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BUILDING ENVELOPE CEM REFRESHER

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ENERGY SPECIALIST CURRICULUM

ENERGY MANAGEMENT SPECIALIST

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BUILDING ENVELOPE

FOR ENERGY PROFESSIONALS

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WHAT SHOULD YOU LEARN

What is a Building Envelope and Why Is It Beneficial?

Tight vs. Loose Building Envelopes

Functions of a Building Envelope

Components of a building envelope

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WHAT IS A BUILDING ENVELOPE AND WHY IS IT BENEFICIAL?

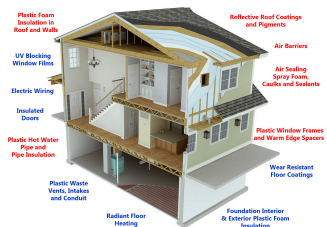
A building envelope is a seal of protection for the people and things inside a structure. It's like a shell — a barrier against the world outside of the building.

In the winter, the building envelope helps prevent the transfer of heat from inside to outdoors. Similarly, during the summer months, the envelope keeps the cooled air inside and the hot air outside.

Because of this barrier, the building envelope plays a key role in a structure's energy efficiency. Keeping heated or cooled air inside (and their respective opposites out) means less energy used and less money spent on heating and cooling.

Building envelope technologies account for approximately 30% of the primary energy consumed in residential and commercial buildings; these technologies affect many factors related to a building's energy consumption, including lighting, ventilation, and the energy required to heat and cool the building.

WHAT IS A BUILDING ENVELOPE AND WHY IS IT BENEFICIAL?



It's important to note that older structures weren't constructed with building envelopes in mind, which explains why these buildings aren't as energy-efficient as newer ones.

So, what exactly makes up a building envelope? A building envelope is everything that separates the internal building from the external environment, including the roof, doors, windows, floors, and walls. Good insulation in the walls, high-efficiency windows, and sufficiently sealed gaps increase the effectiveness of the envelope.

TIGHT VS. LOOSE BUILDING ENVELOPES

Building envelope systems are defined in one of two ways: tight or loose.

A tight building envelope allows very few air leaks. This is achieved by the aforementioned insulation, sealants, and energy-efficient windows.

Why create such a tight seal? Indoor environmental control. The tighter the seal on the building envelope, or shell, the more control people have over the indoor environment.

A tightly sealed building allows for a higher level of comfort control, reduced moisture issues, and more energy efficiency. Of course, with a tighter seal comes less natural ventilation, so more mechanical ventilation is needed.

TIGHT VS. LOOSE BUILDING ENVELOPES+

On the other hand, a loose envelope allows for more natural ventilation, so more outside air can flow inside without the need for mechanical means. Loose envelopes can be achieved by design, but poor construction can result in a loose envelope as well.

The drawbacks associated with loose building envelopes can include unwanted moisture (i.e., mold and mildew); indoor air quality potentially being affected by nearby contaminants; other equipment in the building performing less efficiently; and greater loss of air conditioning and heat, which results in higher energy use and costs.



FUNCTIONS OF A BUILDING ENVELOPE

The three main functions of a building envelope are to support the structure, offer climate control, and provide an aesthetic finish to the building, making use of the latest building technologies.

Structural Support :

Since the building envelope includes the walls of the structure, it must be able to provide support, keeping the building structurally sound.

The foundation must be able to support the structure's weight, and the walls must be load-bearing. The exterior of the building and foundation support must meet local regulations and building codes.



FUNCTIONS OF A BUILDING ENVELOPE +

Climate Control :

Climate control is another key function of a building envelope. As mentioned previously, the envelope helps ensure that conditioned air — whether cooled or heated — remains inside while the outside air remains outside so that energy isn't wasted in the process.

Local climate often determines how each building envelope is constructed. For example, a structure in a cold climate needs more protection from infiltration of cold air than a building in a warm, humid climate.



FUNCTIONS OF A BUILDING ENVELOPE +



Finish :

What's "finish?" Two words: curb appeal. All buildings — whether commercial, residential, or industrial — need to maintain a visually pleasing exterior.

That means the building envelope, since it is made up of the structure's exterior, should be designed with proper aesthetics in mind. Some locales have requirements for the outer appearance of their buildings, and the building envelope will need to reflect these, in addition to offering structural support and climate control.



COMPONENTS OF A BUILDING ENVELOPE



The functional requirements of a building envelope are designed to meet certain performance standards on a structure's exterior. The components of the building envelope, made of the building materials used, include the foundation, walls, air, movement, acoustics, durability, and energy.

Foundation :

A building's foundation is usually made up of a combination of slabs, footings, and concrete walls. The purpose of the foundation is to transmit a building's loads to the ground underneath.

As part of the building envelope, the foundation needs to offer moisture control (have waterproofing and appropriate drainage) and prevent thermal energy from getting inside.



COMPONENTS OF A BUILDING ENVELOPE +



Walls :

Walls are an essential part of a building envelope because they provide support, control, and finish.

The structural components of the exterior walls create the necessary support. Wall system elements such as insulation, exterior cladding and sheathing, a vapor barrier, and interior sheathing help walls resist water and condensation, along with providing thermal energy control.

Air :

Building envelope airtightness must be considered and controlled in a structure. The more air getting to the interior space from the outside, the looser the envelope, which can result in the heating and cooling challenges mentioned previously.

Solutions for air leakage include sealants, sheathings, spray foams, and membranes. These air barrier solutions can account for up to 20% of heating and cooling energy in a building.



COMPONENTS OF A BUILDING ENVELOPE +



Movement :

Every structure moves. With temperature changes, volatile weather, and ground movement, buildings move. The building envelope has to be able to allow these movements.

A building envelope that is too rigid (i.e., walls and foundations that allow no differential movement) can result in cracks and failure under smaller stresses than a more flexible structure would.

Acoustics :

A building envelope does more than help control the climate of a structure with regard to the comfort of the occupants. The envelope should also be insulated against any external sounds.

The attenuated acoustics allow the people who are working or living in the building to engage in activities with less interference from the outside.



COMPONENTS OF A BUILDING ENVELOPE +



Durability :

The building envelope needs to be durable. Being a key part of the structural integrity of the building, the components of the envelope need to last.

Windows, doors, and the like, should be placed for both functional and aesthetic purposes. Yes, the elements of the building envelope must provide the strength and support the building needs while also looking attractive.

Energy :

Construction today has to take energy consumption into account. This includes both new builds and retrofits.

Building design that's energy efficient prevents energy loss through the building envelope. The envelope needs to resist thermal transfer through radiation, convection, and conduction.

Buildings that are constructed or renovated to be energy efficient are more pleasant to be in, cost effective, and eco friendly.



FINAL CONCLUSION



A building envelope plays a key role in the climate, the structural soundness, and the energy efficiency of a building.

The foundation, walls, windows, doors, and other barrier materials work together to keep inside, conditioned air in and outside air and heat (or cold) out.

The strength and flexibility of the materials used help to make the building last by preventing moisture and movement damage.

Finally, a sound building envelope uses less energy, which is good for environmental sustainability and provides building owners the added benefit of energy savings.

