



WALL-BRACING 101

2009 Uniform Dwelling Code



Lakeland Builders Association
Elkhorn, WI
October 29, 2009

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Safety and Buildings Division

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2009 Code Change



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Status of 2009 Code Change

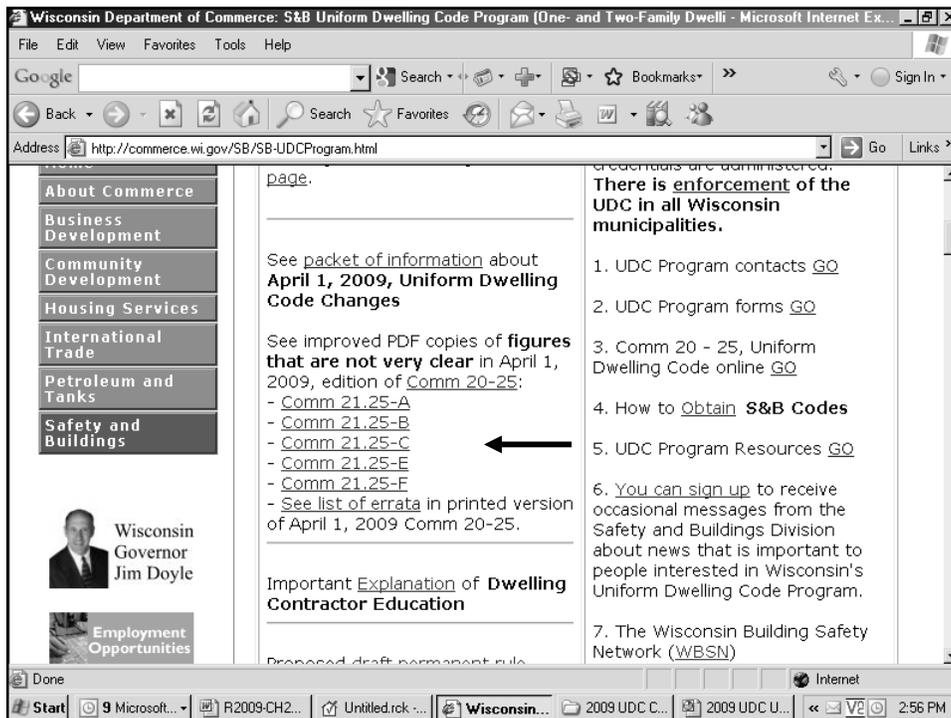
- Effective April 1, 2009.
- Watch S&B website for updates.
- If you have any interest in any proposed code changes, you may attend the council meetings or contact your council representative. List of members may be found on the S&B Div codes webpage.

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It Is Not All That Bad.

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Wisconsin Department of Commerce: S&B Uniform Dwelling Code Program (One- and Two-Family Dwelling) - Microsoft Internet Explorer

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Address: http://commerce.wi.gov/SB/SB-UDCProgram.html

About Commerce

- Business Development
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See [packet of information](#) about **April 1, 2009, Uniform Dwelling Code Changes**

See improved PDF copies of **figures that are not very clear** in April 1, 2009, edition of [Comm 20-25](#):

- [Comm 21.25-A](#)
- [Comm 21.25-B](#)
- [Comm 21.25-C](#)
- [Comm 21.25-E](#)
- [Comm 21.25-F](#)

- See [list of errata](#) in printed version of April 1, 2009 Comm 20-25.

Important [Explanation of Dwelling Contractor Education](#)

Proposed draft permanent rule

credentials are administered.

There is enforcement of the UDC in all Wisconsin municipalities.

1. UDC Program contacts [GO](#)
2. UDC Program forms [GO](#)
3. Comm 20 - 25, Uniform Dwelling Code online [GO](#)
4. How to [Obtain S&B Codes](#)
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6. [You can sign up](#) to receive occasional messages from the Safety and Buildings Division about news that is important to people interested in Wisconsin's Uniform Dwelling Code Program.
7. The Wisconsin Building Safety Network ([WBSN](#))

Done

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List of errata in printed version of April 1, 2009 Comm 20-25.

1. The reference to sub. (10) in s. Comm 21.03(1)(c) should be sub (8).
2. Section Comm 21.11(1)(b)1. should be 1/2 - inch gypsum wallboard
3. Section Comm 21.11(1)(b)2. should be 1/2 - inch nominal wood structural panel
4. Section Comm 21.11(1)(b)3. should be 3/4 - inch sawn lumber with tongue-and-groove or lap joints
(For items 2,3,4, these number were missing on the earlier copies of the UDC that were distributed. It has been changed since then)
5. The reference to Table 21.25-G in s. Comm 21.25(8)(e)2. should be 21.25-H.
6. The reference to Table 21.25-J in Table 21.25-H, footnote 5, should be 21.25-K.
7. The reference to sub. (9)(c)6. in Figure 21.25-G(c) should be sub.(9)(c)5.

