Technical Issues and Update

Mark S. Graham, NRCA Vice President of Technical Services

NRCA

Georgia code requirements

On October 1, 1991, the Uniform Codes Act became effective in Georgia. On July 1, 2004, this Act was revised to make the following eight construction codes mandatory as the Georgia State Minimum Standard Codes. Listed below are the code editions in effect as of January 1, 2016:

International Building Code	2012 Edition
International Residential Code	2012 Edition
International Plumbing Code	2012 Edition
International Mechanical Code	2012 Edition
International Fuel Gas Code	2012 Edition
International Energy Conservation Code	2009 Edition
International Fire Code	2012 Edition
National Electrical Code	2014 Edition

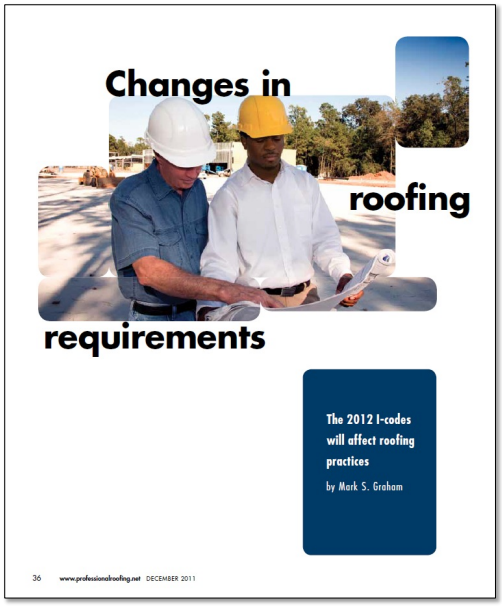
The Act requires local governments that elect to enforce these codes within their jurisdictions to adopt administrative procedures and penalties in order to locally enforce any of these mandatory codes.

The Act also made the following optional codes available for local government adoption and enforcement. Local governments choosing to enforce any of the below optional codes must adopt the code(s) they wish to enforce, as well as administrative procedures and penalties.

International Property Maintenance Code	2012 Edition
International Existing Building Code	2012 Edition
International Swimming Pool and Spa Code	2012 Edition
National Green Building Standard	2008 Edition

The Georgia Amendments are available at the below web link:

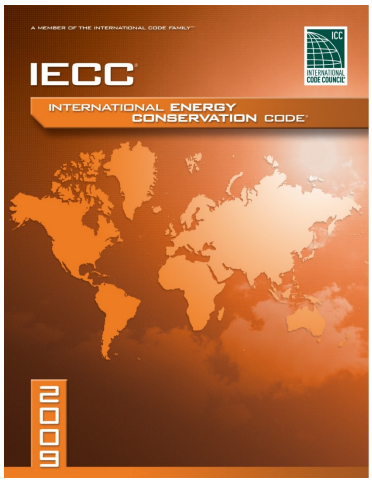
http://www.dca.state.ga.us/development/constructioncodes/programs/codeAmendments.asp



Professional Roofing,
December 2011

Link

International Energy Conservation Code, 2009 Edition (IECC 2009)



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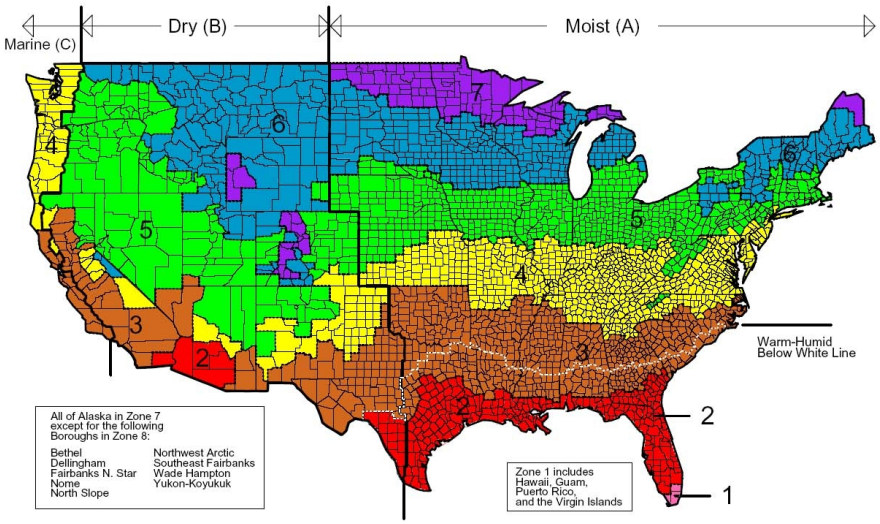
Climate zones

