Unvented, conditioned attics

by Mark S. Graham

Ventilation of attic spaces is viewed by many in the roofing industry as a technical requirement for steep-slope roof assemblies and often is substantiated as being a building code requirement. But this viewpoint is changing.

Code change

During the International Code Council's (ICC's) 2003-04 code development cycle, the U.S. Department of Energy submitted and ICC accepted sweeping changes to ICC's energy-efficiency requirements, including a provision in the *International Residential Code* (IRC) allowing unvented attics, or "conditioned attic assemblies," in certain situations.

As a result, the upcoming 2006 edition of IRC will allow unvented, conditioned attics when the following four conditions are met:

1. No interior vapor retarders are installed on the ceiling side (attic floor) of the unvented attic space.

2. An air-impermeable insulation is applied directly to the interior underside of the structural roof deck. "Air permeable" is defined as ASTM E283, "Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen." An exception is permitted in the code's Climate Zones 2B and 3B (portions of southern California and Arizona) where the use of air-impermeable insulation is not required.

3. In Climate Zones 3 through 8, sufficient insulation is installed to maintain the monthly average temperature of the condensing surface above 45 F (7 C). These zones encompass all the U.S. except Florida and Hawaii and the southernmost portions of Alabama, Arizona, California, Georgia, Louisiana, Mississippi and Texas. The condensing surface is defined as either the structural roof deck or interior surface side of the air-impermeable insulation. For calculation purposes, an interior design temperature of 68 F (20 C) is assumed; exterior temperature is determined as the monthly average outside temperature.

4. In warm, humid locations, for asphalt shingle roof systems, a vapor retarder with a perm rating of 1 perm (57.4 mg/s•m^2•Pa) or less be installed on the exterior side of the structural roof deck. For wood shingle and shake roof systems, a ¼-inch- (6-mm-) thick minimum air space shall be provided between the underlayment and shingles or shakes. "Warm, humid locations" include all of Florida and specific counties in Alabama, Arkansas, Georgia, Louisiana, Mississippi, North Carolina, South Carolina and Texas.

Rationale

An extensive discussion of the rationale behind the unvented, conditioned attic concept was presented by Joseph Lstiburek, principal with Building Science Corp., Westford, Mass., at an education program held during the 2005 International Roofing Expo.

Advocates of the unvented, conditioned attics concept contend by moving the ceiling air and thermal barriers to the roof plane, better building airtightness can be achieved, and it takes a "whole house" approach to building moisture control. Also, for houses where air handler and ductwork systems are located in attics, the effect of ductwork air leakage is negated when systems are placed in conditioned attics. Such air leakage typically accounts for 10 percent to 20 percent of air handler flow. This also offsets the increased volume of conditioned space created.

Some roofing professionals criticize the unvented, conditioned attic concept. They contend the increased roof surface temperatures that result from nonvented deck substrates will cause premature roof system deterioration, particularly with bitumen-based roofing products, such as asphalt shingles. Although roof surface temperatures will be higher over unvented, conditioned attics, the amounts of these temperature increases are less than or equal to the amounts attributable to other readily identifiable sources, including building location, building orientation and roof surface color. For additional information, see "What's the value of ventilation?" March 2002 issue, page 20.

Closing thoughts

With the publication and implementation of IRC's 2006 edition, an alternative to conventional attic ventilation—unvented, conditioned attics—will be available.

NRCA maintains its longstanding recommendation to provide proper ventilation of attic spaces. However, NRCA is evaluating the unvented, conditioned attic concept and may consider revising its attic ventilation recommendations.

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