Monthly teleconference
March 2013

Technical Discussion

presented by

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FM Approvals' revision of FM 4470

- FM 4470 provides the basis for FM's classification of roof assemblies (e.g., 1-60, 1-90)
- Previous edition dated 1992 (April 1986)
- New edition published in June 2012 with an effective date of January 1, 2013

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Code requirements

IBC 2006 and previous editions

1504.3.1 Other roof systems. Roof systems with built-up, modified bitumen, fully adhered or mechanically attached single ply, through fastened metal panels and other types of membrane roof coverings shall also be tested in accordance with FM 4450, FM 4470, UL 580 or UL 1897

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Code requirements

IBC 2009 and IBC 2012

1504.3.1 Other roof systems. Roof systems with built-up, modified bitumen, fully adhered or mechanically attached single ply, through fastened metal panels and other types of membrane roof coverings shall also be tested in accordance with FM 4474, UL 580 or UL 1897

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Revisions to FM 4470

June 2012

- Adds NFPA 276
- Changes conditions of acceptance for wind uplift and hail damage resistance testing
- Adds alternative test methods for fastener corrosion resistance
- Changes to methods on how steel roof decks are evaluated
- Adds optional tests for dynamic puncture resistance, noncombustible core insulation and solar reflectance

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Revisions to FM 4470

Evaluation of steel roof decks

- Allowable stresses per AISI S100
- Deflection based upon 200 lb. point load
- Deck design based upon 0.7-mm-thick (< 22 ga.)
- Fasteners tested for “pull over” of the deck material
- Stress calcs. on decks and fastener heads; lower value controls

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Effective date

FM 4470, Section 1.6

- Effective date is December 31, 2012
- "…Products FM Approved under a previous edition shall comply with the new version by the effective date or else forfeit Approval…"

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So, what does all this mean?

- FM has re-evaluated pre-12/31/12 classifications:
  - Reduce deck span, increase deck thickness and/or grade (33 ksi to 80 ksi) to maintain wind rating and existing RoofNav number
  - Re-evaluate assemblies, lower wind rating and create a new RoofNav number
- FM classifications likely have changed

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Deck span limitations

22 ga. wide rib deck, spanning 6 ft. with fully-adhered roof membranes:

- 33 ksi deck limited to Class 1-165
- 80 ksi deck limited to Class 1-300

Mechanically-attached roof membranes have varying ratings based upon row spacing

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An example

Sika Sarnafil Roofing Technical Bulletin #08-12, dated December 19, 2012

System description:

S327 membrane, 9'6" row spacing, attached with XP/XPN fasteners at 6" o.c. to 22 ga. steel roof deck

Pre-12/31/12 wind rating:

120 psf

New wind ratings:

- 90 psf using 80 ksi steel deck
- 90 psf using 22 ga., 33 ksi steel deck and 6' membrane row spacing

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Suggestions

- Be careful!
- Work closely with manufacturers
- For current projects, notify and seek clarification from A/E/C, GC/CMs and/or building owners.

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TECH TODAY

Changes reduce some FM classifications

FM 4470 has been revised, resulting in different uplift resistance criteria

by Mark S. Graham

FM 4470

All products tested after Dec. 31, 2012, are required to satisfy the new standard's requirements

What this means

Proceed cautiously

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New requirements for air barriers

International Energy Conservation Code, 2012 Edition
(Climate Zones 4-8)

- ASHRAE 90.1-10 alternative (All Climate Zones)

International Green Construction Code, 2012 Edition
(All Climate Zones)

- ASHRAE 189.1-09 alternative (All Climate Zones)

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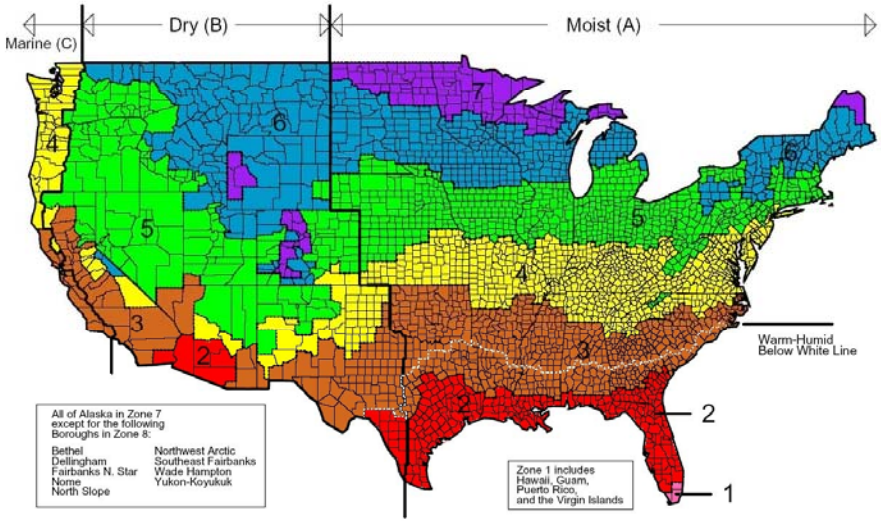
Climate zones

IECC 2012, Section C301—Climate Zones



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IECC 2012

Sec. C402.2-Air leakage (Mandatory)