IECC 2012, Section C301 and Sec. R301—Climate Zones



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Roofing-specific adaptation of Table 402.1.1

International Energy Conservation Code, 2009 Edition (Residential buildings)

Insulation and Fenestration Requirements by Component[a]	
Climate zone	**Ceiling R-value**
1	30
2	
3	
4	38
5	
6	49
7	
8	
[a] R-values are minimums. … [Other footnotes omitted for clarity]	

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Roofing-specific adaptation of Table 502.2(1)

International Energy Conservation Code, 2009 Edition (Commercial buildings)

Opaque Thermal Envelope Assembly Requirements			
Climate zone	**Roof assembly configuration**		
	Insulation entirely above deck	**Metal buildings (with R-5 thermal blocks)**	**Attic and other**
1	R-15ci	R-19	R-30
2	R-20ci	R-13 + R-13	R-38
3			
4			
5			
6		R-13 + R-19	
7	R-25ci		
8			R-49

ci = Continuous insulation
LS = Liner system (a continuous membrane installed below the purlins and uninterrupted by framing members; uncompressed, faced insulation rests on top of the membrane between the purlins)

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Wind design for roof assemblies

Specifying a wind warrantee, in itself, is not proper wind design

Proper wind design

- Determine wind loads
  - IBC Ch. 16-Structural Design
  - ASCE 7-10, "Minimum Design Loads for Buildings and Other Structures"
- Design for resistance
  - FM 4474
  - UL 580 or UL 1897

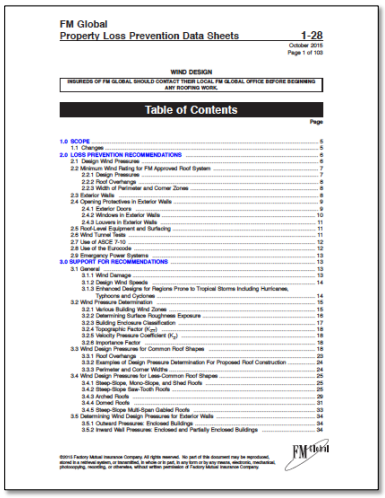
IBC requires (Sec. 1603) design wind loads to be shown in the Construction Documents

Design wind load determination

www.roofwinddesigner.com

FM 1-28 has been updated

www.fmglobaldatasheets.com



FM Global
Property Loss Prevention Data Sheets 1-28
October 2015
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WIND DESIGN

INSUREDS OF FM GLOBAL SHOULD CONTACT THEIR LOCAL FM GLOBAL OFFICE BEFORE BEGINNING ANY ROOFING WORK.

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- October 2015 update
- Based upon ASCE 7-05 with enhancements
- Reformatted
- Be cautious of FM-insured projects
- See *Professional Roofing*, March 2016

Professional Roofing, March 2016

TECH TODAY

A new consideration

FM 1-28 has been updated, further complicating wind designs

by Mark S. Graham

FM Global recently updated its Property Loss Prevention Data Sheet 1-28, "Wind Design" (FM 1-28). The data sheet provides general guidance to building designers regarding wind considerations for highly protected buildings insured by FM Global.

FM 1-28's revisions

The new edition of FM 1-28 is dated October 2015 and was first publicly distributed in late November 2015. The document's previous edition was published in April 2011.

FM 1-28 has been completely revised and reformatted and expanded. The current edition consists of 103 pages; the previous edition had 72 pages.

FM 1-28's wind design guidance continues to be based on ASCE 7-05, "Minimum Design Loads for Buildings and Other Structures," though FM 1-28 contains some enhancements that typically result in higher design wind pressures and recommended resistance ratings. Conversely, the 2012 and 2015 editions of the International Building Code® (IBC) reference ASCE 7s-2010 edition, which can result in notably different design wind loads from those derived using FM 1-28.

FM 1-28 typically results in higher design wind pressures and recommended resistance ratings

FM 1-28 recommends roof field, perimeter and corner design wind pressures be determined using the ratings calculator in FM Approvals' RoofNav℠ online application (www.RoofNav.com). FM 1-28's previous editions included specific calculation procedures and tables for determining design wind pressures.

