

TEXAS DEPARTMENT OF INSURANCE

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Proposed Change to Windstorm Building Requirements or Procedures in the Texas Windstorm Insurance Association Plan of Operation

Name T. Eric Stafford _____ Date 6-6-06 _____
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Address 2038 Club Road _____ Fax No. 205-985-4375 _____
City, State, Zip Birmingham, AL 35244 _____

Please complete the following for each proposed change:
(A separate form must be submitted for each proposed change.)

1. Proposed change to the following building requirement or procedure:

Prescriptive methodology for hurricane resistant residential structures.

2. Proposed change is to:

Document 2003 International Building Code _____
Section R803.2.3, R803.2.3.1 _____
Table _____
Figure R803.2.3.1 _____
Appendix _____

3. Please use the following format to present the proposed change:

LINE THROUGH LANGUAGE TO BE DELETED UNDERLINE NEW LANGUAGE TO BE ADDED

4. Proposed Change. Please specify change. Attach additional sheets if needed.

Add new section as follows:

R301.2.1.1.1 Roof sheathing attachment. Wood structural panels used as roof sheathing for wood roof framing shall be attached in accordance with Section R803.2.3.

Revise Section as follows:

R803.2.3 Installation. Wood structural panels used as roof sheathing shall be installed with joints staggered ~~or nonstaggered~~ in accordance with Section R803.2.3.1 ~~Table R602.3(1), or APA E30~~ for wood roof framing or with Table R804.3 for steel roof framing in accordance with the applicability limits established in Section R804.1.1.

R803.2.3.1 Sheathing fastenings. Wood structural panel sheathing shall be fastened to roof framing with 8d ring-shank nails at 6 inches on center at edges and 6 inches on center at intermediate framing. Ring-shank nails shall have the following minimum dimensions:

1. 0.113 inch nominal shank diameter
2. Ring diameter of 0.012 over shank diameter
3. 16 to 20 rings per inch

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- 4. 0.280 inch full round head diameter
- 5. 2 inch nail length

Where roof framing with a specific gravity, $0.42 \leq G < 0.49$ is used, spacing of ring-shank fasteners shall be 4 inches on center in nailing zone 3 for 130 mph or greater design wind speeds in accordance with Figure R803.2.3.1.

Exceptions:

1. Where roof framing with a specific gravity, $0.42 \leq G < 0.49$ is used, spacing of ring-shank fasteners shall be permitted at 12 inches on center at intermediate framing in nailing zone 1 for any design wind speed and in nailing zone 2 for 110 mph or lower design wind speeds in accordance with Figure R803.2.3.1.

2. Where roof framing with a specific gravity, $G \geq 0.49$ is used, spacing of ring-shank fasteners shall be permitted at 12 inches on center at intermediate framing in nailing zone 1 for any design wind speed and in nailing zone 2 for 120 mph or lower design wind speeds in accordance with Figure R803.2.3.1.

3. Where roof framing with a specific gravity, $G \geq 0.49$ is used, 8d common or 8d hot dipped galvanized box nails at 6 inches on center at edges and 6 inches on center at intermediate framing shall be permitted for 100 mph or lower design wind speeds in accordance with Figure R803.2.3.1.

