



STATE OF WISCONSIN

Department of Safety and Professional Services
1400 E Washington Ave.
Madison WI 53703

Governor Scott Walker

Secretary Dave Ross

Mail to:
PO Box 8935
Madison WI 53708-8935

Email: dps@wisconsin.gov

Web: <http://dps.wi.gov>

Phone: 608-266-2112

Frequently Asked Questions/UDC Wall Bracing Emergency Rules. Effective date of Emergency Rules April 1, 2014

1. What was the emergency necessitating the emergency rule provisions for wall bracing?

Some building designers, home builders, and regulatory officials performing permitting, plan review and inspections found the previous rules for wall bracing for one- and two-family dwellings were too difficult to understand and apply, which resulted in unnecessary costs and delays in home building. Promulgating revisions to the rules through the emergency rule process was needed in order to avoid these costs and delays as soon as possible. In addition, the report that the Dwelling Code Council is required to complete by July 1, 2014, under section 101.62 (4) of the Statutes is expected to include recommendations to clarify and simplify these rules through the emergency rule process.

2. Are additional resources available?

Yes, see the department's home page at the link below for a short video providing explanation of the meaning and use of the new provisions. There is also a non-mandatory compliance worksheet available for use and a 'Guide' on how to use the emergency rule provisions based on the compliance worksheet.

<http://dps.wi.gov/Home>

3. How long are the emergency rules in place and are permanent rules being developed?

The emergency rules with permissible extensions if approved could be in place until no later than December 26, 2014.

Yes, subsequent to the emergency rules the Uniform Dwelling Code Council proceeded to develop permanent rules which if approved through the rulemaking process could become effective as early as August 2014 and will clarify many items within the emergency rules and addressed within this FAQ document.

4. I am very comfortable using and complying with the current UDC Wall Bracing provisions. May I continue to use this method after the effective date of the Emergency Rules?

No, while the design wind pressure remains unchanged at 20 psf the new provisions are based on the 2012 International Residential Code (IRC) Simplified Wall Bracing Method.

The 2012 IRC Simplified Method (and prior 2009 IRC Wall Bracing Provisions) were the result of an Ad Hoc Wall Bracing Committee established by the International Code Council. This committee developed a rational design approach for wall bracing taking into consideration recent research and large scale testing by Simpson Strong Tie, National Association of Home Builders, and other industry stakeholders as well as several conventional wood frame whole house tests. In some cases the emergency rules may require slightly more bracing and the bracing to be distributed in different locations than what was required under the previous WI Uniform Dwelling Code wall bracing provisions while at the same time providing a simplified approach and greater flexibility to achieve code compliance.

5. **When reviewing plans and processing permit applications how does one determine which rules to apply?**

The 'code applies' date is the date upon which a valid permit application is received by the authority having jurisdiction. If received prior to the effective date the current wall bracing provisions OR the simplified method in the emergency rules may be used. If received after the effective date of the emergency rules the emergency rules shall be used to determine compliance with the wall bracing requirements

6. **Table 321.25-A The new stud height and spacing table doesn't appear to meet industry standards for deflection limits for some interior and exterior finishes, doors and windows, etc. is this a problem?**

The Table in the emergency rules does not include the conditions or limitations for its use and thus it is advisable to consider the impacts on product warranties, serviceability, durability, etc. which may be impacted by excessive deflection beyond industry standards. The Table has been revised to include design conditions and limitations for its use in the permanent rule package.

7. **Section 321.25(8)(a) and Figure 321.25-B How do the wall bracing provisions apply to methods of construction other than 'stick built' such as post frame, log homes, structural insulated panels (SIP's), insulated concrete forms (ICF's), etc.? How do you apply the wall bracing provision to a home with a walk out basement where some of the walls are concrete and other walls or portions thereof are wood-framed?**

SPS 321.25 (8) WALL BRACING. (a) General. Dwellings using wood-framed walls shall be braced in accordance with this section. Where a building, or a portion thereof does not comply with one or more of the bracing requirements in this section, those portions shall be designed and constructed in accordance with accepted engineering practice.

The code language above indicates the requirements only apply to wood-framed walls, ie stick built with studs max 24" o.c. Therefore other methods of construction must be designed per applicable adopted standards and accepted engineering practice.

Walk-out basement: The department considers a minimum 8" nominal thickness poured in place concrete basement wall as equivalent in lateral load/shear resistance to any of the allowable wood-framed wall bracing materials. To determine the required bracing for a walk out basement first draw a rectangle around the entire floor plan and projections as if

all of the walls are wood-framed. Determine the required bracing amounts per the chosen bracing material and method and then locate the bracing to meet the requirements of Figure 321.25-C. Any required braced wall panel locations that occur on a wall or portion of a wall that is actually of poured in place concrete construction is considered equivalent and that amount of bracing will count towards the minimum required amount and will not need to be provided in another location.

8. **Table 321.25-G Can bracing materials and methods be mixed & matched on the same floor level or from one floor level to the next?**

Yes, bracing materials can be mixed on any given rectangle side, within a story or from one story to the next. In addition, bracing methods either intermittent or continuous can be mixed within a story or from one story to the next. However, on any given rectangle side you cannot mix intermittent and continuously sheathed methods.

9. **Table 321.25-G and SPS 321.25 (8) (c) 6. require the interior side of all exterior walls to be sheathed with a minimum ½” gypsum wall board. Since portal frame wall panels are listed under Table 321.25-G, is it the intent to require drywall on the interior of Portal Frame braced panels?**

No. That is not the intent. Figure 321.25-A as referenced in Table 321.25-G for Portal Frame method in the cross section and construction details does not show ½” drywall on the interior of the Portal Frame braced panels. The intent for the PF is to follow the same exception as in Section R602.10.4 (exception 1) in the 2012 IRC.

