

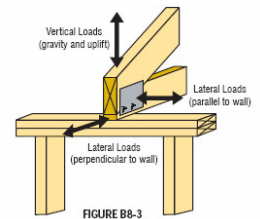
February 21 2007

Honorable Richard Luis
Administrative Law Judge
Minnesota Office of Administrative Hearings
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Minneapolis, MN 55401
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WTCA is submitting reply comments relating to the rules proposed by the Department of Labor and Industry on the 2006 Residential Building Codes (Minnesota Rules, Chapter 1309). The reply comments are in reference to the comments submitted under the title, Maple Grove Comment.

1. Definitions

The concern with semantics is the commenter's because he wants his specific requirements for connectors (not fasteners) to be understood for R802.10.5. The real concern should be for load and resistance, not a limitation on the method of providing the resistance. Fasteners and/or connectors are to be used as required. Common connectors used for uplift may provide adequate uplift resistance, but may not provide sufficient lateral resistance parallel and perpendicular to the bearing which is provided by typical fasteners, like toe-nails.



2. Reference to industry and building regulatory experts:

The language currently in the IRC-03 & -06 at R802.10.5 was proposed by Rick Davidson in 2002 (RB133-02).

RB133-02

R802.10

Proponent: Rick Davidson, representing the Minnesota Building Officials

Add new text as follows:

R802.10.5 Truss tie downs. Trusses shall be connected to wall plates by the use of approved connectors having a resistance to uplift of not less than 175 pounds (79.45 kg) and shall be installed in accordance with the manufacturer's specifications. For roof assemblies subject to wind uplift pressures of 20 pounds per square foot (0.958 kN/m² or greater, as established in Table R301.2(2), adjusted for height and exposure per Table R301.2(3). See Section R802.11.

Reason: One of the most important connections in the construction of a dwelling is the roof-to-wall connection. This amendment will result in a significant improvement in the ability of roofs to resist wind uplift, provide a more reasonable means to attach trusses to plates, and do so at a very minimal increase in cost. Building inspectors for years have complained that toe nailing trusses is an unacceptable means to achieve these connections which often result in splintered wood members with little uplift resistance. Many builders and homeowners already use these connectors on a regular basis. Similar approaches are used in other sections such as R502.6 for joist bearing (. . . by the use of approved joist hangers) and R802.3 for ridge board alternates (. . . to each other with a gusset plate as a tie).

RB133-02 was disapproved by the IRC-BE Committee.

Committee Action: Disapproved

Committee Reason: The truss manufacturer should specify the type of connection required for the truss.

The reason given misstates the code requirements. The Truss Manufacture is required to provide an uplift value on each Truss Design Drawing (R502.11.4 & R802.10.1), which value is then used by the builder, building designer or owner to determine the method of connection for approval by the building code official. The connection of the truss to bearing is the responsibility of others (prescriptively or engineered). The only connections specified by the Truss Manufacturer are:

1. Truss to truss
2. Truss ply to ply

3. Field splices

A comment in support of RB133-02 was provided by Patrick Parsley, City of Fairmont, representing MN Building Officials, which then brought RB133 to the Final Action Hearings.

Public Comment:

Patrick Parsley, City of Fairmont, representing the Minnesota Building Officials, requests Approved as Modified by this comment.

802.10.5 Truss tie-downs-to wall connection: Trusses shall be connected to wall plates by the use of approved connectors having a resistance to uplift of not less than 175 pounds (79.45 kg.) and shall be installed in accordance with the manufacturer's specifications. For roof assemblies subject to wind uplift pressures of 20 pounds per square foot (0.958 kN/m²) or greater, as established in Table R301.2(2), adjusted for height and exposure per Table R301.2(3). See section R802.11.

Commenter's Reason: At the hearings the committee sighted the responsibility for this connection should be with the manufacturer. Most Building Officials would probably disagree and place the responsibility with the truss designer. In the end neither the manufacturer nor the designer will consistently detail this connection unless it is a special situation thereby leaving the inspector to accept an inappropriate connection or design and require the appropriate anchor.

It is assumed that "standard practice" will suffice at this location. It is failing because the slanted nail connection is splintering the truss cord and compromising the truss stability and at the same time not providing an equivalent connection used for the conventionally framed roof which called for nails slanted into the plate for both the rafter and the ceiling joist.

This "common connection" for the engineered roof to the conventional wall framing should be delineated with the proper framing anchor in order to maintain the same structural integrity as expected in a conventionally framed roof. The anchor specified is already required in some jurisdictions in MN. The Building Official needs this code language to be able to enforce an adequate connection. Trusses are a relatively new system being integrated into existing code language. The code must keep up to the new technology and this is one of those necessary changes.

