduce onsite labor, cycle time, and construction waste. A 2,000-square-foot residence framed in steel produces less than 2 percent leftover material, all of which can be recycled,

Photo courtesy of Kingspan Insulated Panels

## CASE STUDY



**Location:** Richmond Hill, Canada  
**Building owner:** Toronto Montessori School  
**Contractor:** TriAxis  
**Date completed:** January 2020

Architects Farrow Partners Inc. were tasked with creating a brand-new atrium lobby, office area, and gymnasium for the Toronto Montessori School Bayview Campus ahead of the school's 60th anniversary. It was critical for the design to incorporate the principles of Montessori education, invoking a sense of curiosity and exploration. This included interesting shapes, plays on natural light, and the materials used.

Weather was a concern for both construction and future energy

use. Ontario's harsh winters limit the building season and require the building envelope to be closed-in more quickly.

The facility was designed to be sustainable, using glued laminated Douglas fir timber, along with fire-rated insulated metal panels that provide superior thermal efficiency during the cold Ontario winters. The use of the triangle metal accent fins allowed architects to continue incorporating a triangular pattern into the exterior façade, while highlighting the natural lines of the insulated metal panels.

The insulated metal panels' all-in-one assembly and need for only an installer allowed for swift construction that ensured the building envelope was closed ahead of winter. The project took 19 months from groundbreaking to opening.

Fire rated IMPs provide a fire-resistive rating of up to three hours with an R-value of up to 3.6 per inch. They share the same exterior profile options as other panels used on the building for a seamless transition.

When equipped with closed-cell insulation cores, the selected wall panels have an R-value of up to 8 per inch. This provides some of the best thermal efficiency available on the market, reducing energy costs for decades to come. During the summer of 2020, Toronto Montessori School added solar panels to the roof, allowing the building to generate its own electricity starting in October 2020, while reducing the energy required to heat or cool the building.

Toronto Montessori School's Bayview Campus stands as a testament to curiosity and to nature, meeting early design goals and future sustainability goals for years to come.

compared to wood framing, which yields an estimated 20 percent waste going to a landfill.

### Product Transparency Certifications

When decision making to avoid embodied carbon and secure environmental benefits, look for IMP products that are supported with LCA documentation. Coupled with clear simple material ingredient reporting in the form of HPDs and Declare labels, EPDs and other LCA disclosures help in meeting LEED, WELL, and additional guidelines on many levels.

Environmental Product Declarations (EPDs) provide LCA-based information and details about the products' environmental aspects and assist purchasers and users in making informed comparisons between products. IMP EPDs contain valuable information about product definition, building physics, the basic material and its origin, product manufacture and processing, in-use conditions, life-cycle assessment results, and testing results and verifications.

### Achieving Sustainability Goals

IMPs also meet or exceed multiple sustainable design criteria that contribute toward a

Photo courtesy of the Metal Construction Association



Soraa, a leading developer of solid-state lighting, wanted a building to reflect their high-tech products. The building's flat exterior incorporates over 22,000 square feet of IMPs in a blend of hues.



Photo courtesy of Nucor Insulated Panels Group



Architects of the Cliff Hangers facility in Mooresville, N.C., created an interest on the building facade by using the standard length of IMPs in only two colors. It is an eye-catching layout.

project earning green building certifications and push forward the design and construction of healthier and more environmentally conscious buildings.

Metal cladding components are factory coated with a 20-40 year warranted life coating, and any volatile compounds (VOCs) are controlled at the factory, not released at the jobsite. Daylighting and exterior views can also be easily incorporated into a metal building design to earn LEED credits using composite materials. Metal buildings offer

Photo courtesy of AWI Panels



Western Distribution Center in Seattle Washington is clad with insulated metal panels in striking colors.

effective insulation, reduced air leakage, and readily accept high-performance windows and doors. A metal roof can also be the ideal base to support solar panels. All of these factors can be used to earn LEED points.

Under LEED v4.1, IMPs are eligible for credits under the categories of Integrated Process, Sustainable Sites (SS), Energy & Atmosphere (EA), Materials & Resources (MR), Indoor Environmental Quality (EQ), Innovation (IN), and Regional Priority (RP).

#### Ready Integration with Solar Installations

IMPs act as a perfect host for solar installations. Combining solar installations with

IMP wall or roof panels means enhancing overall system performance. IMPs are proven to reduce heating and cooling costs, provide the vapor, air, and water barrier beneath the installation, and can increase system ROI. IMP manufacturers offer easy integration with solar collection system, often resulting in significant cost savings.

Continues at [ce.architecturalrecord.com](https://ce.architecturalrecord.com)

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The Metal Construction Association's Insulated Metal Panel (IMP) Alliance comprises leading manufacturers, resellers, and suppliers who are dedicated to growing the use of IMPs. [www.metalconstruction.org](http://www.metalconstruction.org)

Photos courtesy of S-5!

## CASE STUDY



**Location:** Williamson, New York

**Building owner:** Chip and Karla Bailey

**General Contractor:** Secor Building Solutions

**PV Contractor:** LTHS Solar Electrical Contractor: Lauterborn Electric; Bleier Electric, Inc.

**Nine solar PV systems:** Total system size, 294.055 kW; 1,083 panels installed

In 1984, as a senior at Cornell University studying pomology (fruit science) and economics, Chip Bailey founded KC Bailey Orchards, a now 230-acre apple orchard in upstate New York.

The goal for KC Bailey Orchards is to integrate a vertically holistic approach to sustainable fruit growing and operating, utilizing sustainable materials and renewable energy sources. Ultimately the model will reduce their carbon footprint and work towards achieving a net-zero farm.

Because the orchard selects apple varieties and plants trees based on predicted consumer demands up to 20 years out, KC Bailey Orchards requires buildings that utilize sustainable building components and an energy-efficient power generation system to run the farm.

KC Bailey Orchards chose to use metal building components not only for their lasting performance and durability but also because of their reflective properties, which lowers the temperature of the building and enhances its cold-storage

functionality. The farm also chose to “go-solar” to supplement the farm’s power generation and achieve their goal of operating a net-zero farm. On-site, nine metal buildings primarily provide cold storage for their apples after harvest and immediately prior to distribution. Each building was constructed with metal panels and roofing offering superior strength. Five of the nine metal roofs feature direct-attach solar photovoltaics (PV). A standing seam roof was selected to allow direct-attach of the solar panels to the seams or ribs of the roof, preserving the PV assembly’s longevity by providing a penetration-free system. The PV was secured to the roofs with a solar attachment solution that integrates with the roof’s rails, making solar mounting quick and convenient. This attachment method reduced the weight of the mounting system by 85 percent, provides 25 percent better load distribution, uses 70 percent fewer components, and lowers material costs. The mounting system is also aesthetically-pleasing.

Another added benefit for the apple storage is the shaded air space between the solar panels and the metal roof creates a lower surface temperature on the roof and lessens the refrigeration load because the exterior structure is cool, thus creating a more energy-efficient building. Together, the solar PV and the metal building components provide the sustainability the project hoped to achieve.

The PV system is allowing KC Bailey Orchards to realize their long-term sustainability goals and reduce operating costs, all while getting them closer to their goal of running a net-zero farm.