10. **Table 321.25-G footnote ‘a’, Table 321.25-I footnote ‘e’, and Table 321.25-J footnote ‘d’. Are braced wall panels on a gable end wall required to be sheathed full height on the interior with ½” gypsum board where the wall extends above the ceiling and faces normally unfinished attic space on the interior of the dwelling?**

Yes, unless the required amount of bracing on the rectangle side is increased by the applicable 1.4 adjustment factor per Table 321.25-I footnote ‘e’ or Table 321.25-J footnote ‘d’.

11. **Tables 321.25-G, H, I, and J. On a gable end wall how do you measure the nominal wall height?**

When using Tables 321.25-G and H to determine the maximum allowable height and minimum width of a braced wall panel the wall height is measured from the bottom of the bottom plate up to the underside of the roof deck/diaphragm. If the height of the braced wall panel exceeds 12’ it can have a maximum height to width ratio of 2.5:1 which is clarified in the proposed permanent rule package.

When using Tables 321.25-I and J to determine the required amount of bracing the nominal wall height is measured to the top of the wall top plate at the bearing elevation of the roof structural assembly (trusses or rafters).

12. **Table 321.25-H Is linear interpolation allowed in this table?**

Yes. This has been clarified by adding a footnote to the Table in the permanent rule package.

13. Figure 321.25-A Does the portal frame design require 7/16" OSB or plywood on all sheathable surfaces?

It depends on the bracing method being used for that rectangle side. If using the intermittent method - No. If using the Continuously Sheathed method - Yes.

14. Figure 321.25-A, the first 2 lines under the heading indicate, depending on the extent of the header with double or single portal frame, that the portal frame counts as one or two braced wall panels (depending on width). Table 321.25-I footnote 'g' states the following braced wall panel conditions shall be permitted to be counted as one-half a braced wall panel toward meeting the required number of panels: (5) one PF panel complying with Figure 321.25-A. How do you count portal frame panels when determining how much bracing they provide towards meeting the minimum required amount?

Intermittent bracing method: Per Table 321.25-I footnote 'g' a single narrow portal frame panel at one side of the opening counts as one-half a braced wall panel. A narrow portal frame panel at each side of the opening would count as one full braced panel.

Continuously Sheathed bracing method: Table 321.25-J indicates the minimum required total length of continuously sheathed panels and Figure 321.25-A indicates the minimum required width of a narrow portal frame panel dependent upon the total wall height. The actual width of the portal frame panel in feet (16-24" per the figure) counts towards the minimum required total length of continuously sheathed panels determined from Table 321.25-J.

15. Figure 321.25-A Are oversize 2"x2"x3/16" plate washers still required for portal frame anchorage to concrete?

No the emergency rules do not require the oversized plate washers. The proposed permanent rules will again require the oversized plate washers for adequate anchorage of narrow portal frame braced panels.

16. 321.25(8)(c)7. allows balloon frame walls up to two floors in height but Tables 321.25-I and J do not permit extrapolation beyond 12' wall height. Are braced wall panels allowed on a two floor balloon frame wall and if so how wide must the panels be?

Extrapolation is prohibited in Tables 321.25-I and J so the provisions may not be used on a building of an overall larger size and height than indicated in the bracing amount tables. Balloon frame walls should be viewed as an exception for a portion of the overall structure not the whole building. If braced wall panels must be located on the balloon frame portion they shall have a maximum height to width ratio of 2.5:1.

17. Figure 321.25-B footnote 'b'. Can you define what is meant by enclosed plan offsets and projections? Is a screen porch classified or defined as enclosed?

There are definitions currently in the UDC that provide guidance on this topic. SPS 320.07(59m) definition of a "Porch" means an unenclosed exterior structure at or near grade attached or adjacent to the exterior wall of any building, and having a roof and floor.

SPS 320.07(10t) definition of a "Carport" means a structure used for storing motorized vehicles that is attached to a dwelling and has at least 2 sides completely unenclosed.

Carports are specifically exempted as are open structures such as decks. A deck is a porch without a roof. A screen porch with no enclosing walls of any height and no other construction other than the structural members necessary to support the roof and the screen itself will be considered an open structure that can be excluded from the rectangle.

18. Figure 321.25-B, Do rectangles have to abut at a wall line? Can it be a 100% interior wall line? How do you draw rectangles for homes with segments constructed at an angle or an attached garage at an angle to the dwelling?

Generally speaking, yes you want adjacent rectangles to abut at a common wall line which will be at least partially an interior wall line. It is permissible for rectangles to overlap but this will result in more bracing being required than if the rectangles did not overlap.

For guidance on drawing rectangles for homes with angled segments or attached garages at an angle to the dwelling see the added diagrams in the proposed permanent rule package which also provide a method for calculating the amount of bracing which can be attributed to an angled wall segment.

19. Tables 321.25-H, I, and J. If a dwelling has varying wall heights, wind exposure categories, opening heights, etc. on each rectangle side how are the requirements and Tables to be applied? Are the most restrictive requirements applied to the entire building, to each rectangle, each rectangle side or to each braced wall panel?

It depends on the requirement being considered. The prescriptive requirements are a simplified method which attempt to strike a balance between practicality, simplicity and ease of use versus specificity and complexity.

Tables 321.25-I and J Bracing Amounts.

When applying these tables you must use the most restrictive variables for wall height and floor levels for the rectangle being considered. If the wall heights and number of floor levels vary an alternative would be to draw the rectangles differently so that each rectangle encompasses constant conditions.

For wind exposure category you could have and use different wind exposure categories for each wind direction or use the most restrictive or worst case wind exposure when evaluating the required bracing in both orthogonal directions.

For eave to ridge height it should be determined using the roof structure located on the portion of the building with the greatest number of floor levels (ie highest walls).

Table 321.25-H

For braced panels located in walls of differing heights and with openings of differing heights the braced wall panel limitations are based on the context of its location and immediately surrounding conditions. So the minimum width of a braced wall panel may be determined based on then wall height and opening height where it is located.

