Building envelope issues: Owners should identify and address issues before they cause problems

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Identifying and addressing building envelope issues before they cause serious problems can help building owners avoid serious damage to its building's infrastructure but also implement energy savings alternatives.

The global economy is becoming increasingly constrained by energy cost, energy availability, and energy-related regulations. The building envelope plays a fundamental role in energy-efficient construction and can make a significant contribution to energy savings.

The building envelope is the barrier between a building and the outdoor elements. This barrier is formally separated into three different segments: the barrier of energy and materials, the structural integrity of the building's exterior walls, and the aesthetics of the building's exterior. The building envelope is the first line of defense, protecting the structure and its occupants from wind, rain, frost, humidity, and temperature variations while maintaining interior comfort throughout its operating life. Failure may be as obvious as water infiltration, cracks, bulges or collapses, or as subtle as energy inefficiency and user discomfort. Energy loss through the building envelope is highly variable and depends on numerous factors, such as building age and type, climate, construction technique, orientation, geographical location and occupant behavior.

Within New York City, the building envelope is an especially important topic as buildings undergo an annual heating and cooling cycle due to variation of climate. This cycle is incredibly energy intensive and is one of the main reasons why buildings account for 70% of energy use in New York City.

Recent updates to energy codes continue the trend towards energy efficient building, with an increased emphasis on minimizing thermal loads and reducing heat flow through the building enclosure.

There are few fundamental sustainability recommendations pertaining to the design, construction and retrofit of the building envelope:

Site selection is a crucial first step in new construction. Optimizing site potential can be easily achieved by consideration of local climatic conditions and selection of proper construction materials. The design of the horizontal elements of the building envelope should encompass design alternatives to reduce the site's urban heat such as cool roofs, blue roofs or green roofs. New structures should be designed with integrated faÃ§ade systems that optimize daylight while minimizing energy consumption for heating, cooling, artificial lighting and peak electricity use. Window to wall ration should be optimized. Such systems can optimize energy savings of up to 60% for lighting, 20% for cooling and 26% for peak electricity.

Global revenue for energy efficiency in commercial and multi-unit residential buildings retrofits is predicted to grow from $68.2 billion in 2014 to $127.5 billion in 2023.

Existing energy codes emphasize increased levels of thermal performance for the building

enclosure. This includes increased R-value requirements, use of continuous insulation and tougher effective air leakage control requirements.

Commissioning of the building envelope can identify areas of concern related to air infiltration and leakage, moisture diffusion, surface condensation and water penetration. All of those issues ultimately compromise the building envelope integrity and negatively impact the building's energy performance and indoor environmental quality. LL11 and roof inspections can serve as initial opportunity to evaluate the building's envelope and its deficiency. Capital work should encompass implementation of energy saving materials and equipment.

Energy use in new and existing buildings can be optimized by using high R-value insulation in walls, installation of cool, blue or green roofs, installation of high performance windows, climate -appropriate solar heat gain coefficient and installation of energy efficient equipment. Highly reflective roofs can lower the roof surface temperature by up to 100 degrees, decreasing the amount of heat transferred into a building. According to IEA, windows account for the largest single source of energy loss in buildings. Window elements such as framing materials, glazing, coatings, spacers between panes of glass and low thermal conductivity are essential elements of overall window design. Using lighting sensors to control perimeter lighting is a simple solution to cut cost and preserve energy Integrating Photovoltaic Panels is another way to generate on-site renewable energy, which can also be sold back to energy providers. It is important to acknowledge that initially higher cost of upgrading existing mechanical and electrical equipment with more a durable and efficient one usually results in lower operating costs down the road. There are various incentives available for building owners in New York to reduce the cost of upgrades. Proper building waterproofing is essential yet often disregarded subject. Lack of water-tightness leads to building deterioration and significantly higher costs of repairs, which is often not reflected in capital budgeting and often leads to structural damage and disruption to normal operations. It is also important to mention that with any capital projects, selection of proper construction materials is essential.

Less than two years ago, Superstorm Sandy has exposed New York City's vulnerabilities, as well as tested our capabilities to withstand a natural disaster. Unfortunately, we now know that more resilient infrastructure and better building performance are necessary to avoid tragic consequences of what Mother Nature is now expected to throw at us every few years. Incorporating new design alternatives and innovative products has become the new norm. Flood mitigation systems are now becoming almost a necessary option when addressing the building's envelope.

Technology and building codes constantly change therefore working with knowledgeable professionals is a key factor in maintaining and managing real estate assets.

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