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Comm 21.25 (8) & (9) Wall Bracing

There are a couple of terms a person will need to become familiar with whether using the intermittent bracing method of Comm 21.25 (8), alternate bracing method of Comm 21.25 (9)(b) or the continuous sheathing method of 21.25 (9) (c):

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Braced Wall Line: A braced wall line (BWL) consists of wall segments that are off-set no more than 4' from the BWL. Within that braced wall line are braced wall panel(s) that provide resistance to wind loads. The spacing of a BWL shall not exceed 35', or 50' meeting certain additional conditions. [See Comm 21.25 (8)(e) and Fig. 21.25-A]

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Braced Wall Panel: A braced wall panel (BWP) is an individual bracing component that is installed within a braced wall line. Examples of types of BWP are let-in bracing, wood boards, wood structural panels, structural fiberboard, and gypsum board [See Comm 21.25 (8) (b)]. The BWP, unless otherwise specified in the code, shall begin no more than 12.5 feet from each end and shall be located every 25 feet on center.

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**Open and screened porches and decks
do not have to meet the wall bracing provisions
of Comm 21.25 (8) & (9).**

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Comm 21.25 (8) WALL BRACING. (a) *General.*

Dwellings using wood-framed walls shall be braced in accordance with this section.

(b) *Bracing Materials and Methods.*

1. 1-inch-by-4-inch let-in bracing 60 to 45 degrees from the horizontal.
2. Metal T-bracing not less than 22 gage thick and 1 ¾ inch wide 60 to 45 degrees from the horizontal.
3. Wood boards of 5/8-inch net minimum thickness applied diagonally.
4. Wood structural panel sheathing with all edges fastened not less than 3/8 inch thick for 16-inch stud spacing and not less than 7/16 inch thick for 24-inch stud spacing.

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Comm 21.25 (8) WALL BRACING.

(b) *Bracing Materials and Methods.* (Cont'd)

5. Minimum one-half-inch thick structural fiberboard sheathing applied vertically or horizontally on studs spaced a maximum of 16 inches on center.
6. Gypsum board with minimum ½-inch thickness placed on studs spaced a maximum of 24 inches on center and fastened at panel edges including top and bottom plates at 7 inches on center
7. Alternative methods under par. (9).
8. Other approved wind bracing materials and methods.

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Comm 21.25 (8) WALL BRACING. (Cont'd)

(c) *Minimum length of braced panels.* 1. 'General.'
Except as provide under subd. 2., the minimum lengths shall be as follows:

- a. For methods 3, 4 and 5, each braced wall panel shall be at least 48 inches in length, covering a minimum of three stud spaces where studs are spaced 16 inches on center and covering a minimum of two stud spaces where studs are spaced 24 inches on center.
- b. For method 6, each braced wall panel and shall be at least 96 inches in length where applied to one face of a braced wall panel and at least 48 inches in length where applied to both faces.

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Comm 20.09 Procedure for obtaining uniform building permit.

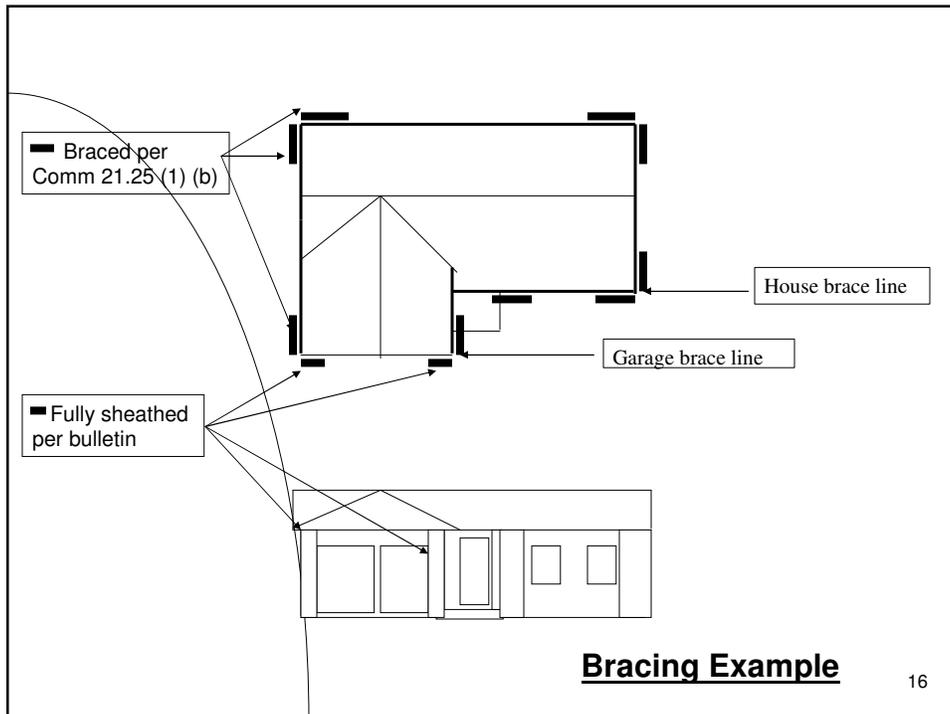
(5) REQUIRED PLANS.