- 20. Tables 321.25-I and J. On a dwelling with varying number of stories, roof bearing elevations and roof heights what eave to ridge distance must I use when applying the bracing amount tables?**

Generally, the most restrictive variables for the entire rectangle must be used when applying Tables 321.25-I and J to determine the required bracing amounts. The eave to ridge height of the roof with the highest roof bearing elevation and greatest number of floor levels must be utilized when applying the bracing tables. An alternative would be to draw additional rectangles for portions of the dwelling with fewer floor levels and lesser eave to ridge height.

- 21. Tables 321.25-I and J Are bonus rooms considered another floor level when applying the bracing amount tables? Do the walls associated with roof dormers create an additional floor level when applying the tables?**

No, a bonus room contained wholly within an attic truss does not create an additional floor level when applying the bracing amount tables since the tables are based on the wall surface area subjected to lateral wind load and not the vertical uniform live loads associated with a floor level. Similarly for a dormer, being only a small portion of the overall roof area the amount of wall surface can be considered negligible in most cases (except maybe a large shed dormer or a story and a half cape cod home) and the wind load applied as if it is roof surface.

- 22. Table 321.25-I in one case lists 1 braced wall panel as the minimum required but s. SPS 321.25 (8) (c) 2. says you can never have less than 2 braced wall panels, which is correct?**

Both. The Table lists 1 braced wall panel as the starting point for calculating the minimum number of braced wall panels required considering all of the adjustment factors in the footnotes that could apply. This allows a more accurate determination of the required amount of bracing without 'over bracing' when applying the footnote adjustment factors. If however, after applying the required adjustment factors the calculated number of braced wall panels is less than 2, SPS 321.25(8)(c)2. applies and the minimum number of braced panels on a rectangle side is 2.

The same logic applies to Table 321.25-J for the continuously sheathed method and the minimum required length of bracing and the minimum width of a CS braced panel per Table 321.25-H compared to the requirement of 321.25(8)(c)2.

- 23. Table 321.25-J, Eave-to-Ridge Height (feet) column: Should the numbers read, “0-10, 10-15, 15-20” or do you have to interpolate values for, say a 12-foot roof or an 18-foot roof?**

Per table footnote ‘a’ interpolation shall be permitted when using the table but is not required. If interpolation is not used, then if the eave to ridge height falls between two of the rows, the next highest value/row for eave to ridge height must be used. For example, if the eave to ridge height is 12’ the row for eave to ridge height of 15’ must be used to determine the required length of bracing.

- 24. Table 321.25-J, Do the adjustment factors in the footnotes apply cumulatively (as with intermittent)?**

Yes. This has been clarified in the proposed permanent rule package by adding a footnote to the table indicating the adjustment factors apply cumulatively.

- 25. Figure 321.25-C Where does the 21-foot spacing begin and end with a portal frame?**

Per Figure 321.25-A a portal frame whether consisting of one or two narrow panels has a maximum opening dimension of 18’ and therefore will automatically comply with the 21’ spacing requirement. If only one side of the opening has a narrow panel the opposite side is required to be either a wood structural panel (WSP) if using the intermittent method or a continuously sheathed wood structural panel (CS-WSP) if using the continuous method. Then, at the outer extent of the portal frame figure whether it is a narrow panel or standard braced wall panel you measure the 21’ away from portal frame from the outside edge of the panel in the figure to the outside edge of the next nearest panel.

- 26. Can a hole be made in a braced wall panel, and if so, are there restrictions on the location?**

Yes holes can be made in braced wall panels. There are no clear limitations within the emergency rules on size or location of what one might consider ‘small’ holes or penetrations in a braced wall panel. The rules do address large openings such as doors and windows as relates to minimum width of continuously sheathed braced panels per Table 321.25-H.

Designers or builders may wish to consult with an engineer to determine reasonable limits on openings and penetrations based on accepted engineering practice. Limitations on holes within a braced wall panel are contained in the proposed permanent rule package.

Wall Bracing Compliance Worksheet

Complete this worksheet or provide equivalent information on the plans submitted with the permit application.

Sketch and dimension the building plan and the wall bracing rectangle(s) per 321.25(8)(c)1. and Figure 321.25-B. Provide and label additional sketches if the building plan/rectangles change at different floor levels.

Indicate applicable Wall Bracing Method for each level (see Table 321.25-G), each labeled rectangle if more than one [see 321.25(8)(c)], and amount of bracing (# of braced panels or length of braced wall required) per the respective table (provide additional worksheets for additional rectangles as needed):

Rectangle: _____ Wall Ht. = _____ Eave to Ridge Ht. = _____ Max. Opening Ht. = _____ Wind Exp. = _____

Walls Supporting:	Intermittent method (LIB, DWB, WSP, SFB, GB, PCP) and # of panels per Table 321.25-I Min. panel width (Table 321.25-G) = _____		Continuous method (CS-WSP, CS-SFB) and total length required per Table 321.25-J Min. panel width (Table 321.25-H) = _____		PF Method (see Figure 321.25-A). Indicate number of PF panels 16-24" wide provided. Min. PF width (Fig. 321.25-A) = _____	
	Long side	Short side	Long side	Short side	Long side	Short side
Roof and ceiling only						
One floor, roof and ceiling						
Two floors, roof and ceiling						

Rectangle: _____ Wall Ht. = _____ Eave to Ridge Ht. = _____ Max. Opening Ht. = _____ Wind Exp. = _____

Walls Supporting:	Intermittent method (LIB, DWB, WSP, SFB, GB, PCP) and # of panels per Table 321.25-I Min. panel width (Table 321.25-G) = _____		Continuous method (CS-WSP, CS-SFB) and total length required per Table 321.25-H Min. panel width (Table 321.25-H) = _____		PF Method (see Figure 321.25-A). Indicate number of PF panels 16-24" wide provided. Min. PF width (Fig. 321.25-A) = _____	
	Long side	Short side	Long side	Short Side	Long side	Short side
Roof and ceiling only						
One floor, roof and ceiling						
Two floors, roof and ceiling						

PF Method: For Intermittent bracing, per Table 321.25-I footnote 'h', each PF panel (16-24" wide per Figure 321.25-A) counts as 1/2 of a braced wall panel when determining compliance with Table 321.25-I. For Continuously Sheathed bracing, the actual length of each PF panel (16-24" wide per Figure 321.25-A) in feet counts toward the required total length of bracing required. For intermittent or continuous methods, each PF panel meeting min. required width of Fig. 321.25-A counts as a braced wall panel when evaluating panel spacing per Fig. 321.25-C.

