The Prefab Package

Modular EIFS construction offers benefits to today's busy jobsites.

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There has always been a need for a more efficient way to build in large cities like Chicago, New York, Los Angeles or other central business districts. The tight quarters on construction sites in such places put operating and materials storage space at a premium.

When limited operating space, weather considerations or the need for a faster construction schedule are a concern, prefabricated panel construction offer a solution.

Prefab panel construction has been around for many years, but the process is still largely misunderstood. Owners, developers and designers not familiar with prefab may wrongly perceive it as a complex, costly and/or time-consuming

The look of metal panels can be achieved with modern EIFS providing a cost savings when used in traditional or modular construction. Photos courtesy of Dryvit Systems Inc.

Modular EIFS panel construction with a brick appearance is much lighter than a modular panel with traditional brick; EIFS allows for less structural materials to be used, saving time and money.

process. Without overcoming these misconceptions, they run the risk of not considering all available options, missing out on the potential benefits of prefab construction.

While this type of construction can range anywhere from a complete structure (for small buildings) to just certain parts of the structure being built off site, transportation size restrictions play a role in limiting what can physically be shipped.

It is more common to see certain parts of a structure, like exterior walls, prefabricated because these parts are easier to transport and can be created cost-effectively off site. These panels can then be attached to the building frame on site to provide the enclosure for the building.

Prefab panel construction can be used on practically any building but is most commonly used in education, health care, office, retail and multifamily buildings. These buildings tend to be larger in size, have more repeating features that result in duplicating panel designs, and are built under tight timelines.

Prefab panels can incorporate practically any cladding material including brick, metal, stone or EIFS. One advantage of using the EIFS cladding option is the fact that it is significantly lighter in weight, which allows more flexibility in the design of the panels as well as easier

transport, handling and erection.

Overall, prefabricated EIFS panel construction is popular for different reasons. What makes it a method worth exploring on your next design?

Prefab Panels and Quality Assurance

Building owners, architects and general contractors can all benefit from prefabricated panel construction.

As the following sections show, building owners get better quality control, a shorter construction timeline and often a lower cost.

General contractors see cost efficiencies through shorter job cycles, which can lead to more efficient planning and management of multiple jobsites.

Weather and Temperature

Quality assurance is an important aspect of any job, and issues like weather and temperature can affect quality in outdoor construction sites.

When panels are built off site, indoors, in a controlled environment, there is a known tolerance for all panels and multiple quality assurance checks in the process. Building on site, however, brings greater opportunities for error and damage from weather conditions and multiple contractors having access to the jobsite.

The final product can be more consistent when construction is unaffected by outside conditions. Temperature and weather conditions affect drying times on the jobsite, for instance. Off site, however, the temperature is controlled, which provides a known drying time.

EIFS basecoats and adhesives, for example, have dry times that vary based on temperature and weather. If the weather is outside the product guidelines, then the contractor may need to delay the work or install temporary protection until the materials cure. This can add significant cost to a project if not initially budgeted.

With no concern for weather conditions, prefab panel production can be completed despite outside temperatures, rain or snow. As a result, the construction work and timelines are not affected by inclement weather, and panel construction can occur during the winter months.

Many claddings cannot be applied at temperatures lower than 40°F, so indoor construction can speed up the completion of the exterior façade.

The prefabricated panels can be worked on and completed while the construction and framing of the structure itself is underway, allowing for a quicker enclosure and enabling the building to open sooner.

Storage and Space

Storage space is often scarce on jobsites. When using prefabricated panels, no storage is needed for the exterior.

Prefabricated panels can be shipped and installed the same day, using cranes already on site. Additionally, no scaffolding is needed, which assists sites with limited space and helps reduce costs.

Prefab panel construction also limits the number of subcontractors on the jobsite. The entire panel is fabricated and installed by one subcontractor/company, compared to the multiple trades that are required with other construction methods.

Design and Planning

Panel fabricator engineers create the detailed drawings for plans. This allows architects to spend less time on drawings of the exterior and can help speed up the design process.