This modification also retitles this section to remove confusion with the truss tie-down section.

At the Final Action Hearing, RB133-02 was approved as modified by a public comment (AMPC) by the Assembly. The Assembly is made up of ICC Governmental Member Representatives (essentially code officials) in attendance, each of which has one vote on all eligible codes.

RB133 was disapproved by the industry experts on the IRC-BE committee but approved from the floor by building code officials, since there was no one present to speak against it.

This IRC requirement was deemed too restrictive by the Minnesota Structural Committee when it was originally discussed and then addressed in the January 18, 2005 Structural Committee Meeting (**Appendix E**). The following amendment was proposed by the Minnesota Structural Committee (a group of industry experts) as a reasonable alternative allowing the use of an appropriate connection to resist the stated load without bias:

1309.0602 SECTION 802, WOOD ROOF FRAMING.

IRC Section R802.10.5 is amended to read as follows:

R802.10.5 Truss to wall connection. Trusses shall be connected to wall plates by the use of approved fasteners or connectors having a resistance to uplift of not less than the value listed on the truss design drawings.

3. Availability of resistance values for toe-nailing:

As has been mentioned, uplift values for toe-nailed connections are provided by WTCA in BCSI B8 and prior to that in TTB Toe-nailing For Uplift Reactions. These values have been in use by builders and have been accepted by building code officials since 2000 when the TTB was first published. AF&PA has also made a toe-nailing design aid for common and box nails based on NDS[®]-97 and available for free.

(<http://www.awc.org/Publications/update/index.html>).

Appendix A – is the uplift table from the 2006 edition of BCSI - B8.

4. There is an assertion made that components designed by engineering methods require connection design by engineering methods:

Trusses are acceptable by the IRC (R502.11 & R802.10). The uplift connection requirements per Table R802.11 apply to both rafter (prescriptive) and trusses. There is no difference in the load requirement.

**TABLE R802.11
REQUIRED STRENGTH OF TRUSS OR RAFTER CONNECTIONS TO RESIST WIND UPLIFT FORCES_a.**

The empirical provisions for connections reflected in Table R602.3(1) are based upon tens of thousands to millions of structures that have been constructed using conventional light-frame construction methods throughout the country and have proven their reliability over time. Both rafter and truss construction have used toe-nailed connections in low wind areas for generations with great success. Reported failures are typically attributable to tornadic wind events that are beyond the scope of the code.

The design wind speed for MN is 90 mph (3 second gust). ASCE 7-05 provides the following background on the wind speed map (Figure 6-1) in the commentary:

The wind speed map of Fig. 6-1 presents basic wind speeds for the contiguous United States, Alaska, and other selected locations. The wind speeds correspond to 3-s gust speeds at 33 ft (10 m) above ground for exposure category C. Because the National Weather Service (NWS) has phased out the measurement of fastest-mile wind speeds, the basic wind speed has been redefined as the peak gust that is recorded and archived for most NWS stations. Given the response characteristics of the instrumentation used, the peak gust is associated with an averaging time of approximately 3 s. Because the wind speeds of Fig. 6-1 reflect conditions at airports and similar open-country exposures, they do not account for the effects of significant topographic features such as those described in Section 6.5.7. Note that the wind speeds shown in Fig. 6-1 are not representative of speeds at which ultimate limit states are expected to occur. Allowable stresses or load factors used in the design equation(s) lead to structural resistances and corresponding wind loads and speeds that are substantially higher than the speeds shown in Fig. 6-1.

...
The nonhurricane wind speeds of Fig. 6-1 were prepared from peak gust data collected at 485 weather stations where at least 5 yr of data were available [Refs. C6-12, C6-17, C6-18]. For nonhurricane regions, measured gust data were assembled from a number of stations in state-sized areas to decrease sampling error, and the assembled data were fit using a Fisher-Tippett Type I extreme value distribution. This procedure gives the same speed as does area-averaging the 50-year speeds from the set of stations. There was insufficient variation in 50-yr speeds over the eastern three-quarters of the lower 48 states to justify contours. The division between the 90 and 85 mi/h (40.2 and 38.0 m/s) regions, which follows state lines, was sufficiently close to the 85 mi/h (38.0 m/s) contour that there was no statistical basis for placing the division off political boundaries. This data is expected to follow the gust factor curve of Fig. C6-4 [Ref. C6-19].