Indicate location of required braced wall panels determined above on each rectangle side as required by Figure 321.25-C.

TEXT OF RULE

SECTION 1. SPS 320.09 (5) (b) 2. d. is amended to read:

SPS 320.09 (5) (b) 2. d. The location and construction details of the braced wall lines wall bracing on each building side and floor level.

SECTION 2. SPS 321.02 (1) (c) is amended to read:





SPS 321.02 (1) (c) *Wind loads.* Dwellings shall be designed and constructed to withstand either a horizontal and uplift pressure of 20 pounds per square foot acting over the surface area or the wind loads determined in accordance with ASCE 7-05, Minimum Design Loads for Buildings and Other Structures.

SECTION 3. SPS 321.02 (1) (c) (Note) is created to read:

SPS 321.02 (1) (c) Note: ASCE 7-05 allows for substantial reduction from 20 psf as applied to the surface area.

SECTION 4. SPS Table 321.25-A is amended to read:

**Table 321.25-A
SIZE, HEIGHT AND SPACING OF WOOD STUDS^{a,c}
(Partial Table)**

Nominal Stud Size (inches)	Maximum Laterally Unsupported Stud Height ^a (feet)	Bearing and Exterior Nonbearing Walls				Interior Nonbearing Walls	
		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)	Maximum Laterally Unsupported Stud Height ^a (feet)	Maximum Spacing (inches)
2x6	10 ^b 12 ^d	 24	 24	 16	 24	20	24

^cAll spacing dimensions are to the center of the studs.

^dUnless supported by structural analysis, use of stud heights that range from over 10 feet to 12 feet is limited to where all of the following conditions are met: snow loads do not exceed 25 psf; tributary dimensions for floors and roofs do not exceed 6 feet; spans for floors and roofs do not exceed 12 feet; eave projections do not exceed 2 feet; the bending modulus of elasticity is at least 1,600,000 lb per square inch; the allowable fiber stress in bending for the wood is not less than 1310 psi as determined by multiplying the AF&PA NDS tabular base design value by the repetitive use factor, and by the size factor for all species except southern pine; utility, standard, stud, and No. 3 grade lumber of any species is not used; and the allowable deflection does not exceed whichever of the following are applicable:

Interior walls and partitions – span height/180.

Exterior walls with plaster or stucco finish – span height/360.

Exterior walls with other brittle finishes – span height/240.

Exterior walls with flexible finishes – span height/120.

Exterior walls with interior gypsum wallboard finish – span height/180.

Any manufacturer-specified limits for any included windows or doors.

SECTION 5. SPS 321.25 (7) (d) and (8) (a) (Note) are amended to read:

SPS 321.25 (7) (d) Cripple walls with a stud height of 14 inches or greater shall be braced in accordance with sub. (8) ~~or (9)~~.

(8) (a) Note: Acceptable engineering wall bracing practices include any of the following:

1. The provisions under s. section R602.10 or R602.12 of the International Residential Code (IRC) – 2009 2012.
2. Design in accordance with the engineering basis of the 2012 IRC bracing provisions, such as described in Crandell, J. and Martin, Z., “The Story Behind the 2009 IRC Wall Bracing Provisions (Part 2: New Wind Bracing Requirements),” Wood Design Focus, Forest Products Society, Peachtree Corners, GA, Spring 2009.
3. Installation instructions from the manufacturer of the bracing product that are compliant with section SPS 321.02.

SECTION 6. SPS 321.25 (8) (b) and (c), Tables 321.25–G to 321.25–J, and Figures 321.25–A to 321.25–C are repealed and recreated to read:

SPS 321.25 (8) (b) *Bracing materials and methods.* Wall bracing shall consist of the materials and methods listed in Table 321.25–G or approved alternatives capable of providing the required wind load resistance as determined in accordance with s. SPS 321.02 (1) (c).

**Table 321.25-G
BRACING METHODS^{a, f}**

Material	Minimum Brace Material Thickness or Size	Maximum Nominal Wall Height ^b	Minimum Braced Wall Panel Width or Brace Angle	Connection Criteria	
				Minimum Fasteners	Maximum Spacing
Intermittent Bracing Methods					
LIB ^c Let-in bracing	1x4 wood brace (or approved metal brace installed per manufacturer instructions)	10'	45° angle and maximum 16" o.c. stud spacing ^b	2-8d common nails or 3-8d box nails (2 3/8" long x 0.113" diameter)	Per stud and top and bottom plates ^e
DWB Diagonal wood boards	3/4" (1" nominal) for maximum 24" o.c. stud spacing	10'	48"	2-8d box nails (2 3/8" long x 0.113" diameter) or 2 - 1 3/4" long 16-gage staples	Per stud and top and bottom plates ^e
WSP Wood structural panel	3/8" for maximum 16" o.c. stud spacing; 7/16" for maximum 24" o.c. stud spacing	10'	48"	6d common nail or 8d box nail (2 3/8" long x 0.113" diameter); or 7/16"- or 1/2"-crown 16-gage staples, 1 1/4" long	6" edges, 12" field (nails) 3" edges, 6" field (staples)
SFB Structural fiberboard sheathing	1/2" for maximum 16" o.c. stud spacing	10'	48"	1 1/2" long x 0.120" diameter galvanized roofing nails or 1"-crown 16-gage staples, 1 1/4" long	3" edges, 6" field
GB Gypsum board (installed on both sides of wall)	1/2" for maximum 24" o.c. stud spacing	10'	96"	5d cooler nails, or #6 screws	7" edges, 7" field (including top and bottom plates)
Continuous Sheathed Bracing Methods					
CS-WSP ^d Continuous sheathed WSP	3/8" for maximum 16" o.c. stud spacing; 7/16" for maximum 24" o.c. stud spacing	12'	Refer to Table 321.25-H	Same as WSP	Same as WSP
CS-SFB ^d Continuous sheathed SFB	1/2" for maximum 16" o.c. stud spacing			Same as SFB	Same as SFB
Narrow Panel Bracing					
PF Portal frame	7/16"	12'	Refer to Figure 321.25-A	Refer to Figure 321.25-A	Refer to Figure 321.25-A