Architects are also assured the wall will be completed correctly and with no substitute products. In traditional builds, contractors can select "equivalent" products to use in place of a specific brand or product selected by the architect; these changes have to be approved by the architect. When walls are prefabricated, the fabricators custom engineer each wall using only

Different-sized panels can be installed, completely finished, to enclose the building quickly and efficiently.

The majority of this apartment building was completed using modular EIFS panels.

the products specified by the architect.

Additionally, the architect can inspect and ensure the wall system's quality off site before it is placed on the building. This is an additional quality assurance measure that is not usually available for traditional building since the exterior wall is constructed directly on steel studs.

Prefabricated EIFS Construction

While many cladding types can be prefabricated, as energy efficiency becomes more important, EIFS panel assemblies grow in popularity in prefabricated panel construction.

The three most common types of configurations used in EIFS prefabricated panel construction are: steel stud, corrugated metal panels and channel-reinforced insulation.

Steel Stud Panels

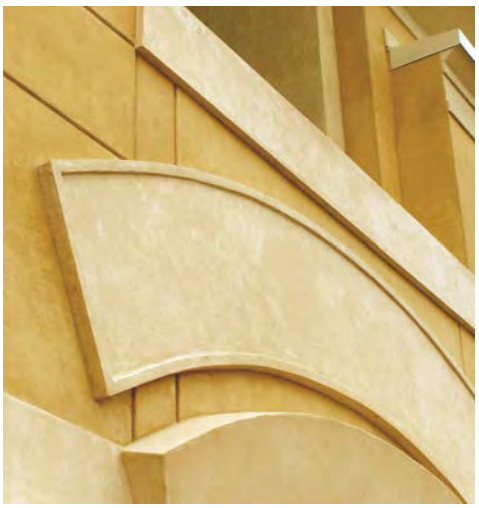
Steel stud panels, the most common type of prefabricated EIFS, are available in any type of prefab panel construction. The entire wall — steel studs, sheathing, air/water barrier, adhesive, insulation board, reinforced base coat and finish — is fabricated off site.

The panel fabricator typically supplies the design and engineering of the panels and connections. The panels can be practically any size, with the only limitations being the trucking of materials on roadways and any erection requirements. Because the panels include the metal studs, they have complete structural integrity. In some cases windows and other components can also be integrated within the same panel as the cladding.

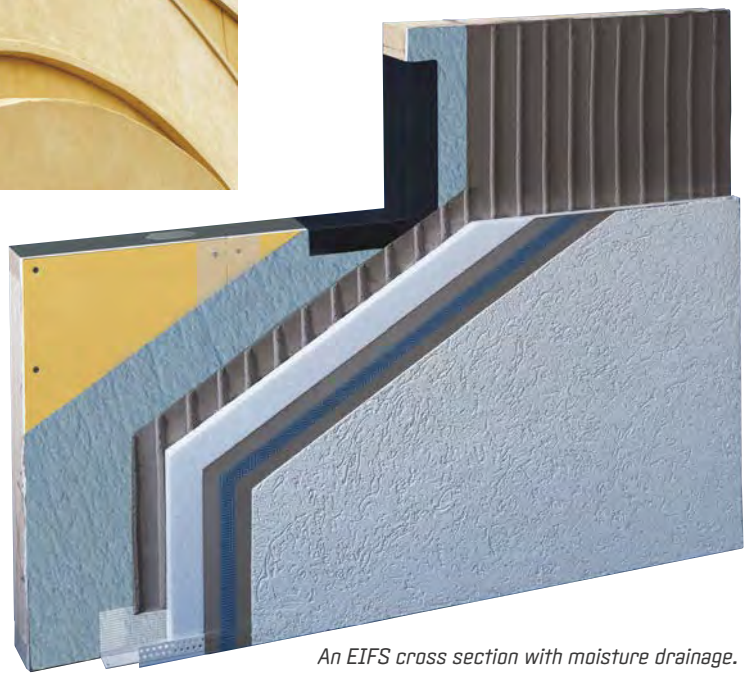
Once the panels are shipped to the jobsite, they are put in place using a crane and are welded or bolted to the existing framing of the building. This process allows extremely large and intricate designs to be created quickly and easily incorporated on the building's exterior.

