COURTESY METALWERKS

FOR UNCERTAIN FUTURES, METAL CLADDING ENSURES A SMART BET

A new life sciences center at 100 Hood Park Drive in Charlestown., Mass., features varied metal cladding systems, including a customized perforated aluminum screenwall system for its four-story parking structure, which accommodates about 1,000 vehicles.

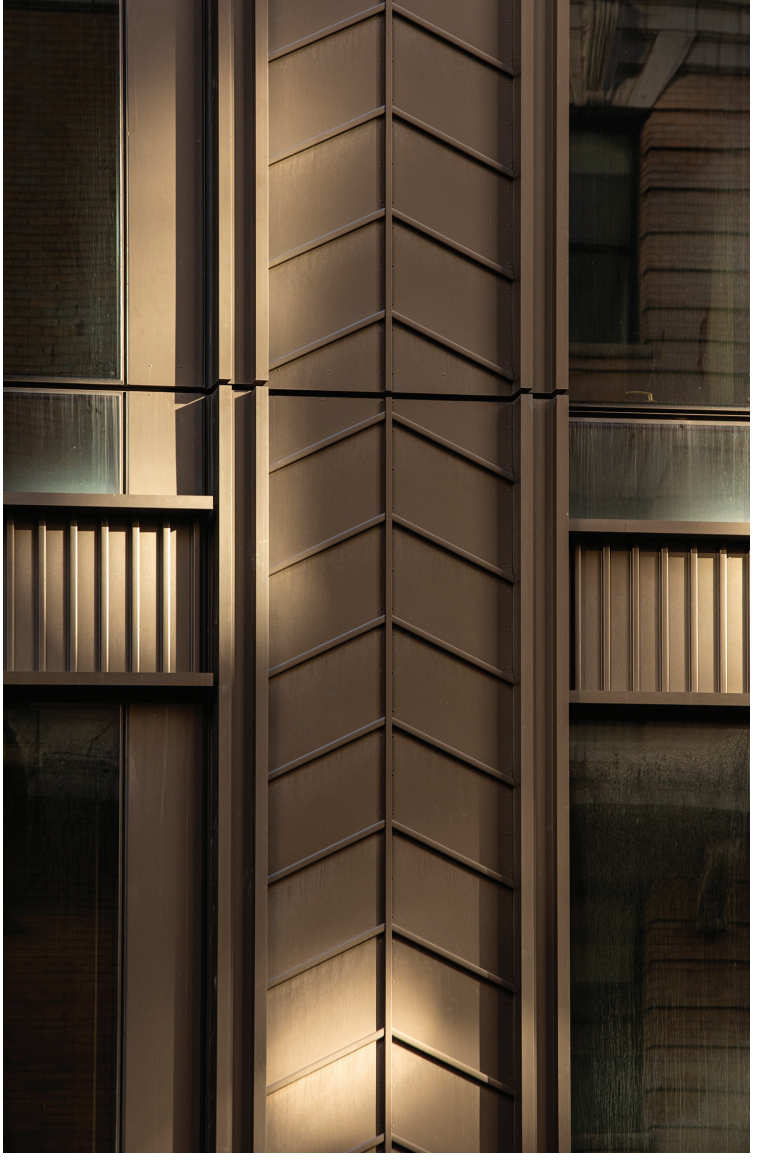
LEARNING OBJECTIVES

After reading this article, you should be able to:

- **DISCUSS the differences in application and performance criteria for various solid metal and metal composite claddings**
- **DESCRIBE the basic function of insulated metal claddings and aluminum composite materials, and how they impact building performance**
- **EXPLAIN how IMP systems used for overcladding can contribute to façade function in existing buildings**
- **LIST two or more cladding finishes and technologies that can improve the performance of a building by enhancing its enclosure's effectiveness**

Metal cladding is on a growth trajectory globally. This is reflected in rising demand for rainscreen cladding, which market research firm VMR values currently at over $10 billion worldwide, and expects to see grow to over $16 billion by 2028. Adding to that is robust demand for—and faith in—architectural metal coatings, which are advancing from about $5 billion today to just under $6 billion by 2026, according to analyst Research and Markets.

On top of that are recent advances in building science and metal cladding manufacture that increase the systems' attraction,



including the use of composite clad metals such as carbon steels bonded to more corrosion-resistant materials like copper and stainless steels, which result in lamellar composites with desirable properties not possible with a single material. Instead of using adhesive or extrusion bonding, these composite metals are made through hot rolling, centrifugal casting, brazing, and weld cladding.