^aThe interior side of all exterior walls shall be sheathed with minimum 1/2-inch gypsum wallboard unless otherwise permitted to be excluded by this subsection. All edges of panel-type wall bracing, except horizontal joints in GB bracing, shall be attached to framing or blocking.

^bThe actual measured wall height shall include stud height and thickness of top and bottom plates. The actual wall height shall be permitted to exceed the listed nominal values by not more than 4 1/2 inches. Tabulated bracing amounts in s. SPS 321.25 (8) (c) are based on a 10-foot nominal wall height for all bracing methods and shall be permitted to be adjusted to other nominal wall heights not exceeding 12 feet in accordance with footnotes to Table 321.25-I or Table 321.25-J.

^cLIB is not permitted for walls supporting a roof and two floors. Two LIB-braces installed at a 60° angle from horizontal shall be permitted to be substituted for each 45° angle LIB brace.

^dBracing with CS-WSP and CS-SFB shall have sheathing installed on all sheathable surfaces above, below, and between wall openings.

^eShall be attached to the top and bottom plates and any intermediate studs, in one continuous length.

^fEach braced panel may contain no more than one hole, having a maximum dimension of no more than ten percent of the least dimension of the panel, and confined to the middle three-fourths of the panel.

Table 321.25-H^{a, b}

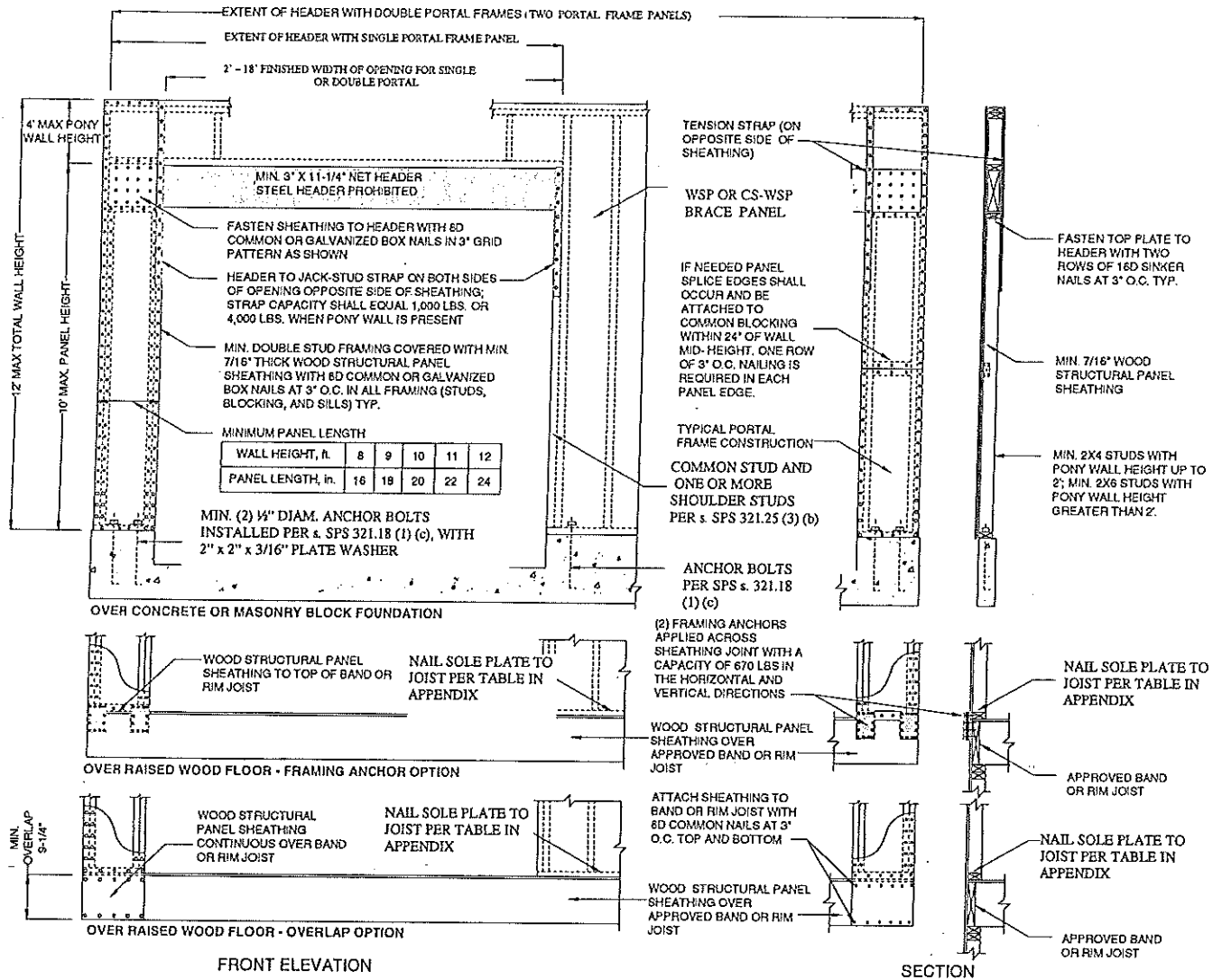
MINIMUM WIDTHS OF CS-WSP AND CS-SFB BRACED WALL PANELS

Maximum Opening Height Adjacent to Braced Wall Panel	Minimum Width of Full-Height Braced Wall Panel (inches)			
	8' Tall Wall	9' Tall Wall	10' Tall Wall	12' Tall Wall
5'- 4"	24	27	30	36
6'- 8"	32	30	30	36
8'	48	41	38	36
9'	-	54	46	41
10'	-	-	60	48
12'	-	-	-	72

^aSheathing shall extend from the top of the top plate to the bottom of the bottom plate and may be multiple sheets. All joints shall be blocked.

