Climate Change is Controlling How We Build

With the effects of extreme weather, it is essential to build homes to a building envelope code

By **Don Neff**

Varying climate zones and weather patterns across the United States drive different building envelope solutions. It follows that building envelope designs, product selections and installation methods need to be responsive to these regional climate variations. Weatherproofing, insulation, eave projection and roof/wall reflectance are all part of a comprehensive solution. Product availability and pricing points of these assemblies for national production building clearly drive home affordability.

Climate change appears to be increasing the risk of storm damage and devastation in some areas. The kinetic energy of hurricanes, for example, increases with higher ocean surface temperatures. The hurricane activity around Florida with its warmer gulf stream is a natural result. Hawaii, on the other hand, experiences little hurricane activity due to the greater ocean depths and relatively cooler water temperatures.

Some may argue that global warming has intensified storm activity, raising a new and growing threat of wildfires. However, decades of questionable forest management practices have also contributed to this problem. Adapting to these changes and their impacts is a big challenge for builders but is essential to keeping people and communities safe.

Complicating this discussion is the urban heat island effect. Urban areas have inherently different microclimates than suburban and rural neighborhoods, resulting in higher temperatures from the concentration of concrete and asphalt surfaces, larger clusters of buildings, fewer landscaping elements and less air movement. By contrast, the evapotranspiration process of all living landscaping elements creates a natural cooling effect.

Climate zones are central to the International Energy Conservation Code (IECC). Climate zones dictate many of the energy efficiency measures that a building must include and are relevant to the building envelope. Climate zones are defined at the county level and are based on weather factors like winter and summer temperatures along with humidity and rainfall (to define the "dry" and "marine" sub-climates). The climate zone map has not changed since the 2003 IECC.

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Every three years, the International Code Council (ICC) updates the building codes in the IECC. Changes come from ICC staff, industry groups, government and the public. The IECC is the model energy code in the U.S., and updates to the 2021 edition were finalized by ICC in December 2020.

A weather barrier is an essential part of the building envelope. Choosing the right one for a particular project depends on many factors, including the building's design and climate zone. Weather, temperature, humidity and environmental conditions will affect the performance of the weatherproofing in terms of air and moisture movement as well as energy efficiency.

In colder climates, a well-sealed envelope means the home does not have weaknesses in the barrier between the indoors and outdoors that would invite drafts or leakages. The goal is to manage how quickly heat is lost or gained – controlled using appropriate building materials and techniques to establish and maintain an airtight and well-insulated building envelope.

In a warmer climate, where heat waves are present, outfitting buildings with more insulation and efficient cooling technologies is important. Green roofs and shade trees can help keep areas cool. Long eaves and proper orientation minimize exposure of wall assemblies to the sun's rays and lighter colors have higher wall reflectance. White reflective paint and specialized paint products can also enhance solar reflective performance. IBEC is the International Institute of Building Enclosure Consultants and is a resource for education, research and technical information in the field of building enclosures *(iibec.org)*; and has published a recent study on how to achieve higher solar reflectance with the resultant benefits of energy savings.

Common insulation materials currently on the market are fiberglass, mineral wool, glass wool, stone wool, polystyrene, polyurethane, cellulose and wood fiber. Each of these options has different qualities and attributes to consider for a particular location. But there are also other materials, such as aerogel, cork, cotton and straw. There are R-value compliance requirements by climate zone about different building components—for slabs on grade, walls above and below grade and roof assemblies. These are minimum standards that production builders will inherently design to maintain their competitive pricing position.

"In The Nature of Materials," by Frank Lloyd Wright (architect), and "Design with Nature," by Ian McHarg (landscape architect), can be reliable reference guides. Joe Lstiburek, Ph.D., PE, principal at Building Science Corporation and Betsy Petit, architect, have also both written extensively on this topic *(www.buildingscience.com)*.

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