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New Codes Push For Greener Buildings

A proposed law mandates stringent energy-efficiency standards. One construction technique, EIFS, would help building owners comply.

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Buildings have been identified as a major (if not the major) source of demand for energy and materials that produce by-product greenhouse gases. Slowing the growth rate of greenhouse gas emissions and then reversing it over the next 10 years is the key to keeping global warming to less than 1 degree Centigrade above today's level, according to Architecture 2030 and the 2030 Challenge. It will require immediate action and a concerted global effort. Yet there are hundreds of coal-fired power plants currently on the drawing boards in the United States. A staggering 76% of the energy produced by these plants will go to operate buildings.

The fact that buildings use a great deal of energy has not escaped the notice of the International Code Council (ICC), Washington, Proposed federal legislation calls for new buildings to meet tough energy-efficiency requirements.
which is the custodian of the single model building code for the United States. The ICC maintains 14 separate building codes for specific applications, including the International Building Code (IBC), the International Residential Code (IRC), the International Mechanical Code, the International Fire Code, the International Energy Conservation Code, and the International Existing Building Code.

The ICC earlier this year set a course to develop a new code addressing sustainability. The code will be known as the International Green Construction Code and will promote sustainability in buildings.

ICC’s public announcement stated, in part: “This new project...[will cover] traditional and high-performance buildings [and will be] consistent and coordinated with the ICC family of codes and standards.”

The ICC is becoming a dominant force in the mechanism to reduce energy consumption through the regulatory process. Another group involved in this effort is the American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE), Atlanta.

**What pending federal legislation could require**

The decision on what course of action the United States should take on climate change and global warming is being decided now. Pending federal legislation on climate control (the proposed American Clean Energy and Security Act of 2009) will establish new and more stringent requirements for energy efficiency. The proposed legislation, which is sure to pass, will necessitate embracing emerging technologies, improving existing technologies, and developing new technologies to meet the requirements of the proposed climate-control law.

The proposed energy-efficiency requirements will not be easy to meet. With the enactment of the law, all buildings must reduce energy use by 30%, comparable to a building designed and constructed using the baseline code. The proposed law stipulates that a 50% reduction in energy use, relative to the baseline code, must be met by Jan. 1, 2014, for residential buildings, and Jan. 1, 2015, for commercial buildings. A 5% additional reduction in energy use, relative to the baseline code, will become effective Jan. 1, 2017, for residential buildings, and Jan. 1, 2018, for commercial buildings. The requirements will apply every three years thereafter through Jan. 1, 2023, and Jan. 1, 2030, respectively.

These requirements will be difficult to meet, given the U.S. economy’s proclivity to use increasing amounts of energy. According to Mary Bell, senior quality manager at General Electric Inc., Fairfield, CT, and a member of the National Electrical Manufacturers Association’s Smart Grid Advisory Panel, “By 2030, energy usage is expected to grow by 30%, due to the increase in use of devices, most of which have not even been invented yet.”

The proposed law intends that its provisions will be enforced through the model building or baseline code. For residential buildings, this is essentially the 2006 International Energy Conservation Code published by the ICC. Commercial buildings must meet ASHRAE Standard 90.1–2004.

That’s not the end of it. If a successor code to the baseline codes provides a greater reduction in energy use than is provided for in the law, then the code, with the more aggressive level of energy savings, becomes the target with all building codes. The proposed law considers a successor code to be any code containing a high level of energy efficiency that is developed through a recognized consensus process, much the same as ICC codes.

The Secretary of Energy, Washington,
may establish a national building code energy-efficiency target for residential or commercial buildings that achieves greater reductions in energy use than the targets prescribed in the law. If the Secretary determines that such greater reductions in energy use can be achieved with a code that is lifecycle cost-justified and technically feasible, then the Secretary may establish a national building code energy-efficiency target for residential or commercial buildings. The successor code must achieve a reduction in energy use that is greater than zero but less than the targets previously prescribed.

Quick fixes, such as re-lamping and altering thermostat settings, can provide the energy savings initially specified in the law. Other additional savings may come from building occupant behavior, such as turning off lights and equipment when not in use. Even more savings will come from equipment trade out. However, these quick-hit solutions are limited. Substantial savings will need to come from larger investments in energy-saving equipment and solutions, many of which are still evolving or in development.