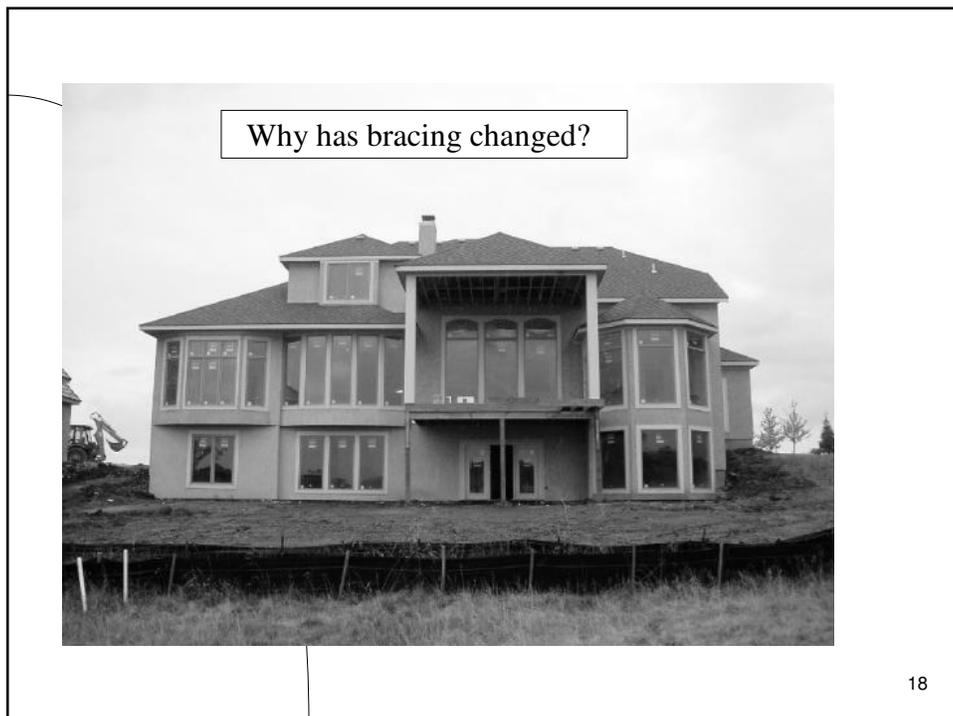
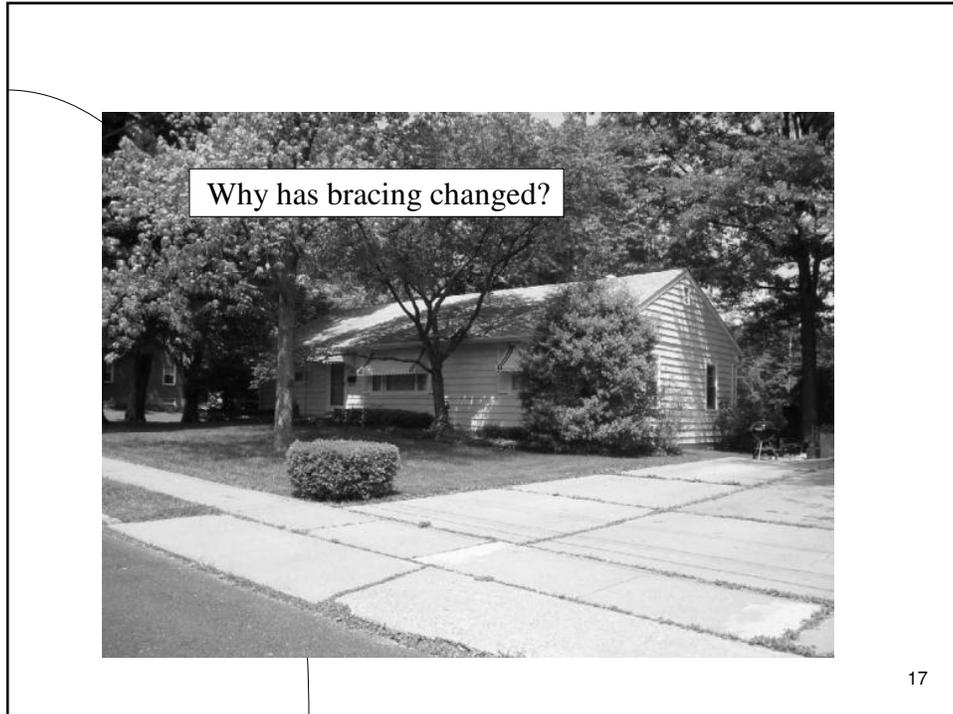
(b) *Floor plan.*

2. The following features shall be included on all floor plans:

d. The location and construction details of the braced wall lines.