^bInterpolation is permitted.

Figure 321.25-A
PF – PORTAL FRAME BRACE CONSTRUCTION



Note: Steel headers are permitted if designed by structural analysis.

Note: As shown in the above cross-section, 1/2-inch gypsum wallboard is not required on the interior side of the wall.

(c) *Bracing amount.* Bracing methods and materials complying with Table 321.25-G shall be applied to walls in accordance with all of the following requirements:

1. For the purpose of determining bracing amounts, the outermost extents of the building plan at each floor level shall be circumscribed with a rectangle to define the overall length of each building side as shown in Figure 321.25-B.
2. In no case may the amount of bracing be less than two braced wall panels on walls parallel to each rectangle side for each floor level of the building.

3. Where used, the number of intermittent brace panels applied to walls parallel to each rectangle side shall comply with Table 321.25-I.

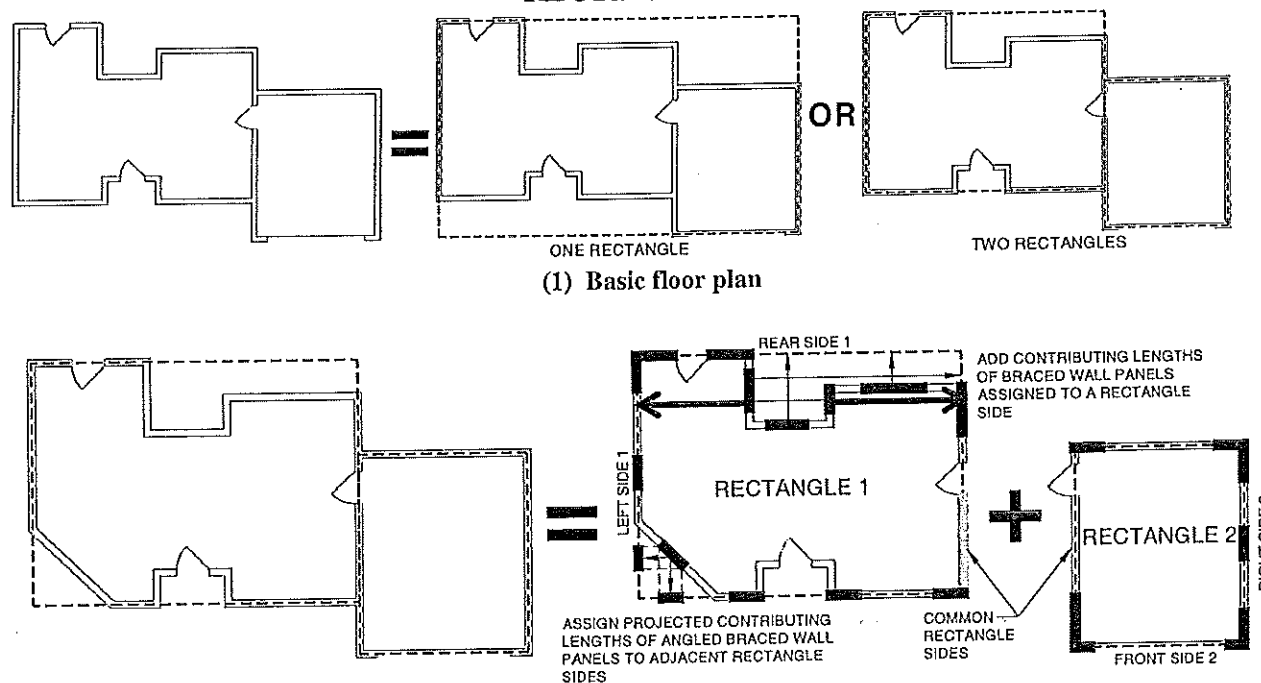
4. Where used, the total length of continuous sheathed brace panels applied to walls parallel to each building side shall comply with Table 321.25-J.

5. The location of brace panels applied to walls parallel to each building side shall comply with Figure 321.25-C.

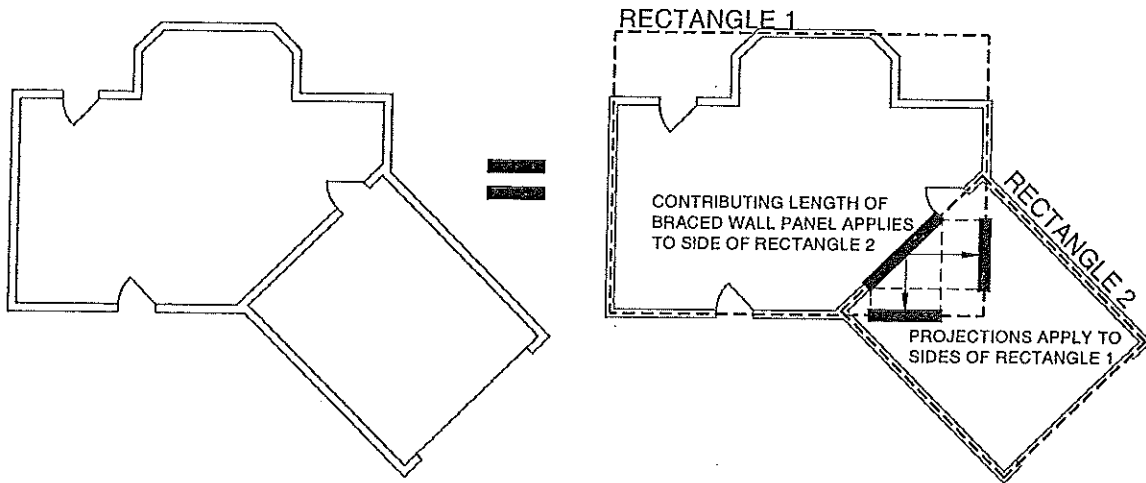
6. Balloon-frame walls may be no longer than 21 feet and shall have a maximum height of two floors unless constructed in accordance with an approved design. Wall framing shall be continuous from the lowest floor to the wall top plate at the roof. All edges of sheathing shall be supported on and fastened to blocking or framing. Braced wall panels may not be required on the balloon-frame wall portion provided the bracing amount and brace spacing requirement are satisfied for the building side. Where brace panels are located on the balloon-frame wall portion, they shall have a height-to-width ratio of not more than 2.5:1.

