Technical Bulletin

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ASHRAE 90.1-2007, Alternate Compliance Paths for the Building Envelope

April, 2008

Complying with the Energy Code

ASHRAE 90.1 is in effect over much of the USA as the energy design standard for new commercial buildings and for residential buildings greater than 3 stories. For the building envelope, compliance can be accomplished using any one of five different methods. The alternative methods are briefly described in this technical bulletin. See the actual standard for complete details.

Prescriptive Building Envelope Option (installed R)

This option, perhaps the simplest method, provides tables, one for each of the 8 ASHRAE 90.1 climate zones. The tables contain "prescribed installed R values" for opaque elements, and other factors for glazing. The tables cover residential and non-residential (commercial), a variety of construction types, and various elements of the building envelope. If the prescribed R's are installed, for example above a roof deck or in a stud cavity with continuous insulation (if required) over the stud, the building envelope is deemed to comply.

Prescriptive Building Envelope Option (assembly U, C or F)

In each of the 8 climate zone tables, in addition to "installed R", thermal performance factors are listed including assembly U (wall above grade, roof, floor and door), C (wall below grade), and F (slab edge). The performance factors enable design flexibility or a form of "trade-off" from the prescribed "installed R" concept. The designer may demonstrate compliance with the standard by selecting from the standard's Appendix A an alternate construction that has a lower U, C or F-factor than the value listed in the tables. Or, for alternate assemblies that are not listed in the Appendix, compliance can be demonstrated by completing thermal performance calculations in accordance with Appendix A.

Building Envelope Trade-Off Option

This option treats envelope components as a system and allows the flexibility to make trade-offs between envelope components. In this method, some components of the building envelope may be increased in thermal performance while others may be reduced, provided the overall performance complies. In this option an "envelope performance factor" (EPF) is calculated for the proposed building. It must be less than or equal to the EPF of a budget building that is designed to comply with the prescriptive requirements.

Energy Cost Budget Method

This method is an alternate to the prescriptive methods and involves all building envelope components and building systems. In this method an "energy cost budget" is established for the building using simulation software such as DOE-2 BLAST or EnergyPlus based on a design that complies with the prescriptive requirements. Next, the proposed building design is analyzed, using the same software, to determine the "design energy budget". In the final analysis, the "design energy budget" may not exceed the "energy cost budget". Using this method, individual components may not comply with code prescriptions, but, other components compensate so that the design, as a whole, complies.

COM*check*

Another compliance option, although not explicitly listed in ASHRAE 90.1, is COM*check*. The software, developed by the U.S. Department of Energy, provides a highly flexible method to demonstrate compliance that is acceptable to many code jurisdictions. The envelope section enables tradeoffs between envelope components. The lighting section determines if the lighting design meets interior-lighting power limits. The mechanical section assembles a customized list of requirements applicable to the building systems and equipment.

References:

- ASHRAE Standard 90.1-2004, Energy Standard for Buildings Except Low-Rise Residential Buildings; American Society of Heating, Refrigerating and Air-Conditioning Engineers; Atlanta, Ga. ; ASHRAE 90.1-2007 edition available in the fall of 2007.
- Roof Insulation, Above Deck Prescriptive Requirements, Owens Corning Technical Bulletin, June 2007
- Continuous Insulation ("ci") Prescriptive Requirements, Owens Corning Technical Bulletin, June 2007
- U.S. Department of Energy, Frequently Asked Question Website, http://www.energycodes.gov/support/com_compliance_faq.stm

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