EIFS with Drainage and Sustainable Design in the Built Environment

Bill Egan

8 Minutes

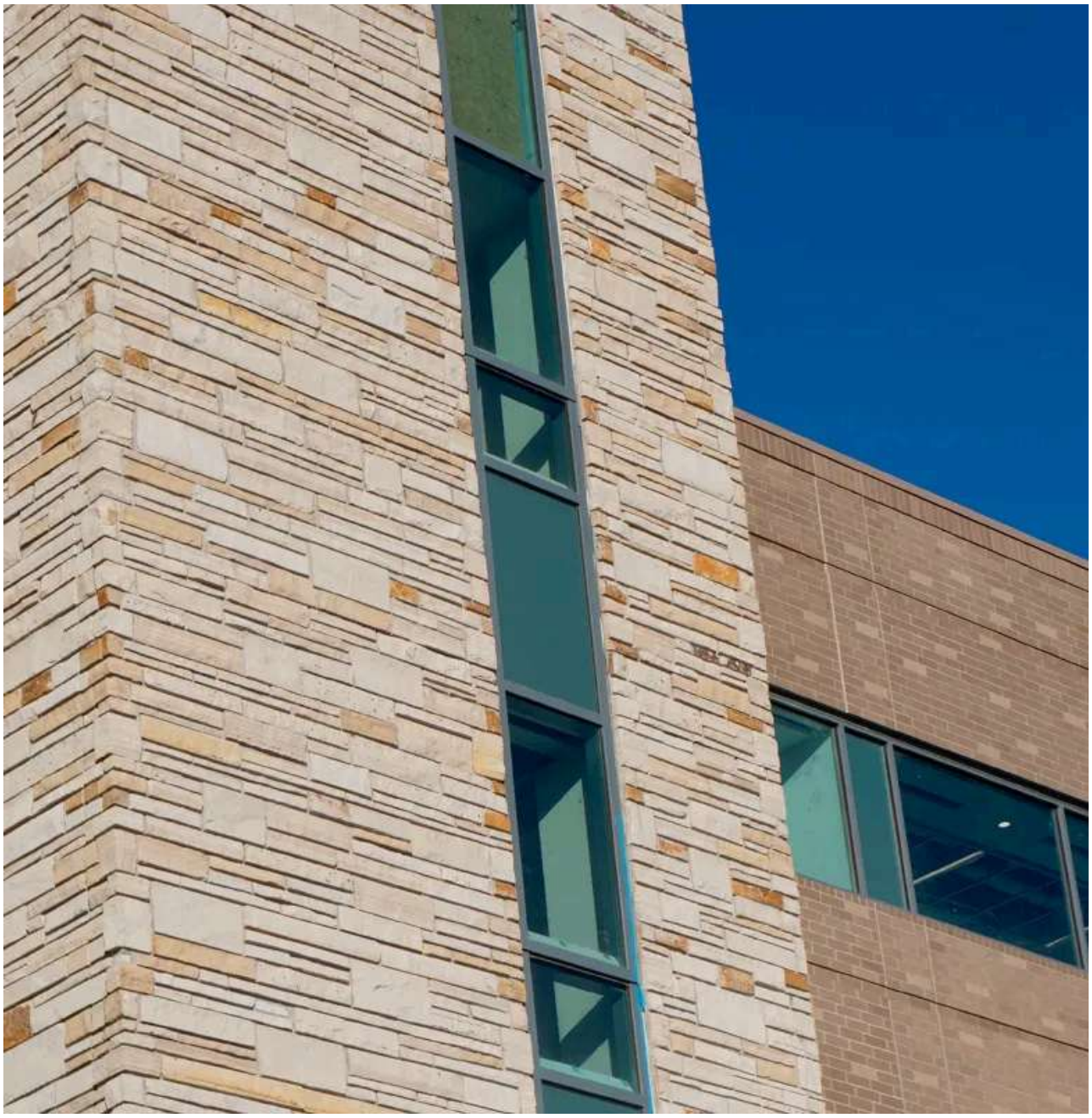

Photo Credit: Sika Facades »

While there are many exterior wall cladding options available, EIFS with drainage features energy efficiency, aesthetics, cost effectiveness,

performance and durability which can help achieve sustainable designs in the built environment on new construction and existing buildings.

The built environment includes buildings and structures that provide places for people to live, work and enjoy recreational activities. Important aspects and expectations of the built environment include health, safety, sustainability, low environmental impact, resource conservation, accessibility, economical construction, maintenance and operations, community needs and energy efficiency.

Meeting the expectations can be complex due to numerous and sometimes competing factors related to construction, design and materials as well as population, economics, environment, climate conditions, social needs and regulatory requirements, which need consideration in a holistic fashion.