7. For a gable end wall, if the brace-panel height does not exceed 12 feet at the highest portion and if the 12½-foot and 21-foot spacing requirements in Figure 321.25-C are met, the wall is adequately braced. Where a brace panel exceeds 12 feet in height, it shall have a height-to-width ratio of not more than 2.5:1, and comply with Figure 21.25-C.

Figure 321.25-B
DEFINING BUILDING SIDES AND LENGTHS WITH ONE OR MORE CIRCUMSCRIBED RECTANGLES^{a,b,c}



(2) Angled-building-side plan^d



(3) Angled floor plan^e

^aEach floor plan level shall be circumscribed with one or more rectangles around the entire floor plan at the floor level under consideration as shown. When multiple rectangles are used, each side shall be braced as though it were a separate building and the bracing amount added together along the common wall where adjacent rectangles overlap or abut.

^bRectangles shall surround all enclosed plan offsets and projections. Chimneys, partial height projections, and open structures, such as carports and decks, shall be excluded from the rectangle.

^cEach rectangle shall have a maximum rectangle length-to-width ratio of 3:1.

^dProjected contributing lengths of angled braced wall panels shall be assigned to the closest rectangle sides, as shown for the angled corner in the angled-building-side-plan shown above.

^eBraced wall panels located on a common wall where angled rectangles intersect, as shown in Figure 321.25-B(3), shall have their contributing length applied towards the required length of bracing for the parallel rectangle side and its projected contributing lengths towards the adjacent angled rectangle sides. Where the common side of rectangle 2 as shown in Figure 321.25-B(3) has no physical wall, the portion shall be designed in accordance with s. SPS 321.25 (8) (a).

**Table 321.25-I
REQUIRED NUMBER OF INTERMITTENT BRACED WALL PANELS
ON WALLS PARALLEL TO EACH RECTANGLE SIDE
AT EACH FLOOR LEVEL^{a,b,c,d,e,f,h}**

Wall Supporting:		Required Number of Brace Panels on a Building Side		
		Length of Perpendicular Side (feet) ^g		
		≤25	≤50	≤75
Roof and ceiling only		1 ⁱ	2	3
One floor, roof and ceiling		2	4	6
Two floors, roof and ceiling		3	6	9

ⁱInterpolation is permitted. Extrapolation to buildings larger than addressed in this table is prohibited.

^bThis table applies to wind exposure category B. For wind exposure category C or D, multiply the number of braced wall panels required by 1.3 or 1.6, respectively.

Wind exposure category B is comprised of urban and suburban areas, wooded areas, or other terrain with numerous closely spaced obstructions having the size of single-family dwellings or larger. Exposure B shall be assumed unless the site meets the definition of another type exposure.

Wind exposure category C is comprised of flat, open country and grasslands with scattered obstructions, including surface undulations or other irregularities, having heights generally less than 30 feet extending more than 1,500 feet from the building site in any quadrant. This exposure also applies to any building located within Exposure B type terrain where the building is directly adjacent to open areas of Exposure C type terrain in any quadrant for a distance of more than 600 feet.

Wind exposure category D is comprised of flat, unobstructed areas exposed to wind flowing over open water for a distance of at least 1 mile. This exposure applies only to those buildings and other structures exposed to the wind coming from over the water. Exposure D extends inland from the shoreline a distance of 1,500 feet or 10 times the height of the building or structure, whichever is greater.

^cTabulated values are based on a nominal wall height of 10 feet. For nominal wall heights other than 10 feet and not more than 12 feet, multiply the required number of brace panels by the following factors: 0.9 for 8 feet, 0.95 for 9 feet, 1.15 for 11 feet, or 1.3 for 12 feet.

^dTabulated values are based on a roof with a top-of-wall-to-ridge height of 10 feet. For top-of-wall-to-ridge heights other than 10 feet, multiply the required number of brace panels by the following factors for each floor level support condition:

Roof only – 0.7 for 5 feet, 1.3 for 15 feet, or 1.6 for 20 feet

Roof + 1 Floor – 0.85 for 5 feet, 1.15 for 15 feet, or 1.3 for 20 feet

Roof + 2 Floors – 0.9 for 5 feet or 1.1 for 15 feet.

^eWhere minimum ½-inch gypsum wallboard is not included on the interior side of the wall, multiply the number of braced wall panels by 1.7 for LIB bracing or 1.4 for all other bracing methods, except this increase is not required for the portal frame method.










^fAdjustments in footnotes b to e apply cumulatively. Fractions of panels shall be rounded to the nearest one-half braced wall panel.

^gPerpendicular sides to the front and rear sides are the left and right sides. Perpendicular sides to the left and right sides are the front and rear sides. See Figure 321.25-B.

^hThe following braced wall panel conditions shall be permitted to be counted as one-half a braced wall panel toward meeting the required number of panels: (1) one 60 degree LIB; (2) one 48" GB or one 96" GB with gypsum wallboard on one side; (3) one 36" WSP or SFB braced wall panel for wall heights not more than 9 feet; (4) a 48" WSP or SFB braced wall panel where there is no more than one unblocked horizontal joint; or (5) one PF brace panel complying with Figure 321.25-A.