Galvanized Decking

EIFS can also be applied to a galvanized steel decking substrate, which is unique



EIFS can provide custom decorative details like cornices and cutouts, shown here.



An EIFS cross section with moisture drainage.

to prefab EIFS panel construction. The EIF system is attached to the substrate using mechanical fasteners in the shop, and then transported to the site and installed on the building frame.

These panels generally do not use a sheathing layer on the building; however, for some types of construction, building codes require that the insulation be separated from the interior by a 15-minute thermal barrier. This barrier is usually a ½-inch thick gypsum-based board that is installed either inboard or outboard of the decking.

These types of panels are usually much lighter and thinner than the traditional steel stud panels, which make them much easier to transport and install. Steel decking substrates are generally non-load-breaking and require additional support for windows, HVACs and other components.

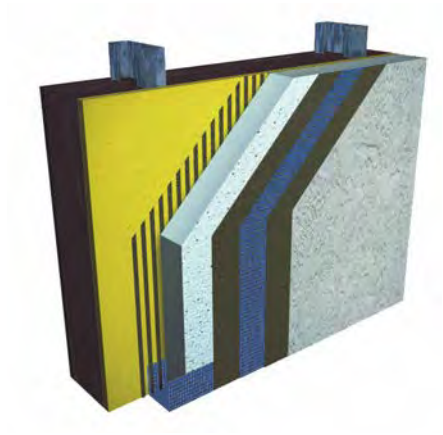
Channel-Reinforced Insulation

Prefinished EIFS can also be constructed off site into panels without a substrate or framing and sheathing, using only reinforcing channels and the EIFS components: insulation board, reinforced base coat and finish. These panels are generally smaller in size, usually less than 10 ft. by 12 ft., and lightweight enough to be handled
by two people without special lifting equipment.

In this type of panel, metal channels are inserted and glued into the back of the expanded polystyrene (EPS) insulation boards to give it added structural stability during handling and erection. The EPS boards can vary in size and are coated with a reinforced base coat and finish.

Once the panels are completed and cured, they are brought to the jobsite and installed to the existing wall substrate/sheathing using either an adhesive or a mechanical fastening, or a combination of the two.

A cross section of a steel-stud prefabricated EIFS panel.



A typical barrier EIF system.

In addition to wall panels, prefinished EPS shapes can also be created — profiled shapes are cut out of EPS and factory finished with the reinforced basecoat and finish. This allows for the same quality assurance and storage benefits seen with traditional panel prefabrication.

Quoins, cornices, trim bands and medallions are some of the most common prefinished shapes, but any custom shape or cutout can be produced. These EPS shapes can be incorporated into panels or simply added to existing building facades.

With any of the panel options, the panel fabricator will provide the engineering calculations required to meet the building's wind, dead and live design loads.

EIFS panels are the lightest and thinnest prefab panel options available. The lightweight option allows for fewer structural materials to be used in a job, which can save building owners money and keep architects and contractors on budget.

Preventing Water Penetration

Joints between panels are generally sealed using commercial-grade sealants proven compatible with the adjacent materials. Most EIFS manufacturers will provide a list of sealants that have been tested for compatibility. Also, most sealant manufacturers will perform project-specific compatibility testing if required.

Since joints between panels generally extend through the full wall thickness, it is good design practice to include a double line of sealants at these locations using a rainscreen approach. This provides redundancy in the event of a breach of the outer layer, allowing the owner time to repair the breach before water can penetrate into the interior of the building.

Sealant joints should be properly designed to accommodate the expected movements without overstressing the materials. A good rule of thumb is to design the sealant joint width to be not less than four times the expected movement, and not less than 3/4 inch.