Sometimes called "clad metals," these materials are further advancing the benefits and performance of metal cladding systems, which are proliferating both in types and aesthetics. Some of the more widely used are insulated metal panels (IMPs), metal composite materials (MCMs), and aluminum composites materials (ACMs), as well as single-layer or solid-plate metal panels. Some are used in conjunction with metal building subassemblies or prefabricated, modular systems. In all cases, the options are many and benefits considerable.

"Material selections during design and construction are almost always a compromise between aesthetics and the demands of cost, schedule, and durability," says John Myers, a Preconstruction Executive in the New England Division of Gilbane Building Company. "Metal cladding offers components of each of these criteria, which makes it a good 'compromise product,'" he emphasizes. The construction company, which has an active development arm, has recently used fire-rated IMP systems for large-scale institutional and commercial projects, including a sleek life-sciences facility on the East Coast utilizing a fire-rated panel enclosure with articulated joints.

Considered through lifecycle assessments (LCAs) to evaluate their sustainability and return on investment, project teams immediately see very long-term benefits in using exterior metals systems, adds architect Victor Body-Lawson, FAIA, NOMA, NCARB, Founding Principal of Body Lawson Architects. "Consider the history: The Statue of Liberty was built from 1876 to 1886 with metal cladding—solid-plate copper, designed by French sculptor Frédéric Auguste Bartholdi to sit on metal framing by Gustave Eiffel—and a few decades later, the sunburst patterned stainless-steel spire of the Chrysler Building debuted," says Body-Lawson. "Today, both are wearing exceptionally well. It's a very powerful statement about the effectiveness of using metal cladding."

Those more costly solid-plate claddings gave way to thinner sheet metals and IMPs by the 1960s and 1970s, led by products based on systems developed for demanding aerospace, industrial, and cold-storage applications. Their key benefits reflected those roots: "We often use metal cladding because it is lightweight, durable, and offers many color options. It is very cost effective and sustainable, embodying high recycled content and a continuous, resilient barrier enclosure that promises good ROI," adds Robert Skolozdra, AIA, LEED AP, a Partner with architecture, art, and advisory firm Svigals + Partners.

"I'd emphasize that metal cladding, and specifically aluminum, is very light in weight, and can be coated in an almost infinite array of extremely long-lasting and durable high-performance coating colors and textures," adds architect Charles Thomson, AIA, LEED AP, an Associate Principal with CetraRuddy. "And aluminum composites and aluminum IMPs are shown to be cost-effective materials in relation to other metals."

ARTISTIC AND SCIENTIFIC ADVANTAGES

Recent project examples include Southern Connecticut State University's new single-building complex

COURTESY CETRARUDDY

for its College of Health and Human Services, built by CM Skanska USA and lead contractor Turner and designed by Svigals + Partners with interiors by Little Diversified and MEP engineering by BVH Integrated Services. “For this major new state-of-the-art center, the metal panels fit the design aesthetic of the campus,” says Skolozdra. “We also used them as the basis for our art integration element on the exterior, because it plays off of the university’s historical main gate made of ornamental metal.”

The plasticity and malleability of metal as a form-making element also attracted the design and art team. “The aluminum we used allowed flexibility in curving, finishing, and laser cutting,” Skolozdra recalls. “We were able to repeat these decorative metal panels very cost-effectively around the entire façade.”

The ornamental metal motif also inspired new informational and wayfinding signage, connecting it to the programs and spaces inside, according to architect Marissa Dionne Mead, AIA, Director of Art Integration with Svigals + Partners.

Another iconic commission, the reimagining of a former dairy plant into a life sciences center at 100 Hood Park Drive in Charlestown, Mass., took the team led by construction provider Lee Kennedy Co. and architect Symmes Maini McKee Associates on a journey to create an iconic, LEED Gold anchor for the mixed-use tech hub. The complex employs varied metal cladding systems, including a customized perforated aluminum screenwall system for its four-story parking structure, which accommodates about 1,000 vehicles. The manufacturer engineered and fabricated “a visually interesting and functional solution” with solid sheet that minimizes the impact of vehicle headlights at night and allows for constant air flow and ventilation through one façade exposure.

Executed by specialty contractor Lymo Construction Co., the cladding employs ¼-inch-thick formed aluminum fins with a painted finish in varying sizes and shapes. A signature element, an internally illuminated spire enclosure above the entrance, is fashioned from custom-perforated aluminum plate. The project team, working for developer Catamount Management, contended that solid aluminum cladding also would offer fire protection benefits. With a melting point of more than 1,200 F—and no plas-

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tics, foams, or other synthetic materials known to accelerate combustion—the façade panels are essentially noncombustible.