ⁱThis value of less than 2 serves only as the beginning value for calculation purposes. The resulting value shall be 2 or greater, to be consistent with subd. 2.

Table 321.25-J
REQUIRED LENGTH OF CONTINUOUS BRACING ON WALLS PARALLEL TO EACH
RECTANGLE SIDE AT EACH FLOOR LEVEL^{a,b,c,d,e,g,h}

Top-of-Wall-to-Ridge Height (feet)	Wall Supporting:		Total Required Length (feet) of Full-Height Bracing on Any Side of Rectangle							
			Length of Perpendicular Side (feet) ^f							
			10	20	30	40	50	60	70	80
10	Roof and ceiling only		2.0 ⁱ	3.5 ⁱ	5.0	6.0	7.5	9.0	10.5	12.0
	One floor, roof and ceiling		3.5 ⁱ	6.5	9.0	12.0	14.5	17.0	19.8	22.6
	Two floors, roof and ceiling		5.0	9.5	13.5	17.5	21.5	25.5	29.2	33.4
15	Roof and ceiling only		2.6 ⁱ	4.6	6.5	7.8	9.8	11.7	13.7	15.7
	One floor, roof and ceiling		4.0	7.5	10.4	13.8	16.7	19.6	22.9	26.2
	Two floors, roof and ceiling		5.5	10.5	14.9	19.3	23.7	27.5	32.1	36.7
20	Roof and ceiling only		2.9 ⁱ	5.2	7.3	8.8	11.1	13.2	15.4	17.6
	One floor, roof and ceiling		4.5	8.5	11.8	15.6	18.9	22.1	25.8	29.5
	Two floors, roof and ceiling		6.2	11.9	16.8	21.8	27.3	31.1	36.3	41.5

^aInterpolation is permitted. Extrapolation to buildings larger than addressed in this table is prohibited.

^bThis table applies to wind exposure category B. For wind exposure category C or D, multiply the required length of wall bracing by 1.3 or 1.6, respectively. Wind exposure categories are as defined in Table 321.25-I footnote b.

^cTabulated values are based on a nominal wall height of 10 feet. For nominal wall heights other than 10 feet, multiply the required length of bracing by the following factors: 0.90 for 8 feet, 0.95 for 9 feet, 1.05 for 11 feet, or 1.10 for 12 feet.

^dWhere minimum 1/2-inch gypsum wallboard interior finish is not provided, the required bracing amount for the affected rectangle side shall be multiplied by 1.4, except this increase is not required for the portal frame method.

^eAdjustments in footnotes b to d apply cumulatively.

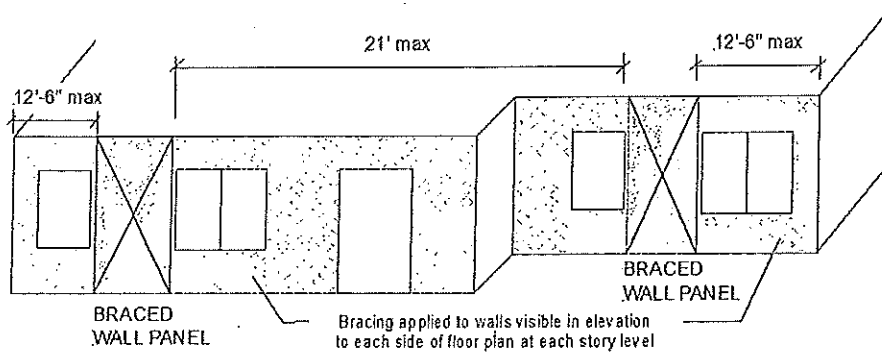
^fPerpendicular sides to the front and rear sides are the left and right sides. Perpendicular sides to the left and right sides are the front and rear sides. See Figure 321.25-B.

^gContinuous sheathing shall be applied to all surfaces of the wall, including areas between brace panels and above and below wall openings.

^hWhen used on a wall line with continuous sheathing, each portal frame panel is counted for its actual length in contributing toward the length of continuous sheathing used on other portions of the same wall line, such as the building side at a given story level.

ⁱAny value of less than 4.0 in this table serves only as the beginning value for calculation purposes. The resulting value shall be 4.0 or greater, to be consistent with Table 321.25-H and subd. 2.

**FIGURE 321.25-C
LOCATION OF BRACED WALL PANELS ALONG A BUILDING SIDE^a**



^aA braced wall panel can be anything from one-half to one brace panel.

SECTION 7. SPS 321.25 (8) (d) to (f) are repealed.

SECTION 8. SPS 321.25 (8) (g) (title), (intro.), and 1. to 3. are renumbered SPS 321.25 (8) (d) (title), (intro.), and 1. to 3.

SECTION 9. SPS 321.25 (8) (g) 4. and (h) and (9), Tables 321.25-K and 321.25-L, and Figures 321.25-D to 321.25-K are repealed.

SECTION 10. SPS 320 to 325 Appendix, Minimum Fastener Schedule Table is amended to read:

**CHAPTERS SPS 320-325 Appendix
MINIMUM FASTENER SCHEDULE TABLE
(Partial Table)**

Other interior and exterior panel products and finishes installed per manufacturer requirements.
For engineered connectors, use manufacturer's specified fasteners.

Description of Building Materials/Connection		Number and Type of Fastener ^{1 2 3}	
Wall Framing			
Sole plate to joist or blocking, face nail		2-16d at 16"o.c.	
Panel Sheathing			
Material	Fastener	Spacing of Fastener	
		Edges	Intermediate Supports
Wood panel siding to framing			
5/8" gypsum sheathing ⁵	1 3/4" galvanized roofing nail; 8d common nail; staple galvanized 1 5/8" long; 1 5/8" screws, Type W or S	4 7"	8 7"