Not included in FM 1-28's new edition is Table 8 from FM 1-28's previous edition, which provided FM Global's recommended resistance ratings based on design wind pressures. When determining recommended resistance ratings, FM 1-28 now directs users to multiply basic uplift pressures by the applicable pressure coefficients, apply a 2.0 safety factor and round up the resulting values to the next highest 15-pound-per-square-foot increment. This procedure likely will cause some user confusion. The RoofNav ratings calculator already includes the recommended safety factor and rounding.

FM 1-28's recommendations for roof overhangs have been reworked, and some roof overhang factors (Table 7) have been increased, which will result in higher design wind pressures at roof overhangs with roof slopes of 1.5:12 and greater.

FM 1-28's Section 3.7 Designing for Windborne Debris includes a specific calculation procedure for determining separation distances between buildings in locations prone to tropical storms where aggregate roof surfacings are used.

FM 1-28's Section 3.8 Roof-mounted Equipment adds guidance to determine resistance to uplift, sliding and overturning in high winds for rooftop equipment. The guidelines for roof-mounted equipment generally are consistent with ASCE 7-10.

FM 1-28's Appendix D Optional Guidance for Tornado-resistant Design and Construction provides optional guidance for important facilities that may warrant additional property protection in locations subject to tornadoes.

FM 1-28 and ASCE 7-10

FM 1-28 includes a discussion and example comparisons of the differences in design wind pressures using FM 1-28 and ASCE 7-10 (as well as IBC 2012 and IBC 2015).

FM 1-28 uses basic wind speeds based on a 50-year mean recurrence interval (MRI) and approaching a 100-year MRI along coastal areas, as well as an importance factor of 1.15 and recommended safety factor of 2.0. Conversely, ASCE 7-10's strength design method for components and claddings uses ultimate wind speeds based on 300-, 700- and 1,700-year MRIs.

ASCE 7-10 also provides a method for converting strength design method results to allowable stress design (ASD) method values, which are more comparable to FM 1-28's results.

FM 1-28 typically results in higher—sometimes notably higher—design wind pressures and recommended resistance ratings than those derived using ASCE 7-10's strength design or ASD methods.

Closing thoughts

The revision of FM 1-28 has resulted in changes to FM Global's recommendations to designers of highly protected buildings insured by FM Global.

Designers using FM 1-28 need to realize it typically results in higher design wind pressures and recommended resistance ratings than when using ASCE 7-10, IBC 2012 and IBC 2015. ●●●

ON the WEB

For a link to download FM 1-28 and example calculations comparing the differences between FM 1-28 and ASCE 7-10, log on to www.professionalroofing.net

MARK S. GRAHAM is NRCA's vice president of technical services.

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- Use RoofNav's ratings calculator
- Apply a 2.0 safety factor
- Roof overhang factors (Table 7)
- Windborne debris separation distances
- Roof-mounted equipment (ASCE 7-10)
- Tornado-resistant design (Appendix)

Comparing FM 1-28 to ASCE 7-05 and ASCE 7-10

Example: A manufacturing building located in New Orleans, LA. The building is an enclosed structure with a low-slope roof system and a roof height of 33 ft. The building is located in an area that is categorized as Exposure Category C.

Document	Basic wind speed (mph)	Design wind pressure (psf)		
		Zone 1 (Field)	Zone 2 (Perimeter)	Zone 3 (Corner)
FM 1-28 (without SF)	v = 120	43	72	108
FM 1-28 (w/ 2.0 SF)		86	144	216
ASCE 7-05 (without SF)	v = 120	38	63	95
ASCE 7-05 (w/ 2.0 SF)		76	126	190
ASCE 7-10 Strength design	v_{ULT} = 150	59	99	148
ASCE 7-10 ASD (without SF)	v_{ASD} = 116	35	59	89
ASCE 7-10 ASD (w/ 2.0 SF)		71	118	178

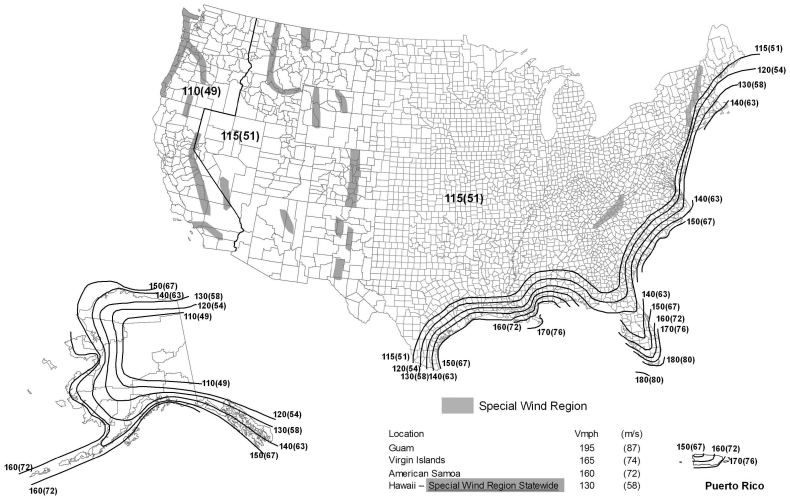
ASCE 7-16 (public review draft)

