

BEYOND

SMART CITIES

BUILDING ENVELOPE CEM REFRESHER

ONLINE TRAINING COURSE

KRISHNAJI PAWAR, LEED AP BD+C, GSAS CGP, ISO 14001:2015, GCP

ENERGY SPECIALIST CURRICULUM

ENERGY MANAGEMENT SOCIETY

BEYOND SMART CITIES

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BUILDING ENVELOPE OPTIMIZATION

FOR ENERGY PROFESSIONALS

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WHAT SHOULD YOU LEARN

Insulation-types and application

Economic thickness of insulation,

Heat savings and application criteria,

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WHAT IS BUILDING ENVELOPE?

A building envelope: is the physical separator between the conditioned (indoors) and unconditioned (outdoors) environment of a building. It is sometimes used synonymous with building enclosure but the latter term also includes the broader aspects of appearance, structure, safety from fire and security. It can take many forms and compositions, but basically it may be composed of the following components:

- ☑ Floors (Below-Grade Systems)
- ☑ Walls (Walling Systems)
- ☑ Roofs (Roofing Systems)
- ☑ Fenestration (Glazing Systems)
- ☑ Shading Elements

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.



FUNCTIONS OF BUILDING ENVELOPE

Depending on many aspects of the building architectural form, the building envelope plays an essential role in "sheltering" the building occupants. The Five basic functions of a building envelope are:

- ☑ Weather Barrier
- ☑ Air Barrier
- ☑ Thermal Barrier
- ☑ Alien Barrier!
- ☑ Structural.

It means that the building envelope provides resistance to the following: Air (wind/air leakage), Heat (hot/cold), Light (indoor/outdoor), Noise (in/out), Loads (dead/live/wind), Intrusion (safety/security/privacy)



A BUILDING ENVELOPE IS A SYSTEM

A Building Envelope is a Sub-System of the Whole-Building. It is not just a wall/roof/floor/window/ door... but, A SYSTEM!

It can be considered as a sub-system of the building. And, by turn, it is composed of various sub-systems. By applying the "Systems Thinking" approach, we find that building envelope is not only providing a "shelter" to building occupants but also contributing to the overall building performance.

Usually, we think of building performance in terms of energy saving and we think a better building envelope is improving only the energy performance. However, when measuring the performance of a building by a green building rating system (such as LEED or GSAS), it is not a surprise that the building envelope is affecting various performance criteria. For instance, the following areas can be improved by applying a better building envelope:



A BUILDING ENVELOPE IS A SYSTEM +

- ✓ Prevention of heat loss/gain and reduce Energy demand
 - ✓ Urban Function and Cultural Identity
 - ✓ Architectural Innovation and Advanced Technologies
 - ✓ Sustainable Source as a Green Building element
- Building Envelope is vital section of Building Science

A "BETTER" BUILDING ENVELOPE?

The performance of the Building Envelope contributes (negatively or positively) to the overall building performance. The role a building envelope plays in buildings is very similar to the role the skin plays in a human body! There are many factors that will help an architect defines a proper building envelope:

Location (Climate Zone), Season (summer/winter), Operating Conditions (temp./humidity/...), Appearance (color/texture/SRI/...), Thickness, (Composition/Layers) Materials (conductivity/appearance/...), Thermal Break (U-value/details/...), Air Leakage (details/sealing/...), Maintenance Frequency (commissioning/cleaning/repairs/retrofits/...)



REGULATIONS AND CODES:

On a related aspect, the building envelope is also regulated at different levels:

International Standards:

2015 IECC (International Energy Conservation Code, by International Code Council (ICC), Section C402 - Building Envelope).

Local Codes/Building Regulations

ASHRAE Standard 90.1 (ANSI / ASHRAE / IES Standard 90.1-2016 -- Energy Standard for Buildings Except Low-Rise Residential Buildings (5.2.1. Insulation, 5.2.2. Fenestration and Doors, 5.2.3. Air Leakage, ...).

Project Spec's/Developer Requirements Green Building Codes



BUILDING ENVELOPE & GREEN BUILDING

Building envelope has direct impact to several aspects of Green Building criteria. It affects (negatively or positively) the ability of a building to meet certain green building requirements/criteria. Two of the common green building rating systems, namely LEED & GSAS, have been analyzed to figure out the relationship between building envelope and the overall performance of the whole building.

LEED (Leadership in Energy & Environmental Design) is a globally recognized green building rating system developed by USGBC (United States Green Building Council). LEED is adopted in Qatar for a large number of projects, mainly in Education City and Msheireb Downtown Doha project.

Both systems are performance-based, using a point-based mechanism to award projects more points for performing better in several performance categories. The following is a summary of our findings, which reflects the importance of the building envelope in achieving higher performance under LEED & GSAS:




