Building Wall Panels: 5 Points You Should Know

by Steve Kennedy

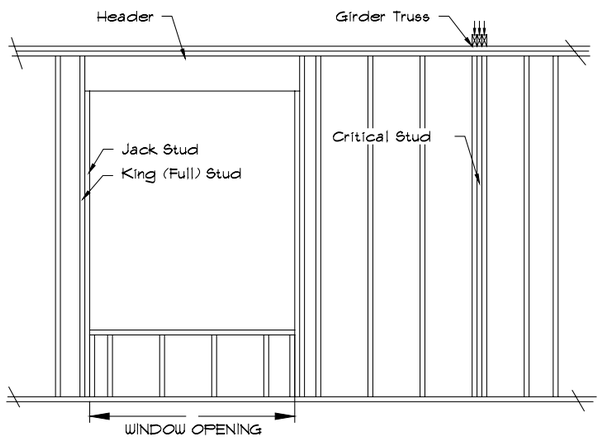
Over the last couple of years my company has done a lot of research on the best way to build a wall panel business. We saw an opportunity to provide another value-added product to our customers and wanted to make sure we learned as much as possible about building them. In my research, I've seen a lot of walls framed in the field. Based on what I've seen, I believe that a very high percentage of these would not pass a comprehensive code review. I am writing this article so that the same could not be said for your wall panels.

How would you answer these questions: Are you building your wall panels per the prescriptive requirements of the building code? Who in your operation is responsible for the details and what would happen if the building department red tags a wall panel as not meeting the code requirements?

The details for framing walls in the International Residential Code (IRC) are not always very clear and even when they are clear they may not be followed. One needs to be cautious when detailing wall panels to ensure they meet not only the requirements of the customer but also the building code.

Common Questions

Here are five specific panel manufacturing items that are commonly skipped over or misunderstood.



1. Do you know how many jack studs are required under a 6' window header on an exterior wall or how many full (king) studs are needed?
2. What about nailing? What on-center spacing is required if it's part of the braced wall line?
3. Do you know if that particular wall is part of the braced wall line?
4. Let's say the plans call out the braced wall lines or shear walls and specify 2" on center for the edge and 12" in the field using 10d nails. Do the nails your company uses in walls meet this? What is a 10d nail today?
5. How many studs should be placed under your girder trusses, and if this is questioned do you have backup information to provide to the building department?

This article will point you in the right direction on some of these questions to help keep you building to code.

You should already have a copy of the IRC or local codes and the Wood Frame Construction Manual (WFCM) in your reference library, especially if you're building walls. The IRC prescriptive requirements for wall framing have been a subject of intense scrutiny and revision since the 2003 version of the IRC. The 2009 version is by far the best version to date, so it is worthwhile to get a copy (as well as the one your local jurisdiction is using). The WFCM is a referenced standard in IRC and has much more detail as well as tables to make your job easier. You can get these through International Code Council's (ICC) and American Wood Council's (AWC) websites.

TABLE R502.5(1)
GIRDER SPANS[a] AND HEADER SPANS[a] FOR EXTERIOR BEARING WALLS
(Maximum spans for Douglas fir-larch, hem-fir, southern pine and spruce-pine-fir[b] and required number of jack studs)

GIRDERS AND HEADERS SUPPORTING	SIZE	GROUND SNOW LOAD (psf)[a]										
		30						50				
		Building width[c] (feet)										
		20		28		36		20		28		3(
		Span	NJ[d]	Span	NJ[d]	Span	NJ[d]	Span	NJ[d]	Span	NJ[d]	Span
Roof and ceiling	2-2×4	3-6	1	3-2	1	2-10	1	3-2	1	2-9	1	2-6
	2-2×6	5-5	1	4-8	1	4-2	1	4-8	1	4-1	1	3-8
	2-2×8	6-10	1	5-11	2	5-4	2	5-11	2	5-2	2	4-7
	2-2×10	8-5	2	7-3	2	6-6	2	7-3	2	6-3	2	5-7
	2-2×12	9-9	2	8-5	2	7-6	2	8-5	2	7-3	2	6-6
	3-2×8	8-4	1	7-5	1	6-8	1	7-5	1	6-5	2	5-9
	3-2×10	10-6	1	9-1	2	8-2	2	9-1	2	7-10	2	7-0
	3-2×12	12-2	2	10-7	2	9-5	2	10-7	2	9-2	2	8-2
	4-2×8	9-2	1	8-4	1	7-8	1	8-4	1	7-5	1	6-8
	4-2×10	11-8	1	10-6	1	9-5	2	10-6	1	9-1	2	8-2
	4-2×12	14-1	1	12-2	2	10-11	2	12-2	2	10-7	2	9-5

Table 1. Partial view of Table R502.5. For the full table as well as WFCM table 3.22F, go to the Support Docs for this issue at www.sbcmag.info.