- Revised basic wind speed map
- Changes (and new) pressure coefficients
- Revised perimeter and corner zones

Expect higher field, perimeter and corner uplift pressures

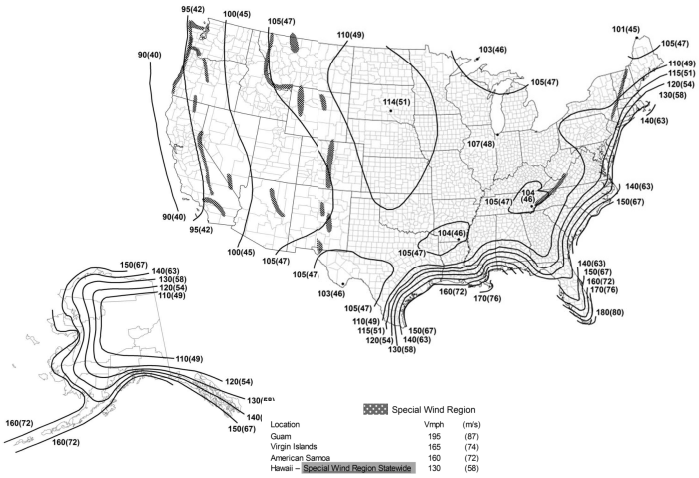
ASCE 7-10 basic wind speed map

Fig. 1607A--V_{ult} for Risk Category II Buildings



ASCE 7-16 (draft) basic wind speed map

Risk Category II Buildings



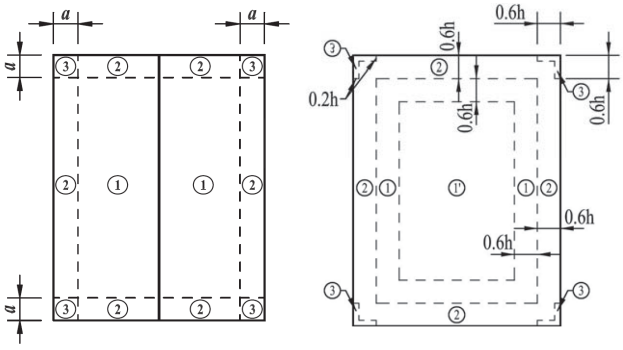
GC_p pressure coefficients

h ≤ 60 ft., gable roofs ≤ 7 degrees

Zone	ASCE 7-10	ASCE 7-16 (draft)
1’	--	-0.9
1	-1.0	-1.7
2 (perimeter)	-1.8	-2.3
3 (corners)	-2.8	-3.2

Zones

h ≤ 60 ft., gable roofs ≤ 7 degrees

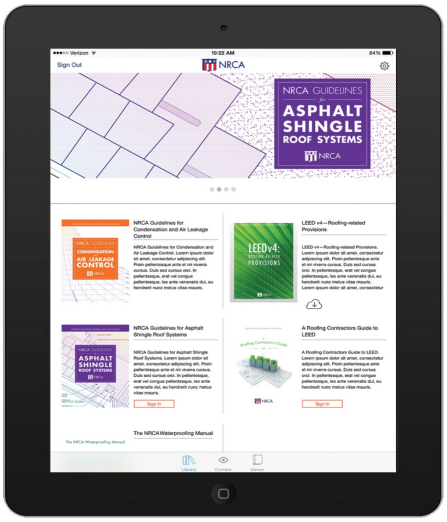


ASCE 7-10 **ASCE 7-16 (draft)**

Proper wind design is oftentimes avoided…
and it's only going to get more complicated

The NRCA Roofing Manual

NRCA App



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- iPhone App also available
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- The NRCA Roofing Manual is viewable to NRCA members
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Mark S. Graham
Vice President, Technical Services
National Roofing Contractors Association (NRCA)
10255 W. Higgins Road, Suite 600
Rosemont, IL 60018

(847) 299-9070
www.nrca.net
mgraham@nrca.net
Twitter: @MarkGrahamNRCA