Substantial quantities of resources (materials, energy, water, etc.) and waste are expended during the construction, operation and maintenance of buildings. By many accounts, commercial and residential buildings in the building sector contribute more than one-third of all greenhouse gas emissions (GHG).

While a significant portion of total emissions are the result of heating and cooling operations, the U. S. Environmental Protection Agency (EPA) estimates 15% of annual global greenhouse gas emissions can be attributed to materials used to construct buildings and infrastructure (EPA, 2024). The quantity of GHG in a construction material varies based on the materials composition and embodied carbon which considers the production of a construction material or product over its lifecycle.

Climate Plans and Policies

Earlier this year, the Department of Energy (DOE) released “Decarbonizing the U. S Economy by 2050: A National Blueprint for the Buildings Sector,” which includes an objective to reduce residential and commercial building related GHG emissions 65% by 2035 and 90% by 2050.

Additionally, some states and local jurisdictions are considering or have already adopted climate policies and action plans. While climate policies and plans vary by locale and authority, all typically look to minimize, reduce, or limit GHG, improve energy efficiency and incorporate other measures that reduce the environmental impacts resulting from new or existing buildings and the construction industry.

For building owners to comply with these policies, implementation of multiple strategies may be necessary and include energy upgrades for existing buildings and construction of new buildings using more energy efficient, climate friendly construction materials.

Sustainable Design

According to the U.S. General Services Administration (GSA), "sustainable design optimizes building performance and minimizes negative impacts on building occupants and the environment." Sustainable design impacts the built environment since it considers durability, construction material and product sustainability, energy efficiency, waste, indoor air quality, water conservation, environmental impact, and safety.

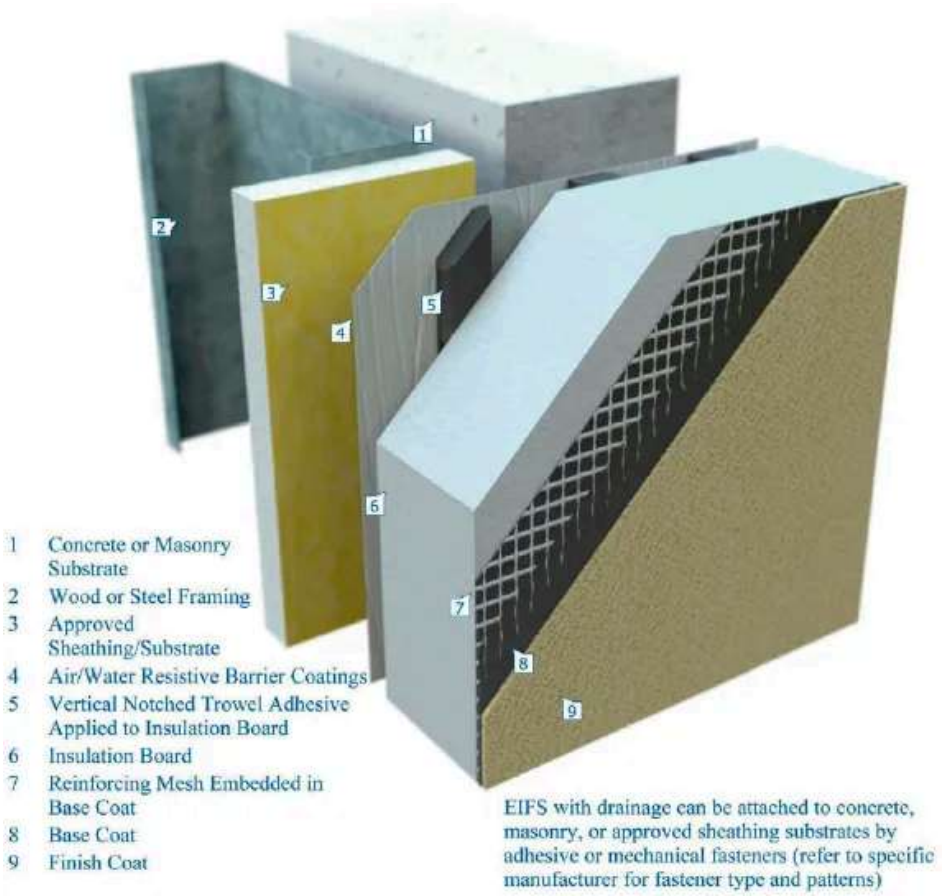

Figure 1. Typical EIFS with Drainage Configuration - Photo Credit: EIFS Industry Members Association »

It touches all parts of the building and items including initial and operational costs, aesthetics and maintenance. As a result of the many considerations that are involved, compromise and tradeoffs are common in order to achieve the overall design objectives. Sustainable design is applicable to new construction and renovation of existing buildings. For existing

buildings, complying with the latest climate policies may involve deep energy retrofits such as new insulated wall claddings and other measures.

