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

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SMART CITIES
SUSTAINABILITY RECOMMENDATIONS
FOR ENERGY PROFESSIONALS
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WHAT SHOULD YOU LEARN
Sustainability of the building envelope
Protect and Conserve Water
Use environmentally friendly products
Enhance indoor environmental quality
optimize operational and maintenance practices
Beyond Masonry: Sustainable Materials for the Building Envelope

SUSTAINABILITY RECOMMENDATIONS

PROTECT AND CONSERVE WATER

- Stormwater Management—use a vegetated roof as a means of capturing, filtering and reusing rain water on site.
- Captured rainwater on the roof or facade can also be collected, filtered/treated, and then reused on-site for landscape irrigation or toilet flushing, or held and released after a delay to municipal stormwater systems.

USE ENVIRONMENTALLY PREFERABLE PRODUCTS

- Evaluate Environmental Preferability Using LCA—employ life-cycle assessment (LCA) tools like ATHENA® Impact Estimator and BEES to evaluate environmental performance of building envelope components or products. Embodied energy (energy required to acquire, manufacture, transport, assemble, install) should be minimized where possible.

USE ENVIRONMENTALLY PREFERABLE PRODUCTS

- Eliminate the use of materials that pollute or are toxic during their manufacture, use or reuse (VOCs, lead, asbestos, PCBs, CFC or HCFC blowing agents for insulation materials). Where possible, evaluate and consider the use of building envelope assemblies that can be easily "de-constructed" at the end of their useful lives.
- Maximize Recycled Content—where possible, incorporate recycled content in building envelope construction materials, especially post-consumer recycled content.
- Use Wood from Sustainably Managed Forests—when using wood products as part of the building envelope, ensure they are supplied from forests that are certified for their sustainable management practices. Forest Stewardship Council (FSC) certification is mandatory for LEED® projects certified under U.S. Green Building Council programs.

SUSTAINABILITY RECOMMENDATIONS

ENHANCE INDOOR ENVIRONMENTAL QUALITY

- Value Aesthetic Decisions—windows should be provided that afford building occupants views outside but do not negatively impact the visual and acoustic comfort of the work environment.
- Provide Thermal Comfort—components of the building envelope should adequately address issues of thermal comfort at the building perimeter, particularly thermal and solar performance of glazing systems. ASHRAE Standard 55 Thermal Environmental Conditions for Human Occupancy should be used as the basis for thermal comfort analysis.
- Avoid Use of Materials High in Pollutants—limit the use of volatile organic compounds (VOCs) in such products as paints and coatings, and sealants and adhesives

SUSTAINABILITY RECOMMENDATIONS

OPTIMIZE OPERATIONS AND MAINTENANCE PRACTICES

- Preventative Maintenance—building occupants and operators should be appropriately trained in a comprehensive preventative maintenance program to keep all building systems associated with the building envelope functioning as designed.
- Environmentally Preferred Cleaning Products—institute a policy for the purchase and use of resource-efficient and non-toxic cleaning products, supplies and procedures for building envelope elements.

EMERGING ISSUES

The benefits of high performance, sustainable design, construction and operation are universal. All different types of buildings, including office buildings, schools, hospitals, libraries, courthouses, and research facilities, can and should incorporate sustainable and high performance strategies and systems that consider the entire building life cycle, above and beyond just the elements associated with the building envelope.

- Balancing Security/Safety and Sustainability Objectives —Providing for sustainable designs that meet all facility requirements is often a challenge to the building design, construction and operation community. With limited resources it is not always feasible to provide for the most secure facility, the most architecturally expressive design, or energy efficient building envelope.

EMERGING ISSUES +

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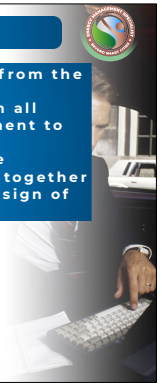
- From the concept stage through the development of construction documents, it is important that all project or design stakeholders work cooperatively to ensure a balanced design. Successful designs must consider all competing design objectives.

EMERGING ISSUES +

- Integrated Design—Designers are moving away from the conventional building design approach that has historically resulted in little interaction between all parties involved in the project. There is a movement to embrace integrated building design, fostering communication amongst all parties that could be involved in the project, and facilitating working together from the start to coordinate and optimize the design of the site and the building.



BEYOND MASONRY

Beyond Masonry: Sustainable Materials for the Building Envelope

Sustainable building practices require an understanding of each material's embodied energy and expected energy performance over the life of the building.

Glass is a technological yet potentially green material that must be considered as part of a sustainable design and building strategy.

Advances in insulated unit fabrication (double- and triple-glazed units with inert gas filling) and invisible low-emissivity coatings have increased the energy performance of glass for building envelopes, especially when combined with hardware such as external louvers or screens for shading. At the molecular level, glass is an amorphous solid — essentially a super-stiff liquid.

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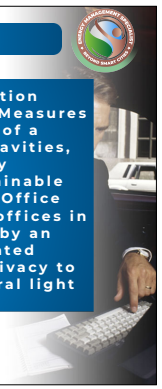
Its atoms cannot crystalize into an orderly formation because of the rapid cooling of hot liquid glass. Measures to enhance the thermal characteristics (U-value) of a glass curtain wall include the use of insulating cavities, inert gas fills, thermal breaks, and low-emissivity coatings. An example of the contextual and sustainable use of glass is the building envelope of the QMA Office Building, designed by AEB to serve as our home offices in Doha. The insulated glass curtain wall is shaded by an external layer of diagonal fin louvers and perforated panels to minimize solar heat gain and ensure privacy to the surrounding community, while bringing natural light inside.



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Ceramics are an ancient building material with newfound applications for sustainable modern architecture. Ceramic tiles are made by pressing and firing mixtures of clay, water, feldspar, talc, flint and other naturally occurring minerals into varying thicknesses and shapes. The resulting products offer an almost unlimited array of designs, textures, colors and finishes.

The several types of insulation in use today, from board to blanket to fiber, are almost all synthetic systems. Air itself can serve as an insulating material, not only inside an insulated glazing unit, but also, on a larger scale, between two curtain walls spaced over a meter apart. Research is currently underway to develop high-performance insulating systems using more sustainable, organically derived materials such as hemp. In any case, the effective use of insulation is a prerequisite for sustainable design and building.

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Other potentially sustainable materials include wood products, though the climate of Saudi Arabia and the surrounding region does not typically support lumber production. Still, there are some environmentally friendly options when wood or timber is necessary. Whenever possible, wood should be certified by the Forest Stewardship Council (FSC).

Such timber and wood products are sustainably harvested from forests maintained by thinning, restoration, and replanting to provide long-term, steady removal of carbon dioxide from the atmosphere. FSC certification guarantees that the forest of origin has been independently inspected and evaluated to comply with strict environmental, social and economic standards.

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Bamboo is the fastest-growing plant on earth and one of the world's oldest construction materials. In addition to being used for scaffolding and housing in many regions, it can be used to make furniture, utensils and tools, paper, and even food. It also mitigates pollution of the soil, water, and air.

There is no single "perfect" material to maximize sustainability in architecture, but being mindful of the qualities inherent to the materials can make a big difference in reducing a building's environmental impact and improving occupants' comfort.

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