**EIFS industry studies wall cladding**

The real estate industry accounts for 40% of total energy use, according to the Dept. of Energy (DOE), Washington. This is a direct result of poor or improper building-envelope construction and temperature control. To this end, the DOE is involved in a landmark study with the EIFS Industry Members Association (EIMA), Morrow, GA, to compare the temperature and moisture control of various exterior wall claddings.

Exterior insulation and finish systems (EIFS) are multi-layered exterior wall systems for commercial buildings and houses. According to the DOE study, EIFS perform better than brick, stucco, and cement-fiber siding in tests measuring the key building-performance goals of energy efficiency, temperature control, and moisture control in mixed, coastal ASHRAE Zone 3 climates. In addition, EIFS offer more design flexibility than other cladding products.

Developed in Europe in the 1950s, EIFS were introduced in the U.S. almost 40 years ago. First used on commercial buildings, today, EIFS account for nearly 50% of the U.S. commercial exterior wall market.

EIFS typically consist of the following components:

- a durable, water-resistant base coat, which is applied on top of the insulation and reinforced with fiber glass mesh for added strength
- an attractive and durable finish coat—typically using acrylic co-polymer technology—which is colorfast and crack-resistant.

The results of a three-year DOE study conducted by researchers from Oak Ridge National Laboratory, Oak Ridge, TN, concluded that EIFS and drainage EIFS performed better than the other typical exterior claddings (e.g. brick, stucco, and cement-fiber siding) in moisture resistance and insulation. As noted in the study, an ideal energy-efficient building would feature a building envelope and wall system that balances outdoor and indoor air pressures, airflows, and heat and moisture loads. All too often, however, problems occur when there is an imbalance. For example, too much heat entering the wall system (called positive heat flux) requires a higher cooling load, while too much heat leaving the wall system (negative heat flux) has the opposite effect and increases the heating load. As a result, the HVAC system has to work harder and uses more energy.

A consequence of excess water vapor within a wall assembly is the increased possibility of condensation on cool surfaces within the wall cavity. Moisture and/or water also can enter the wall system through defects, poor design, and poor installation of interface materials. Uncontrolled moisture migration can result in significant material degradation if not adequately protected.

**Study finds the best wall configurations**

One of the goals of the study was to determine which wall configurations performed best at managing moisture infiltration. The results, again, show that EIFS performed best. Another result of the study illustrates that EIFS walls that used a liquid-applied, water-resistive barrier coating performed better in the study than exterior claddings with sheet-type membranes. In addition, EIFS walls with an exterior airspace ventilation, i.e. open at the top and bottom, performed better than walls with only venting, or those open only at the bottom.

Adding further validation to the study is EIFS inclusion in the 2009 IBC and IRC. These model building codes are the foundation for local building regulation around the United States and are a major influence on how buildings are constructed around the world. The action by the ICC validates EIFS as a product and as a process and removes the ambiguities in the interpretation of what EIFS are and how they are implemented into the building-code construction process.

The ICC action, during its Final Action Hearings in Minneapolis in September 2008, clearly show building officials' consensus that EIFS meets fire-resistance requirements and will safeguard the public health and general welfare through its energy-conservation properties.

One consideration that is overlooked with EIFS is its performance as a green product and system. A 2007 study by the National Institute of Standards and Technology, Gaithersburg, MD, shows that over the 50-year lifecycle of a building, the carbon footprint of EIFS is three times smaller than stucco and five times smaller than brick. The study took into account the five stages of the lifecycle of a building:

1. material extraction for the construction products
2. manufacturing of the products
3. transportation of the products
4. the construction and use of the project
5. the disposal/recycling/re-use of the disassembled building.

Today, when energy efficiency and being green are the new currencies for judging the performance of any type of building, taking another look at proven green, energy-efficient systems such as EIFS is a realistic response to almost unrealistic energy-efficiency requirements.

David A. Johnston is executive director of the EIFS Industry Members Association (EIMA), Morrow, GA. EIMA is a national, non-profit technical trade association comprised of leading manufacturers, suppliers, distributors, and applicators involved in the exterior insulation and finish systems industry.

For more information about EIFS, circle 4 or visit www.cbpmagazine.com