The Importance of Exterior Wall Claddings

Building owners and designers have a wide range of exterior wall cladding options to choose from including brick, exterior insulation and finish systems (EIFS) with drainage, stone, glass, metal, stucco and composites, and other siding materials. The exterior wall cladding plays a key role for the building and sustainable design because of its weather protection, appearance, lifecycle, durability and performance, thermal properties, environmental impact, cost, etc.

Cladding materials can differ in appearance, energy performance, durability, environmental impact, design versatility and cost. These and other items can influence sustainability which makes cladding selection a key consideration for new construction and renovation of existing buildings.

EIFS with Drainage

EIFS with drainage are multi component exterior wall claddings comprised of an air/water resistive barrier (AWRB), continuous insulation (CI), reinforced base coat and decorative and protective finish coat (see Figure 1). The claddings can be applied over a range of substrates including concrete, concrete masonry and wood or steel framing with sheathings such as gypsum, cement board, plywood and oriented strand board (OSB).

Figure 2. EIFS with Drainage and Special Shapes - Photo Credit: Sto Corp »

Figure 3. EIFS with Drainage and Stone Veneer Finish - Photo Credit: Sika Facades »

EIFS with drainage are used on residential and commercial buildings across all climates and types of construction including non-combustible and fire resistive. Installation can be completed in place or via prefabricated panels that enables installation to progress quickly and with minimal interruptions such as weather delays.

EIFS with Drainage can help owners and design professionals comply with aggressive climate goals and achieve sustainable designs necessary for the built environment and well-being of building occupants. Below is a snapshot of important system features and benefits that help meet sustainable design objectives.

Air/Water Resistive Barrier

The systems incorporate an AWRB that is typically a single component, fluid or liquid applied material. This is a dual function product that provides efficiencies in terms of material and labor while serving as both an air and water resistive barrier. The AWRB is integrated with other building enclosure components such as flashings, etc., to provide weather protection to underlying components and reduce or control air flow which can be a benefit to energy efficiency, indoor air quality and occupant comfort. In many instances, the AWRB can also meet the requirements of a flashing material for rough openings and for use behind other claddings.

Energy Efficiency

Continuous insulation (CI) is an inherent system component that provides the thermal insulation layer on the outside of the building. Installed in this manner, CI eliminates thermal bridging which results in higher thermal efficiency than conventional cavity type insulation. Many continuous insulation board types, materials and technologies are available to suit the

needs and satisfy the requirements of virtually any design or local jurisdiction.

CI is typically available in thermal insulation values starting at R 4 or more per inch of thickness. While some exterior wall claddings face practical limitations in terms of CI thickness requiring additional support or complex detailing, EIFS with drainage can generally be applied with CI thicknesses that achieve well over R 16, which meets common prescriptive R value energy code R requirements across the United States climate zones.

Aesthetics

Visually attractive buildings provide social value and play a significant role in sustainable designs. EIFS with drainage can meet a wide range of appearances because of the systems design flexibility and versatility. Adding special shapes in the form of cornices, bands, and other trims further enhance design possibilities.

Available finishes and appearance options now include wood, brick and stone veneer, and metal in addition to traditional textured finishes, which are available in an almost unlimited color palette (see Figures 2 and 3).

Photo 1. Snowden Building—Before - Photo Credit: ADEX Systems »

Photo 2. Snowden Building—Post Renovation - Photo Credit: ADEX Systems »

New Construction and Renovation

EIFS with drainage can be used and is adaptable for use on all types of construction, buildings, and climates across the United States.

Existing buildings are often candidates for renovation because of the need to update the appearance, resolve air/water leaks, improve energy efficiency or repurposing due to a change of owners, occupants or use. Renovation or repurposing an existing building is typically a more sustainable and cost - effective solution than demolition and reconstruction.

Additionally, achieving aggressive climate goals such as reduced or net zero carbon on existing buildings often results in the need for improved energy efficiency which can be achieved by adding EIFS with drainage to the exterior. Because the system is light weight and applied to the exterior, it can often be applied directly over an existing substrate, such as masonry, without structural modifications or disruption to the occupants during the renovation process.

Furthermore, detailing around existing conditions such as fenestrations is easier than thicker or heavier claddings that may require supplemental framing or substructure as part of the installation.

