

# IMPLEMENTATION OF ENERGY CONSERVATION CODES AND THEIR IMPACT ON THE ROOFING INDUSTRY

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In the summer of 2001, the City of Chicago adopted the Chicago Energy Conservation Code. This new code addresses the design of energy-efficient building envelopes and installation of energy-efficient mechanical, lighting and power systems.

The new code's adoption was an unexpected event by many in the roofing industry. Many in the design community also complained that the City officials had not provided an adequate discussion of the code requirements in the design community.

One of the main reasons the Chicago Energy Conservation Code created controversy was its impact on the roofing industry. Due to concerns voiced by NRCA (National Roofing Contractors Association) and CRCA (Chicago Roofing Contractors Association), the City of Chicago postponed its original implementation date of January 1, 2002 to June 3, 2002. The implementation of portions of the code related to environmental requirements (roof membrane reflectance and emissivity) was later postponed again to September 3, 2002. At that time, City of Chicago modified some of the original requirements related to the roofing including requirements for roof membrane emissivity and reflectivity.

The Chicago Energy Conservation Code is primarily modeled after the International Code Council's (ICC) 2000 International Energy Conservation Code (IECC). ICC is the same organization that developed the 2000 and 2003 International Building Code. According to ICC, the International Energy Conservation Code has been adopted by 15 states nationwide (Arizona, Georgia, Idaho, Kansas, Michigan, New Hampshire, New York, North Carolina, Rhode Island, South Carolina, Texas, Utah, Virginia, West Virginia and Wisconsin). In addition to these states, 68 municipalities have also adopted the IECC. Several more adoptions by various municipalities are pending. (For a detailed adoption listing visit [www.iccsafe.org/cs/adoptions/adoption.html](http://www.iccsafe.org/cs/adoptions/adoption.html)).

It should be noted that unlike most building code requirements, the Chicago Energy Conservation Code and IECC requirements are not life safety or primary building performance requirements, rather their requirements are intended to conserve energy. Originally, Chicago Energy Conservation Code, incorporated added provisions that were aimed at improving environmental conditions as well. Improvements of the environmental conditions included reduction of the heat island effect. While the Chicago Energy Conservation Code is primarily modeled after the ICC 2000 IECC, its original version added an article titled,

"Urban Heat Island Effect." The framers of this code desired not only conserve energy, but also to "minimize the undesirable urban heat island effect," by requiring roofing surfaces to comply with certain levels of solar reflectance and emittance. These requirements caused the greatest concern to the roofing industry.

The Chicago Energy Conservation Code's original requirements for reflectance were similar, but not identical to that established by Energy Star for both low and medium sloped roofing systems. The solar reflectance required by the code for low slope roofs (those with slopes 2:12 or less) was 0.65 initially and 0.50 after 3 years. For medium slope roofs, (slopes of 2:12 to 5:12) the required reflectivity was 0.15 initially and 0.15 after 3 years. The City of Chicago also originally required the emissivity of 0.90 for roof coverings when tested in accordance with ASTM E 408.

These requirements severely limited the choices for roofing systems. For example, metallic roof surfaces including un-coated or clear-coated sheet metal roofing and aluminum pigment coatings do not meet the 0.90 emissivity requirements. Also, the only membranes that meet the reflectivity requirements for low-slope roofs are white color single-ply membranes, or traditional membranes with a white coating. Modified bitumen or built-up membranes with a white granular surface do not meet the original reflectivity requirements of the City of Chicago Energy Conservation Code for low-slope roofs.

Due to the concerns raised by some in the roofing industry, the City of Chicago revised the reflectivity and emissivity requirements as follows:

1. The emissivity requirements were omitted altogether.

2. Roof membrane reflectance requirements for low-slope roofs (2:12 or less) were reduced to 0.25 until December 31, 2008. After that date, the reflectance requirements will have to be consistent with the Energy Star requirements. At this time Energy Star's reflectivity requirements are similar to the original Chicago Energy Code requirements (0.65 when new and 0.50 after 3 years of service). Most white granule-surfaced membranes can meet the 0.25 reflectivity requirement. However, roofs with an asphalt glaze coat (black) or other roof membrane colors cannot meet this requirement.

3. Roof membrane reflectance for medium and steep roofs have been omitted. However, in the Authors' interpretation of the revised code, all medium and steep slope roofs should also meet Energy Star require-

ments after December 31, 2008. Please note that Energy Star's reflectivity requirements for medium and steep slope roofs are lower than that for low-slope roofs.

In the implementation of this new component of the City of Chicago Municipal Code, the City saw the need for additional review of plans submitted for permit and their compliance to this new Energy Conservation Code. The City has defined a new professional to complete this review of plans prior to issuing a building permit, a "Registered Energy Professional." During the building permit process, the Registered Energy Professional must rely on published data on products, including their reflectivity, to certify that the proposed products meet the Chicago Energy Conservation Code requirements. In addition, the Registered Energy Professional is responsible for evaluating the required roof insulation within the roofing system.

The City has offered a one-day course for review of the energy code requirements for each residential and commercial building types. By attending these courses, licensed architects, structural engineers and professional engineers become a "Registered Energy Professional." In the future, the City of Chicago may require certification through examination. However, plans for such certification process have not been published by the City.

#### The ICC Energy Conservation Code

As stated earlier, the Chicago Energy Conservation Code is primarily modeled after the ICC 2000 International Energy Conservation Code IECC. The City of Chicago adopted the IECC, revised it to become a chapter within the City of Chicago Municipal Code, and edited the tables and charts to be specific to the City of Chicago. It provides tables and requirements that are based on the climatic conditions for the City of Chicago. As discussed previously, the City of Chicago added the Urban Heat Island requirements to the IECC.

#### How Can These Codes Change the Way We do Business?

The implementation of Chicago Energy Conservation Code and IECC codes can impact the roofing industry in many ways. For example:

1. In the City of Chicago: Permit documents for re-roofing projects will require that the documents be reviewed and stamped by a "Registered Energy Professional." Currently, the City of Chicago requires that licensed architects, structural engineers and professional engineers are the only professionals than can become "Registered Energy Professionals." This excludes the roof consultant who is not also an architect or engineer, clearly having an impact on the roof consultant's ability to review and stamp documents for compliance to the code.

2. In the City of Chicago: Some of the code requirements will impact

the selection of roofing systems and limit choices for roof membranes.

In the case of Chicago Energy Conservation Code, stringent reflectivity and emmissivity requirements that will be incorporated as of January 1, 2009 will require the use of white color membranes or a white coating. Also excluded will be white granule modified bitumen roofs and gravel-surfaced built-up roofs.

3. The IECC Insulation requirements will likely result in a significant increase in the overall roofing system thickness. While this may not impact new construction, it may pose significant difficulties for re-roofing projects where increasing the height of the parapets, adjacent through-wall flashings, and roof penetrations will be required to accommodate greater thickness of insulation.

4. In some instances, a complete analysis of the building energy consumption will be required. While IECC clearly indicates that repair or replacement of one of the building components will not necessarily require that other building components be updated to meet the Code, there are instances when the Code does not allow the design of a building component (such as the roof) without an analysis of the entire building envelope, the mechanical systems and lighting. Such instances include those commercial buildings whose window-wall ratios exceed 50%. Once again, such requirements may not pose significant difficulties for design of new buildings. However, re-roofing of an existing building with over 50% window-wall ratio will require extensive information regarding the mechanical and lighting systems, and the building envelope. Gathering the information required for the analysis on a large building will be a costly task that will present several challenges to the design professional.

*"The new code's adoption was an unexpected event by many in the roofing industry."*

#### About the Authors

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