Considerations for green roofs

by Mark S. Graham

During the past several years, there has been increasing interest in the use of vegetative, green roof systems in the U.S. This follows years of use in some European countries. (For more information, see "Designing green roof systems: A growing interest," September 1994 issue, page 20.)

Although green roof systems are gaining popularity, there are few credible guidelines or requirements governing the design and application of green roof systems in the U.S.

Code requirements

The model building codes, *International Building Code* (IBC) and *NFPA 5000: Building Construction and Safety Code*, are largely silent on the topic of green roof systems. In fact, the only direct statement regarding green roof systems is in IBC's Chapter 16—Structural Design, where Section 1607.11.2.3—Landscaped Roofs indicates, "Where roofs are to be landscaped, the uniform design live load in the landscaped areas shall be 20 psf (0.958 kN/m^2). The weight of the landscaping materials shall be considered as dead load and shall be computed on the basis of saturation of the soil."

It can be interpreted that the model codes' prescriptive requirements for conventional roof coverings also may apply to the waterproofing layers of green roof systems. However, it is unclear whether the model codes' performance requirements are adaptable to green roof systems, particularly the codes' fire- and wind-resistance requirements.

Conventional roof systems sometimes are required to resist interior fire exposure and often are required to resist exterior fire exposure. Although designing green roof systems for interior fire exposure is readily possible, designing green roof systems for exterior fire exposure currently is impractical if not impossible. For a roof system to resist exterior fire exposure, the topmost surface of the roof system is critical. In green roof systems, the topmost surface often is grasses, plants, shrubbery or other organic matter, which are relatively highly combustible. Also, the combustibility of these media largely depends on their moisture contents—dryer materials generally will be more combustible than wetter materials.

Similarly, for wind resistance, the model codes require conventional roof systems to resist wind pressures based on design wind speeds. Also, the codes place restrictions on the use of loose roof surfacings, such as roofing aggregate and ballast, to prevent windborne debris during high winds. For green roof systems, though it is possible to design the waterproofing layer to be wind-resistant, it is difficult to design green roofs' surfacings to be wind-resistant, particularly when considering the codes' windborne debris restrictions.

Closing thoughts

Although interest and popularity of green roof systems is growing in the U.S., additional information and guidance regarding their use is necessary.

I encourage those manufacturers who are promoting green roof products and systems to consider the applicable building code issues and provide appropriate compliance guidance to designers and installers of green roof systems.

Also, I encourage FM Approvals and Underwriters Laboratories Inc., on which the roofing industry relies heavily for fire- and wind-resistance guidance, to begin to consider green roof systems and provide appropriate guidance to roofing professionals. A specific item needing to be addressed is whether existing test methods are appropriate for determining the fire and wind, respectively, waterproofing membrane layers covered with green roofing materials.

ASTM International's Subcommittee E06.71 on Sustainability currently is developing several standards that will apply to designing green roof systems. If you actively are involved with green roof systems, I encourage you to become involved in this ASTM subcommittee. Additional information is available on ASTM's Web site, www.astm.org.

NRCA also is developing a comprehensive manual addressing green roof systems, which is expected to be published late next year. Until this manual is published, NRCA suggests the waterproofing layer of green roof systems be designed and installed according to the guidelines contained in *The NRCA Waterproofing Manual*.

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