According to data reported by the University of Minnesota (see below), the mean wind speed for the Minneapolis area is 10.9 mph. The maximum 2-minute wind speed occurred in May of 1998 and was 49 mph. The maximum 5-second wind speed was 64 mph and also occurred in May of 1998. The source summarizing climate data from 1971-2000 does not list a 3-second gust value comparable to ASCE 7.

http://climate.umn.edu/pdf/normals_means_and_extremes/2005_Annual_LCD_MSP_page_3.pdf

NORMALS, MEANS, AND EXTREMES

MINNEAPOLIS, MN (MSP)

| LATITUDE: | | LONGITUDE: | | ELEVATION (FT): | | TIME ZONE: | | WEAN: 14922 | | | | | | | |
|---------------|------------------------------|---------------|------|-----------------|-----------|-------------------|------|-------------|------|------|------|------|------|------|----------|
| 44° 52' 59" N | | 93° 13' 44" W | | GRND: 871 | BARO: 874 | CENTRAL (UTC + 6) | | | | | | | | | |
| ELEMENT | | FOR | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC | YEAR |
| WINDS | MEAN SPEED (MPH) | 56 | 10.5 | 10.3 | 11.3 | 12.3 | 11.3 | 10.4 | 9.5 | 9.3 | 10.0 | 10.6 | 10.9 | 10.2 | 10.6 |
| | PREVAIL. DIR. (TENS OF DEGS) | 37 | 31 | 31 | 31 | 36 | 14 | 14 | 15 | 14 | 18 | 31 | 31 | 31 | 31 |
| | MAXIMUM 2-MINUTE: | | | | | | | | | | | | | | |
| | SPEED (MPH) | 9 | 35 | 37 | 37 | 45 | 49 | 48 | 40 | 35 | 39 | 38 | 39 | 39 | 49 |
| | DIR. (TENS OF DEGS) | | 29 | 31 | 29 | 28 | 22 | 33 | 22 | 26 | 23 | 31 | 28 | 31 | 22 |
| | YEAR OF OCCURRENCE | | 2004 | 2002 | 2004 | 2000 | 1998 | 1998 | 1999 | 2000 | 2004 | 2001 | 2005 | 2004 | MAY 1998 |
| | MAXIMUM 5-SECOND: | | | | | | | | | | | | | | |
| | SPEED (MPH) | 9 | 47 | 47 | 49 | 59 | 64 | 60 | 52 | 46 | 48 | 47 | 49 | 52 | 64 |
| | DIR. (TENS OF DEGS) | | 32 | 33 | 32 | 28 | 26 | 29 | 21 | 26 | 23 | 29 | 28 | 31 | 26 |
| | YEAR OF OCCURRENCE | | 2004 | 2002 | 2000 | 2000 | 1998 | 2005 | 1999 | 2000 | 2004 | 2001 | 2005 | 2004 | MAY 1998 |

This information is presented to illustrate why empirical methods typically work – design load values tend to be based upon conservative parameters as do connection values.

5. Effectiveness of toe-nailing:

A State Farm Insurance sponsored publication is provided by the Maple Grove commenter. There are other sources of information that broaden the view of the effectiveness of toe-nailed connections. The fact that evidence can be provided regarding poor toe-nailing in the field does not negate the resistance value. If bad driving by a few drivers controlled the use of automobiles, their use would be banned. Rather than banning toe-nailing, the use of toe-nailing should be controlled or limited by reasonable and enforceable means. The preponderance of evidence that toe-nailing is effective is demonstrated by the many structures built using the practice in Minnesota and elsewhere over the last hundred or so years. Roofs are not randomly blowing off structures.

The comment in the Metal Plate Connected Wood Truss Handbook reference by the Maple Grove commenter has been responded to in an earlier comment by WTCA but is reproduced in **Appendix D** for the convenience of the Administrative Judge.

The summary provided in **Appendix B** provides some indication of the measure of safety in the design values of toe-nails (including the State Farm report) – from 2.84 to 4.30 for ultimate load divided by allowable load. Allowable design values for most strength properties for wood (i.e., bending, shear, compression, tension) have factors of safety of 2.1 -2.8.

Appendix C provides a proposal submitted for the upcoming ICC Final Action Hearings that provides a reasonable approach to the presentation of both uplift load values as well as a calibrated resistance value based upon the summary included in **Appendix B**.

6. Remarks related to MN Structural Committee Meeting:

Some of the remarks based on the January 18, 2005 Minnesota State Building Code Structural Advisory Committee provided by the Maple Grove commenter are generalizations. A copy of the official minutes is included in **Appendix E**.

Thank you in advance for your consideration.

Sincerely,

A handwritten signature in black ink that reads "Kirk Grundahl". The signature is written in a cursive, flowing style.

Kirk Grundahl, P.E.
Executive Director
WTCA - Representing the Structural Building Components Industry