



Why a Structural Boundary Member Between a Truss/Rafter is Not Optional

Blocking or boundary member?

In my experience traveling across the country observing wood-framed construction, it was apparent that east of the Rocky Mountains, structural wood members in-line with supporting walls between roof framing cease to be installed. Some may call these wood members blocking and deem them as optional. And often in a humid environment, installation of these members may be ardently resisted in order to provide ample attic ventilation and prevent mold growth. It is important, however, to understand that this blocking creates the structural boundary members for the roof diaphragm and it is not optional.

Tabulated allowable diaphragm lateral design loads contained in the building code, are based on testing of unblocked and blocked diaphragms (structural wood members used at intermediate sheathing edges to increase the shear load in the diaphragm). In all cases a boundary member around the perimeter of the diaphragm, where the shear is the highest, was utilized. The boundary member in these tested assemblies was a minimum 2x structural member that collected the load from the diaphragm through the fasteners in the edge of the diaphragm. When a boundary member is missing, what other key element is also missing? That's right, the fasteners! If a diaphragm boundary member and consequently sheathing fasteners are omitted, a weakened and unknown allowable roof diaphragm lateral load will exist.

Example

If the roof framing is spaced at 24 inches on center in the picture below, what is the fastener spacing in the direction of the shear load if there is no boundary member? Yep, pretty easy, 24 inches on center. So what is the diaphragm allowable load with fasteners spaced at 24 inches on center? The answer is unknown.



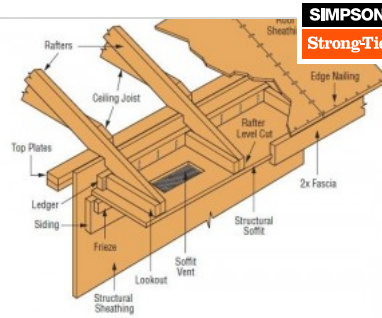
Roof Framing example

In addition to being a required structural member, the boundary member can be a big benefit when installed. There is an obvious direct connection between the roof diaphragm and lateral resisting system below (typically shearwalls) to transfer shear loads. Hurricane ties may be an alternative to transfer shear between the roof and wall, but the use of these connectors does not negate the need for the boundary member. Installing a boundary member will require additional detailing to attain the needed ventilation without compromising the structural integrity of the roof diaphragm.

Ventilation

Adequate attic ventilation can be developed through other detailing like holes and screens in the boundary member, orienting every third member horizontal, or gable end vents; but cannot be a reason for eliminating the diaphragm boundary member.

One possible method to eliminate the boundary member in-line with the wall below may be to soffit the eaves and provide a structural fascia board that will receive the diaphragm fasteners. Proper detailing, like shown below, and a structural soffit will be required to adequately transfer the shear in this method.

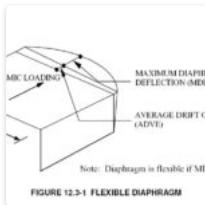


What are your thoughts? Let me know in the comments.

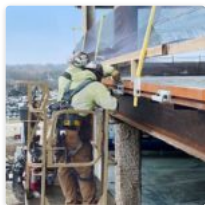
- Paul

What are your thoughts? [Visit the blog and leave a comment!](#)

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Author: Paul McEntee

A couple of years back we hosted a "Take your daughter or son to work day," which was a great opportunity for our children to find out what their parents did. We had different activities for the kids to learn about careers and the importance of education in opening up career opportunities. People often ask me what I do for Simpson Strong-Tie and I sometimes laugh about how my son Ryan responded to a questionnaire he filled out that day: **Q.** What is your mom/dad's job? **A.** Goes and gets coffee and sits at his desk **Q.** What does your mom/dad actually do at work? **A.** Walks in the test lab and checks things When I am not checking things in the lab or sitting at my desk drinking coffee, I manage Engineering Research and Development for Simpson Strong-Tie, focusing on new product development for connectors and lateral systems. I graduated from the University of California at Berkeley and I am a licensed Civil and Structural Engineer in California. Prior to joining Simpson Strong-Tie, I worked for 10 years as a consulting structural engineer designing commercial, industrial, multi-family, mixed-use and retail projects. I was fortunate in those years to work at a great engineering firm that did a lot of everything. This allowed me to gain experience designing with wood, structural steel, concrete, concrete block and cold-formed steel as well as working on many seismic retrofits of historic unreinforced masonry buildings. [View all posts by Paul McEntee](#)