1 Jack studs

Jack studs are installed to support the gravity loads carried by the header. The number of jack studs required can be found in IRC-06 Table R502.5(1) (see Table 1) or a similar table can be found in the WFCM table 3.22F. I suggest reviewing these tables and possibly making a more specific table with criteria that fits your area to make it easier for the technicians in your department.

STUD SIZE (inches)	BEARING WALLS					NONBEARING WALLS	
	Laterally unsupported stud height[a] (feet)	Maximum spacing when supporting roof and ceiling only (inches)	Maximum spacing when supporting one floor, roof and ceiling (inches)	Maximum spacing when supporting two floors, roof and ceiling (inches)	Maximum spacing when supporting one floor only (inches)	Laterally unsupported stud height[a] (feet)	Maximum spacing (inches)
2 × 3[b]	—	—	—	—	—	10	16
2 × 4	10	24	16	—	24	14	24
3 × 4	10	24	24	16	24	14	24
2 × 5	10	24	24	—	24	16	24
2 × 6	10	24	24	16	24	20	24

For SI: 1 inch = 25.4 mm.
a. Listed heights are distances between points of lateral support placed perpendicular to the plane of the wall. Increases in unsupported height are permitted where justified by analysis.
b. Shall not be used in exterior walls.

Table 2. Full view of Table R602.3(5) SIZE, HEIGHT AND SPACING OF WOOD STUDS[a]

2 King studs

King studs are installed to provide resistance to positive and negative wind pressure loads applied to the area of wall in which the opening (e.g., window or door) is located. The number of king studs that should be installed, however, is not as clear. Table R602.3(5) in the IRC says max spacing of studs is 24" on center. You'll need to extrapolate this; that is, take the number of full height studs that would have been placed within the area of the wall where the opening occurs and move them to each side. The WFCM Table 3.23C does this for you and takes advantage of the header location which may reduce the number of full-height studs required. (See Table 2 above.)

3 Braced walls

The braced wall requirements of the IRC have undergone lots of changes over the past several code cycles and building departments are starting to take note. If you're in an area that does not enforce these requirements, it's only a matter of time until they will. You should become familiar with the requirements of IRC section R602.10 along with the connection tables R602.3(1) and make sure your panels are in conformance. Since we typically cannot change wall lengths or window locations you should at least look out for where you're splicing the sheathing and the nailing requirements along with any blocking requirements. View www.sbcindustry.com/wallpanels.php for more information and resources about braced wall panels.

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ICC Revisiting Braced Wall Requirements

This provision in the IRC may soon be changed in a way favorable to component manufacturers. At the ICC Code Hearings in October, a provision was approved to allow the vertical sheathing joints within a braced wall panel to occur at the joint between two adjacent studs. (The current requirement is that the joints must occur over a common stud.) The ICC will vote on this provision at its upcoming Final Action Hearings in May 2010. Be sure to stay on top of these changes so that when they do adopt them you know what is required.

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4 All 10d nails are not created equal

The 2005 National Design Specification® for Wood Construction (NDS), another great reference book that you should have (can be purchased through the SBCA website at www.sbcindustry.com/pubs), shows three nails classified as 10d: a common 0.148" diameter by 3" long, a box 0.128" x 3", and a sinker 0.120" x 2.875". If the print does not specifically call out the diameter and lengths you will need to verify which nail is needed. It's also a good idea to have conversion options ready for the nails your guns will shoot. You will also want to make sure the nails you are using, if not specified, meet the minimum code requirements.

5 Critical Studs

The number of critical studs that should be under a girder truss or other point loads is a column design issue that is best answered by an engineer along with most of the questions above. One prescriptive method that is commonly used is to determine the column size (i.e., number of studs) based on the crushing of the plate material. You would take the total load of the girder or beam and divide it by the Fc-perp of the plate material (335 psi for SPF-south is often used for conservatism). Note that you need to check the bottom plate and the second top plate if they are different species. This calculation will give you the square inches of studs that are required to prevent the plate material from being crushed. Keep in mind that you cannot adjust the Fc-perp for duration of load or repetitive member bending. This prescriptive method also assumes that the built-up column is installed to support gravity loads only and that lateral loads applied to the surface of the wall are resisted by the standard full-height wall studs at the specified on-center spacing.

Staying informed will allow this fairly complex set of information to become less complicated. It will ensure that you take full advantage of today's code requirements, add value to your wall panel products, and assure you are in compliance with the IRC requirements. SBC

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