Photos 1 and 2 show the Snowden Theatre in Montreal, which is an example of a renovation project that enabled preservation and repurposing of a historical building while also improving building energy performance.

Climate and Environmental Impact

By incorporating continuous insulation (CI) into the system, EIFS with drainage can help lower heating and cooling demands in residential and commercial buildings. Not only does this reduce costs, but it can also reduce the buildings operational carbon footprint due to lower quantities of energy being consumed. Combining lower energy consumption and operational costs results in a positive impact on the climate and to the building owner.

Cost

Due to the type of material and weight, the installation of EIFS with drainage is recognized as being more cost effective than exterior wall claddings that are thicker, heavier and are more labor intensive to install. Figure 4 provides examples of installed costs based on data from R S means that compare EIFS with drainage to alternative cladding systems in two geographical locations.

Performance, Durability, and Code Compliance

Like most other claddings, EIFS with drainage manages moisture by shedding water at the outermost face, collecting incidental moisture that bypasses the exterior surface and, with other building enclosure components such as flashings, redirects it to the exterior.

Exterior Cladding	Total Building Cost	Total Building Cost Difference vs. EIFS w/ Concrete	Exterior Wall Costs	Exterior Windows Costs	Exterior Wall & Windows Combined Costs	% Walls Cost Difference vs. EIFS w/ Concrete
EIFS / Reinforced Concrete	$90,199,392		$2,013,038	$791,745	$2,804,783	
Brick Veneer / Reinforced Concrete	$98,359,223	+9%	$3,761,011	$791,745	$4,552,756	+86.8%
Precast Concrete / Reinforced Concrete	$99,761,649	+10.6%	$7,213,353	$791,745	$8,005,098	+258.3%

RSMeans data

Figure 4. RS Means Square Foot Cost Estimate Report »

On a national basis, building code compliance is based on specific requirements for EIFS with drainage, which have been in place in the International Building and Residential Codes (IBC/IRC) since 2009.

Code and performance requirements are based primarily on tests and standards established and published by organizations such as ASTM, ASHRAE, UL and NFPA. Tests and standards that include fire performance, weathering, wind load capacity, drainage efficiency, air infiltration, wind driven rain, thermal efficiency, freeze thaw resistance, impact resistance and others.

Conclusion

The built environment can be impacted by many aspects of the building sector such as the resources needed to construct, operate and maintain buildings. To reduce the impact of buildings on the environment, climate policies on local and national levels have adopted or are considering the limitation of GHG emissions on new construction and existing buildings. Although building operations such as heating, cooling, etc., are large contributors to GHG, the EPA reports an estimated 15% of all GHG emissions can be attributed to construction materials over their lifecycle.

Holistic, sustainable designs seek to optimize building performance while minimizing impacts on the environment and satisfying the needs of building occupants. Such designs consider all parts of the building and its operation. Choosing the exterior wall cladding material is an important part of sustainable design because of its role and contributions to sustainability. While there are many exterior wall cladding options available, EIFS with drainage features include energy efficiency, aesthetics, cost, performance and durability that can help achieve sustainable designs in the built environment on new construction and existing buildings. *CD*

Bill Egan is a technical consultant for the EIFS Industry Members Association (EIMA) and principal of the Bill Egan Group. He has more than 40 years of construction experience in product/system design, standards development, testing, building code compliance, construction-defect investigations and litigation.

$2.2 MM EPA Grant to Develop Environmental Product Declarations (EPDs) for EIFS with Drainage

The Inflation Reduction Act (IRA) of 2022 includes climate-related legislation intended to provide funding, programs, and incentives that will benefit the climate. Under section 60112 of the IRA, the EIFS Industry Members Association (EIMA) was one of 38 businesses or associations recently selected to receive funding to support the shift to cleaner construction

materials through an EPA Grant. The grant program offered five categories of projects that were intended to report and reduce climate impact, resulting from the manufacturing of construction materials.

EIFS with drainage was selected for funding under the category of Environmental Product Declarations (EPDs) that assists construction product manufacturers with development of high-quality, third-party verified EPDs. The EPDs are intended to provide transparency by reporting emissions data such as embodied greenhouse gas (GHG), material composition and environmental impact of a construction product over its lifecycle. For the EIFS industry, the objective is creation of EPDs that are industry wide, facility based and incorporate products from all U.S. manufacturers of EIFS.

For consumers, an EPD provides a path to making informed choices and an ability to compare different materials in consideration of environmental properties. For manufacturers, the EPD provides market differentiation and can identify potential product or process improvements to improve the sustainability aspects of a material such as options to reduce embodied carbon. For federal state and local agencies, this is a means to review and select materials for government-funded projects with consideration of the products environmental impact.