- Materials:
  - 0.004 cfm/ft^3 (0.02 L/s·m^2) at 0.3 inches water gauge (75 Pa) using ASTM E2178
  - Deemed to comply options
- Assemblies:
  - 0.04 cfm/ft^3 (0.2 L/s·m^2) at 0.3 inches water gauge (75 Pa) using ASTM E2357, ASTM E1677 or ASTM E283
- Whole buildings:
  - 0.40 cfm/ft^3 (2.0 L/s·m^2) at 0.3 inches water gauge (75 Pa) using ASTM E779

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IECC 2012

Sec. C402.4.1.2.1-Materials

Deemed to comply options (roofing specific):

- SPF (closed cell), min. 1.5 pcf, min. 1½-inches thick
- Built up roof membrane
- Modified bituminous roof membrane
- Fully adhered single-ply roof membrane

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Roof systems requiring testing

- Mechanically-attached single-ply membranes
- Ballasted single-ply membranes
- Metal panels
- Steep-slope:
  - Asphalt shingles
  - Tile
  - Slate
  - Wood

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Survey of roof system manufacturers

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Preliminary conclusions

- New air barrier requirements applicable to "commercial" buildings
- Compliance may be a challenge
- Compliance may dictate roof system choices and detailing
- How will compliance be documented?
- Additional research and information is needed

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Interim recommendations

- Verify if IECC 2012 (or other requirements) is applicable
- The deemed to comply options provide some guidance for roof system selection.
- Details (transitions, joints, penetrations) are critical to performance
- Request for information
- Work closely with manufacturers
- Work closely with building officials

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TECH TODAY

Air barriers and the new energy code

IECC 2012's air barrier requirements could limit design options

by Mark S. Graham

The *International Energy Conservation Code,® 2012 Edition* (IECC 2012) includes a new requirement intended to limit air leakage through buildings' thermal envelopes, including roof assemblies. The requirements, a change from IECC 2009, will significantly affect the design and installation of certain roof assemblies.

IECC 2012

IECC 2012 Section C402.4—Air Leakage (Mandatory) requires all commercial (nonresidential) buildings, except those in climate zones 1 through 3, to include a continuous air barrier. Climate zones 1 through 3 include Alabama, Florida, Hawaii, Louisiana, Mississippi and South Carolina and portions of Arizona, Arkansas, California, Georgia, Nevada, New Mexico, North Carolina, Oklahoma, Tennessee, Texas and Utah.

The required air barrier is permitted to be located on the inside or outside of the building envelope, located within assemblies composing the building envelope and any combination thereof. The air barrier is required to be across all joints and assemblies comprising the building envelope. Air barrier joints and seams need to be sealed, including sealing transitions and changes in materials. Special provisions are provided for sealing recessed lighting fixtures, air barrier penetrations, doors and access openings, and outdoor air intakes and exhausts.

IECC 2012 provides the three compliance options for air barrier selection and evaluation: materials, assemblies or whole building testing. Using IECC 2012's materials option, a material with an air permeability no greater than 0.004 cfm/ft² under a pressure differential of 0.3 inches water gauge tested according to ASTM D2178, "Standard Test Method for Air Permeance of Building Materials," complies. Also, a number of specific materials—including minimum ½-inch-thick plywood or oriented strand board; minimum ½-inch-thick extruded polystyrene or foil-faced polyisocyanurate insulation or gypsum or cement board; cast-in-place and precast concrete; and built-up, polymer-modified bitumen and fully adhered single-ply membranes—are deemed to comply provided their joints are sealed and materials are installed as air barriers according to manufacturers' instructions.

The assemblies option allows assemblies of materials to comply with an average air leakage not to exceed 0.04 cfm/ft² under a pressure differential of 0.3 inches of water gauge when tested according to ASTM E2357, "Standard Test Method for Determining the Air Leakage of Air Barrier Assemblies"; ASTM E1677, "Standard Specification for An Air Barrier (AB) Material or System for Low-Rise Framed Building Walls"; or ASTM 283, "Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen."

The whole building option requires complete buildings be tested and the resulting air leakage rate not exceed 0.4 cfm/ft² under a pressure differential of 0.3 inches of water gauge when tested according to ASTM E7979, "Standard Test Method for Determining Air Leakage Rate by Fan Pressurization."

Considerations

Although certain roof system types, including built-up, polymer-modified bitumen and adhered single-ply membranes are considered deemed to comply with the new air barrier requirement, other roof system types will require additional testing to substantiate compliance. These include mechanically attached and ballasted single-ply membranes, metal panels and shingle-type roof coverings.

For some of these roof system types, it may be more practical to provide the necessary air barrier at or below the roof deck level by using a cast-in-place or precast concrete roof deck, spray foam below the roof deck or a gypsum board ceiling. IECC 2012 includes specific density and thickness requirements for closed and open-cell spray foam for it to be considered deemed to comply.

I recommend designers consult roof system manufacturers regarding how their specific roof system configurations function as air barriers according to IECC 2012's requirements. Also, roof system manufacturers should be consulted for specific penetration and perimeter sealing instructions to comply with IECC 2012's requirements. ●●●

MARK S. GRAHAM is NRCA's associate executive director of technical services.

ON the WEB

To see IECC 2012's climate zone map and obtain IECC 2012, log on to www.professionalroofing.net.

Did you KNOW?

More information about roofing-related requirements contained in IECC 2012 is available in Guidelines for Complying with Energy Code Requirements for Roof Assemblies: International Energy Conservation Code 2009 and 2012 Editions. To purchase the manual, go to shop.nrca.net.

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Questions

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