13 thoughts on "Why a Structural Boundary Member Between a Truss/Rafter is Not Optional"



October 19, 2012 at 8:06 am

Excellent clarification of the function of blocking between rafters.
Herbert Birtelmer, P.E.
[Log in to Reply](#)

**Scott Headrick, P.E.**

October 19, 2012 at 8:23 am



That was a great article. I had a client that was an electrical engineer, and told me that he use to teach statics at a university and he didn't think that he needed to have blocking between the trusses on his ICF garage. I wish I could have had that article to send him, maybe that would have changed his mind. Ultimately I had to refuse to sign-off on his building.

[Log in to Reply](#)**Bryan Wert, MS, PE, SECB**

October 19, 2012 at 8:55 am

Simpson has the F-RBC flier available online at <http://www.strongtie.com/ftp/fliers.F-RBC10.pdf> that expands on code requirements for blocking (or structural fascia and detailing) with good information on attic ventilation as well

[Log in to Reply](#)**Tom Skaggs**

October 19, 2012 at 8:27 am

Excellent, I'm sharing w/ our helpdesk, I've taken a number of these inquiries.

Tom Skaggs (APA)

By the way, what load did it take to explode the bowling ball.

[Log in to Reply](#)**Paul McEntee**

October 19, 2012 at 9:18 am

Thanks Tom.



The bowling ball in the video exploded at 23 kips, so your guess was right on.

[Log in to Reply](#)**Tom Skaggs**

October 19, 2012 at 10:39 am

Complete and utter WAG...

[Log in to Reply](#)**Jimb**

October 19, 2012 at 9:29 am

Perfect. About time this tune got some air play. Guess I'm not alone out there!

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ToolPro



I agree

that the boundary blocking and nailing and out west here we do put the blocking in but we rarely get the roof sheathing nailed to it or the blocking attached to the wall plate. And what Building Official ever looks for it. The tar paper is already on when he visits.

On the

ventilation issue, it is a critical one and does need to be addressed and it should be address by the engineers, not the architects or building officials. Holes in the middle of the blocking will not work the way the Code requires the insulation to be installed at the eaves. I do a lot of forensic investigation and I will tell you that gable end venting alone does not solve the issue nor does just ridge vent. That low eave ventilation really makes a different in climate where the freeze/thaw is present. So a solution we (not just my Firm) have used is to add 2 "V" notches 3" wide cut with 45 degree sides evenly spaced in the top of the top of the blocking.

I have seen some call for 3 notches.

It takes a little more care on the roof sheathing nailer to get it properly nailed off outside of the notches but it can be done successfully. If you think about it, for

3 notches it would take 9" out of 22.5" leaving 13.5" of contact with the sheathing in 4 sections of over 3" each ((3 notches + 4 Surfaces)*3"=21"<22.5" gives 1.5" of play) which can take 1 nail each for a spacing of roughly 6" o.c. With 2 notches you can roughly get 4" o.c. If

one is concerned about splitting one can specify LSL Blocking.

Just some

thought from the field, would like to hear your thoughts on this idea or other ways of solving the issue of ventilation.

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NITTANYRAY

October 19, 2012 at 1:49 pm

We generally use the structural fascia board method.

Your H1 hurricane ties are the only commonly used tie that has a good horizontal F1 value.

Maybe if you increased the gage and added some nails you could come out with a H1A version that had uplift values equal or better than H2.5A.

If the overhang is not too long the fascia board should be close enough to the support to prevent twisting of the rafter or truss unless the diaphragm shear forces are very large.

On method to increase the diaphragm shear transfer is to nail a 2x flatwise on top of the sill plate (cut tight to fit) between the roof members.

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 SR_Eng

April 16, 2013 at 10:20 am

Do most engineers anchor the blocking to the top of wall also, or do they take the load shear through the truss connector?

[Log in to Reply](#)

 Nope

February 25, 2016 at 6:50 am

Nice article. Has anyone ever seen a roof fail because of missing boundary members, though?

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