"Each type of panel has a unique application," says the architect Thomson. "We are using aluminum plate and aluminum composite materials, known as ACM, within unitized curtain walls. They allow large panel sizes with a high degree of flatness." He adds that there is plenty of flexibility in using plate and composite aluminum materials to set patterns and textures into the panel systems or apply them subsequently. Recent project examples include 77 Commercial, a two-tower development by Clipper Equity now substantially complete in Brooklyn, and their recent mixed-use office tower 412W15 in Manhattan, developed by Rockpoint.

COURTESY NBBJ

For an office campus for Meta's Facebook in Bellevue, Wash., NBBJ and Turner Construction improved on the sprawling, eight-acre campus that expresses connection between work and nature. Originally designed for REI and then sold to Facebook, the newer Spring District building's unique massing is clad with a custom-corrugated metal system in two finish tones: steel and bronze.

DESIGN TRENDS AND INNOVATIONS

Novel design ideas like these are seen frequently with solid metal, IMPs, and other metal systems. Pointing to his work on a noted residential high-rise in Manhattan, called Rose Hill, CetraRuddy's Thomson describes three key applications: "As seen at its podium, Rose Hill employs many uses of metal cladding: perforated panels to obscure mechanical louvers, water jet-cut aluminum plate as an applied texture, and sheet aluminum folded to create a chevron pattern that adds depth to the unitized curtain wall." The chevron motif alludes subtly to the Art Deco architecture built in years past by firms associated with the developer, The Rockefeller Group.

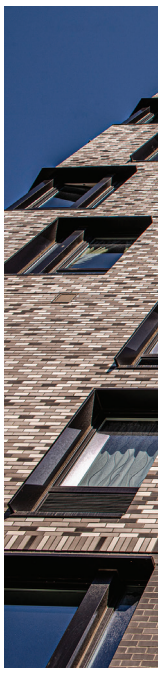
Such flourishes are seen at varied scales, including in applied finishes with novel colors, texturing, and other details. "The newest applications we're seeing are built-up-coatings that allow for both a tactile bump as well as the ability to match almost any finish," says Gilbane's Meyers. "Companies like Minnesota's Pure + Freeform have the ability to layer these coatings in a way that allows for a heavier visual while allowing for a lighter product than stone or terracotta. The lighter-weight material is more economical."

To optimize finished aluminum and other metal panels for best performance as cladding, building teams specify products with coatings rigorously tested and rated by the Fenestration and Glazing Industry Alliance's rating, American Architectural Manufacturers Association (AAMA) 2605, an exterior-grade standard assuring the longest life in even long-term, high-rise uses. Unlike AAMA's 2604 and 2603 ratings, AAMA 2605 ensures the best material resistance to ultraviolet (UV) degradation, corrosion, and chemical exposure. Pairing these finishes with an FEVE resin—the acronym stands for the copolymers' two constituent monomers, fluoroethylene (FE) and a vinyl ether (VE)—further overcomes processing challenges of traditional fluoropolymer resins, which need to be melted or solubilized at high temperatures to create a barrier coating.

For an office campus for Meta's Facebook in Bellevue, Wash., the architect NBBJ and Turner Construction improved on the sprawling, eight-acre campus that expresses connection between work and nature. Originally designed for REI and then sold to Facebook, the newer Spring District building's unique massing is clad with a custom-corrugated metal system in two finish tones: steel and bronze. The 400,000-sf office complex, designed to meet LEED standards, includes outdoor terraces, walkways, and massive mechanical doors.

For other projects, metal cladding is used to detail and enhance façades of other materials, says BLA's

COURTESY BODY LAWSON ASSOCIATES



architect Body-Lawson, who specializes in urban affordable communities. “In the last few years, metal systems have become more expensive, and sometimes we see supply chain issues that spiked during the pandemic,” he explains. “So we use them selectively in choice projects, where you have a budget for it, and often as ornamental materials, sunshading devices, and window surrounds.” Body Lawson Associates’ Home Street Residences, a 63-unit building for low-income senior citizens in the Bronx, N.Y., built with construction manager C&S Consulting, employs prominent metal window surrounds and other metal details. The firm’s earlier Erbograph Apartments present rhythmic metal sunshades.