4. Where roof diaphragm requirements necessitate a closer fastener spacing.

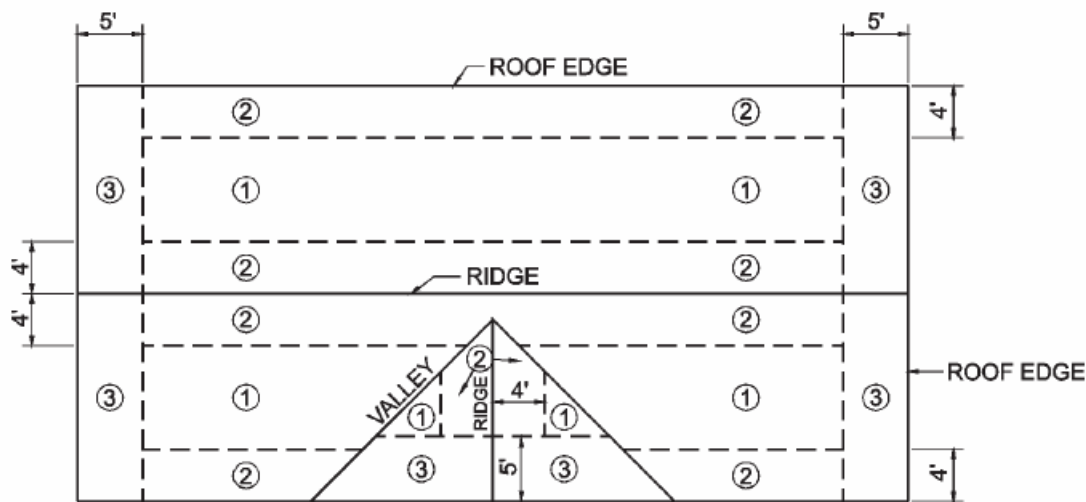


FIGURE R803.2.3.1
ROOF SHEATHING NAILING ZONES

5. Reason for Change. Please state purpose and reason for change. Attach additional sheets if needed.

Implementing this proposed modification will significantly improve the performance of roofs under the impact of hurricane winds. Reducing the potential for damage to roofs is essential to preserving the integrity of the building envelope. Obtaining a significant improvement in performance and doing so at basically minimal to negligible cost increase, provides a rather generous benefit-cost ratio.

The proposed change is based on a Factor of Safety (FS) of 2.0 for the panel as whole instead of the capacity of individual fasteners. The FS accounts for panel variabilities and adjustments for missing

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fasteners. It is based on hundreds of true panel tests conducted at Clemson University and Florida International University.

Based on the wind load provisions of ASCE 7 the design wind speeds at 33 feet height in hurricane-prone regions range from 90 to 150 miles per hour. These wind speeds are used to calculate design wind loads on a per square foot basis for Exposure C (open exposed areas) and Exposure B (built-up areas). The design process allows for adjustments to be made in calculating design wind pressures for gable roof overhang.

Design uplift pressures for roof sheathing on building with roof slopes greater than 2 in 12 will range as indicated by the examples below:

Extensive roof sheathing fastening tests at Clemson University (Reinhold 2000 – 2002, McKinley 2001) and at the International Hurricane Center – Florida International University (Reinhold, Alvarez 2003) have compared the Mean Failure Pressure in psf for roof sheathing panels using both the 8d common and the 8d ring shank nails spaced at 6 inches as prescribed by the Florida Building Code. Sheathing consisted of 5/8 inch thick plywood attached to nominal 2x4 Southern Yellow Pine rafters.

The results of these tests were as follows:

- (1) Mean ultimate uplift capacity for panels attached with 8d common nails at 6 inch spacing: 126 pounds per square foot
- (2) Mean ultimate uplift capacity for panels attached with 8d ring shank nails at 6 inch spacing: 292 pounds per square foot

This shows a 131% improvement in performance when 8d ring shank nails are used instead of the currently prescribed 8d common nails.

Using data from these tests and a design procedure (Reinhold 2002) to calculate the allowable design uplift pressure for roof sheathing using both types on nails the following results are obtained:

- (1) For 19/32 inch thick plywood sheathing using 8d common nails at 6 inch spacing: 58 psf
- (2) For 19/32 inch thick plywood sheathing using 8d ring shank nails at 6 inch spacing: 150 psf

These results show that the currently prescribed 8d common nail would only meet allowable design uplift pressures for some limited roof conditions, roof heights, and only up to wind speeds of 120 mph. In contrast these results show that sheathing attached with the proposed 8d ring shank nail would perform adequately under all roof conditions and heights, from 15 feet up to 40 feet, including gable ends in any exposure category.

The change proposed is consistent with the IBHS Guidelines for Hurricane Resistant Construction. This document is based on SSTD 10-99 and the IBHS Guidelines reflect updates to SSTD 10 to allow the use of the prescriptive solutions in higher wind speed areas.

This proposed code change will result in a negligible cost increase. A small cost increase of approximately \$8.00 to \$10.00 for a building with a 2000 square foot roof could result from using ring-shank nails as opposed to common nails.

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6. Attach supporting written or printed information, including, but not limited to, test data, structural calculations, and/or documentation that the proposed change complies with the minimum wind load criteria and design standards specified in the building requirements adopted by the Texas Department of Insurance. Attach supporting written or printed information relating to the proposed changes to the building requirements or procedures contained in the Texas Windstorm Insurance Association Plan of Operation.

Pursuant to Article 21.49, §6C of the Insurance Code, this proposal form must be complete and submitted to the address specified above not later than the 30th day before the date of a scheduled advisory committee meeting for the proposal to be considered at that meeting.

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