Always verify with the manufacturer of the selected sealant that the sealant has been tested for compatibility and that it can accommodate the expected movements.

EIFS Evolves

Since their introduction to the U.S. market in 1969, EIFS have evolved into one of the most tested and well-researched

claddings in the construction industry. Modern EIFS are in full compliance with building codes which emphasize energy conservation, and they are built to provide maximum energy savings.

Today, for field-applied work, most EIF systems include a designed drainage plane that allows for any incidental moisture that may get behind the system to harmlessly drain out of the wall. The drainage plane can be accomplished in various ways, from a notched trowel adhesive application method to a sheet good that has a grooved surface.

For prefabricated panel assemblies, the panel is made so that it is completely sealed around the entire perimeter. This prevents any water entering within the panel.

However, as with field-applied work, the sealant joints tend to be the critical areas. For that reason it is always recommended that a double line of sealant be installed between panels.

In addition to the drainage plane, they also include an air- and water-resistive barrier (AWRB). The majority of EIFS manufacturers offer fluid-applied AWRBs. These barriers can be applied via trowel, paint roller and airless sprayer, depending on the contractor's preference. Since there are no mechanical fasteners, no punctures are created in the barrier and wind or other weather cannot cause damage.

The last 10 years have provided advancements in continuous insulation technology. EIFS primarily use EPS foam insulation board as continuous insulation. EPS insulation board has a thermal resistance value of roughly R-3.85/inch and compression strength of 10 psi.

Extruded polystyrene (XPS) is another insulation board used as continuous insulation in EIFS. XPS has a higher thermal resistance value, R-5/inch, and compression strength, 25 psi, compared to EPS. Using XPS, architects can achieve greater insulation values at the same thickness, as well as greater impact and puncture resistance.

While much has changed to make EIFS perform better over the years, the biggest advancement is the availability of a wide variety of finishes. Traditionally, EIFS have been thought to look similar to stucco. Now finishes allow the façade to mimic brick, granite and other stone; limestone; and even metal panels.

Finishes are available in almost any color, including custom colors, many textures, rough or smooth, and with additives that repel water, reduce mildew growth and improve fade resistance in brighter colors.

Energy Efficiency Built In

EIFS have always been an energy-efficient cladding. This energy efficiency is attributed to the continuous insulation and air barrier used as components of the system. Exterior continuous insulation wraps buildings with insulation, which differs from the traditional cavity batt insulation that is installed between the studs.

While traditional cavity batt insulation has a comparable R-value to EPS, the effective R-value is actually much lower. For example, a building with steel studs that uses cavity insulation rated at R-11 has an effective value of R-6 due to thermal bridging — heat is transferred through the studs of the building, bypassing the insulation layer.

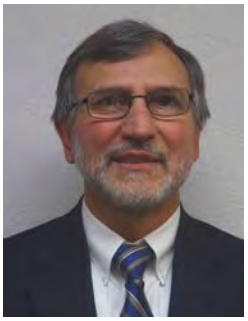
While many cladding products can be code-compliant with modification, EIFS are completely code-compliant. Many EIF systems have been tested and passed the stringent NFPA 285 test because it is an assembly test. In addition to fire testing, EIFS comply with the most recent IBC and IECC codes, as well as ASHRAE and ABAA (Air Barrier Association of America) standards for continuous insulation and as an AWRB respectively.

The Total Package

Prefabricated EIFS construction brings together the advantages of using EIFS and prefabricated panel construction techniques. EIFS provide code compliance and energy efficiency through the EPS and XPS exterior continuous insulation. The continuous insulation negates thermal bridging, wrapping the building in insulation. The expanded breadth of finishes provided the architect with many choices to help achieve their design goals.

Using EIFS instead of heavyweight claddings such as brick, precast, etc., can reduce the sizes of structural supports while providing stunning details and shapes with ease.

Prefabricated panel construction allows for quicker construction timelines and results in the building opening sooner. Prefabricated panel construction also gives architects peace of mind and higher quality assurance standards.



About the Author

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