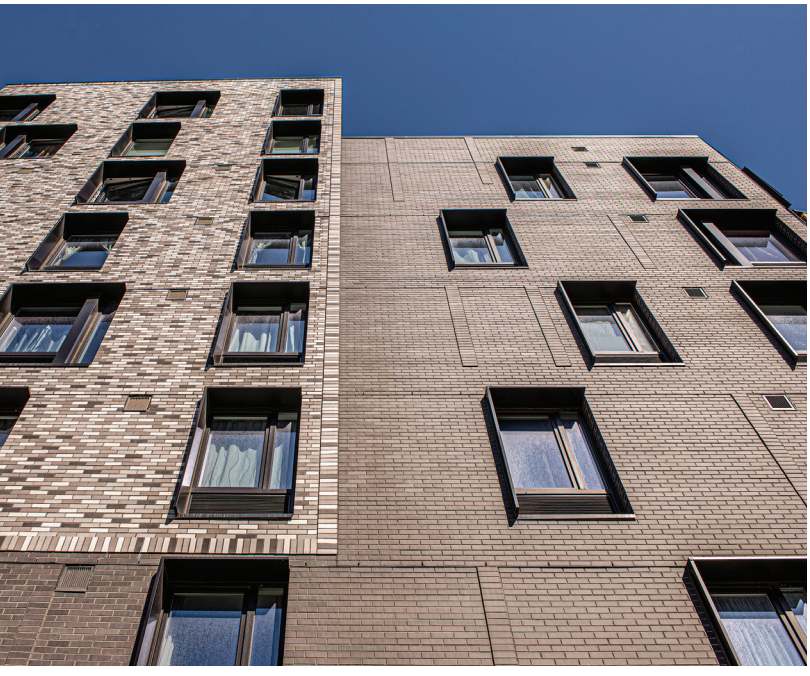
Multi-materials façades, such as SCSU’s new health complex and the Peninsula, an affordable mixed-use campus designed by WXY architecture + urban design with Body-Lawson’s firm, offer another route to selectively incorporating metal cladding. The Peninsula, also in the Bronx, employs a high-R-value IMP system along with standing-seam metal cladding, corrugated metal panels, and other folded plate and sheet flourishes, creating a varied palette for the first phase’s residential block and adjacent light-industrial facility with community uses and food businesses. Constructed by Broadway Builders, the innovative development set to expand to 740 affordable residences and other uses, is led by Gilbane’s Development arm, Hudson Companies, and nonprofit MHANY.

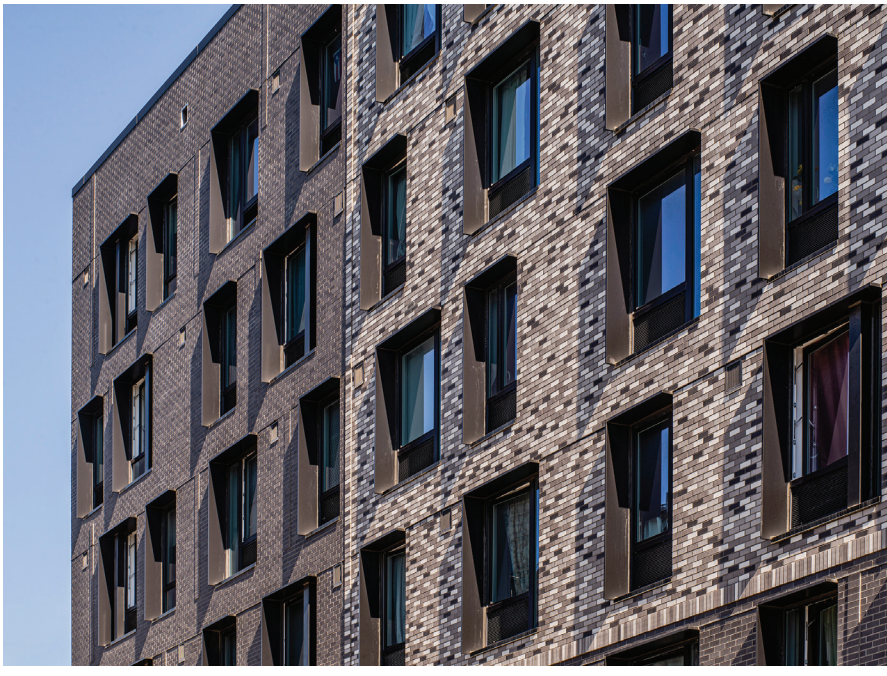
In an example of combining varied metal panel systems with brick veneer, glass, louvers, and other façade materials, the two-building first phase of the Peninsula in the Bronx provides a case study of how adaptable and diverse metal facades can be.

ADAPTIVE REUSE & OVERCLADDING

In other projects, creative and customized metal claddings can reimagine existing buildings for new uses and increased value. In San Francisco, an abandoned parking garage stood glumly in the city’s South of Market (SoMa) district as buildings around it welcomed high-tech companies and other office and retail tenants. Seeing potential value, developer Boston Properties worked with architect and structural engineer firm the Office of Charles F. Bloszies, FAIA and GC Plant Construction to create “a distinctive, eye-catching makeover of an existing concrete structure that would stand out against the well-tailored architectural background of a tower behind it,” says the firm.

The transformation is striking. “The building’s second floor is wrapped in a metal screen, a kind of architectural lamé cut from aluminum sheets using CNC machines driven by files created using Grasshopper, a parametric plug-in for the 3-D modeling program Rhino,” says Bloszies. Between the original façade and the overlaid screen are color-changing LED lamps, and a glass cornice element reflects the metal screen pattern and articulates the form’s verticality while also protecting the gap between substrate and screen. In this way, the luminous 25,000-sf box makes an outsize visual impact.





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This kind of approach, hanging impactful yet light metal skins over obsolete original enclosures, has taken off in the past decades. Equal Justice Initiative's Legacy Pavilion in Montgomery, Ala., employs a solid-metal panel element to transform "a windowless tilt-up concrete warehouse into an inspirational space where visitors reflect on, and engage with, an often-overlooked history," according to the architect and designer William Blackstock Architects.

For yet another constituency, the School Construction Authority (SCA) of New York and architect Albert Aronov, AIA, a Principal and K-12 sector leader with RKTB Architects, are using overcladding with metal panel systems for valuable applications in aging elementary schools with masonry enclosures. "Using metal panels, we add a performative layer to an existing building exterior to their older enclosures of masonry, concrete, brick, and other façade materials," says Aronov. Improving aesthetics as well as adding insulation R-value and weather barriers, these projects improve building energy performance. Some jurisdictions such as Toronto and New York have new ordinances that serve as incentives for adding more insulation while forgiving added floor area ratio, or FAR.

Dating to 1907, Public School (P.S.) 88 in Queens, N.Y., required a means for improving the energy performance of its enclosure while dealing with deteriorating architectural details. Worse, prior work had removed original parapets, cornices, and other neoclassical flourishes. Addressing severe moisture damage to academic spaces with mold and other moisture-related health hazards, the project team conceived a façade overcladding consisting of an exterior parge coat and moisture barrier, followed by a drainage mat and new brickface to match the original. P.S. 88's masonry was strong enough to support the addition, says Aronov, and the overclad would effectively stabilize the school building and extend its service life.

For metal overcladding, the opportunity arises for a total transformation. Examples include the Kensington Market Lofts in Toronto, by ERA Architects and the developer Context and contractor Historic Restoration Inc., that reimagined a former school building clad in glazed yellow terra-cotta blocks that opened in 1952 attached to an older red-brick school building dating from 1923. Following an early 1990s renovation to create condominium lofts, the owners of Kensington Market Lofts saw an opportunity to revitalize the complex's image in multiple phases to remediate water infiltration at the terracotta blocks and steel structure below. Developing an overcladding strategy, ERA designed a metal panel rainscreen system in varied hues in concert with a prominent Toronto artist, An Te Liu. The multicolored aesthetics reflects the neighborhood's historic diversity, says the project team, with colors in the final pattern selected through an analysis of the percentage of colors present in the world's national flags.

Hanging IMPs on new outer subframes or furring, according to the Metal Construction Association, the overcladding approaches work well over varied substrates including CMU, cast concrete, and brick veneer, and provide an effective barrier and continuous insulation (CI) across entire enclosures. "In this way, overcladding is similar to creating new rainscreens," says Aronov, who completed other reconstruction projects including P.S. 73 in Brooklyn as he has led his firm's education studio since 2004. "It also allows schools and other buildings to update their architectural image even in cases where load-bearing concrete and masonry walls complicate retrofits, requiring expensive reinforcing of structure and additions of columns and beams or underpinning foundations if heavier enclosure improvements are employed."

In addition to increasing thermal performance, properly detailed overcladding provides an air barrier and water barrier and improves fire and smoke containment to enhance building resilience. The approach also allows for existing buildings to be largely occupied and accessible during construction, limiting disturbance to occupants and tenant operations—in short, ideal for school improvements. Even better, overcladding can be accomplished at modest costs and with fairly short design and construction schedules.

Reinforcing the benefits of IMPs and ACMs as rainscreens or as barrier wall systems, Gilbane's Myers and CetraRuddy's Thomson point to their superior R-values. "We chose to clad the exposed concrete shear wall of the new high-rise, Rose Hill, with a 6-inch-deep insulated metal panel," says Thomson. "Vertical aluminum profiles were applied to the face of the panels in order to blend this more off-the-shelf system with our bespoke unitized curtain wall façade."+