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Bracing Methods		
<i>Intermittent Methods (Except M7 Continuous)</i>		
Method	Description	Min. Width
1	Let-in bracing, wood 1x4	55" to 96"
2	Let-in bracing, metal T	55" to 96"
3	Diagonal lumber boards	48"
4	Wood Structural Panels	48"
5	Fiberboard	48"
6	Gypsum (1-or 2-sided)	96" or 48"
7	Alternate braced panels w/ holddowns Continuously sheathed w/ WSP's	28"- 42" 16"- 24"
8	Other approved wind bracing methods	

Effective April 1, 2009 19

Comm 21.25 (8) (c) 2. c.

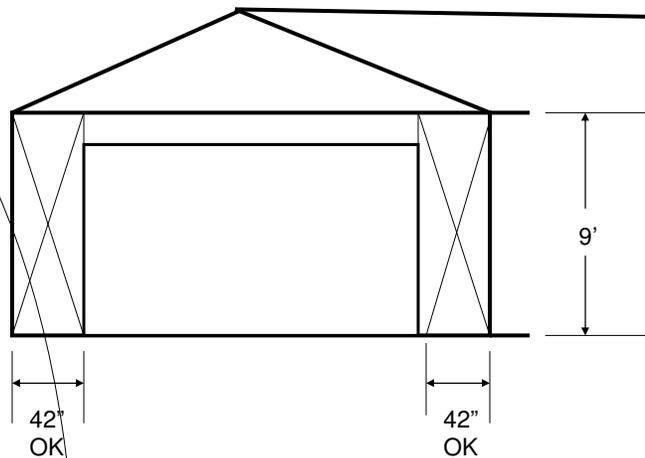
For methods under par. (b) 3., 4. and 5., panels between 36 inches and 48 inches in length shall be permitted to count towards the required percentage of bracing in Table 21.25–H, and the effective contribution shall comply with Table 21.25–G.

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TABLE 21.25-G
EFFECTIVE LENGTHS FOR BRACE WALL PANELS
LESS THAN 48 INCHES IN ACTUAL LENGTH
 (BRACING METHODS PAR. (b) 3., 4. and 5.)

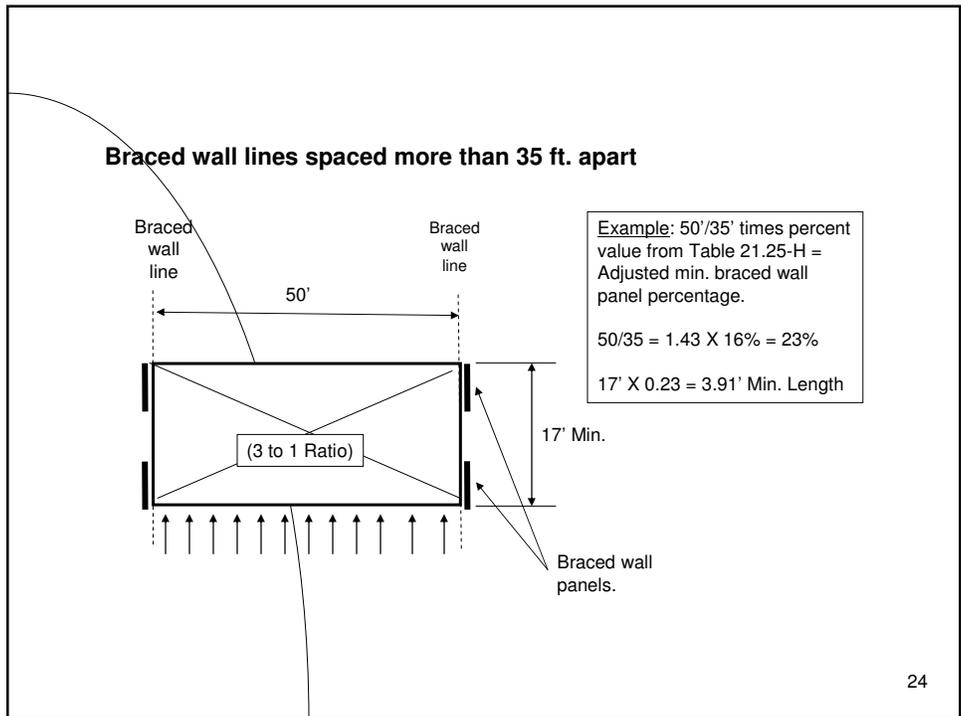
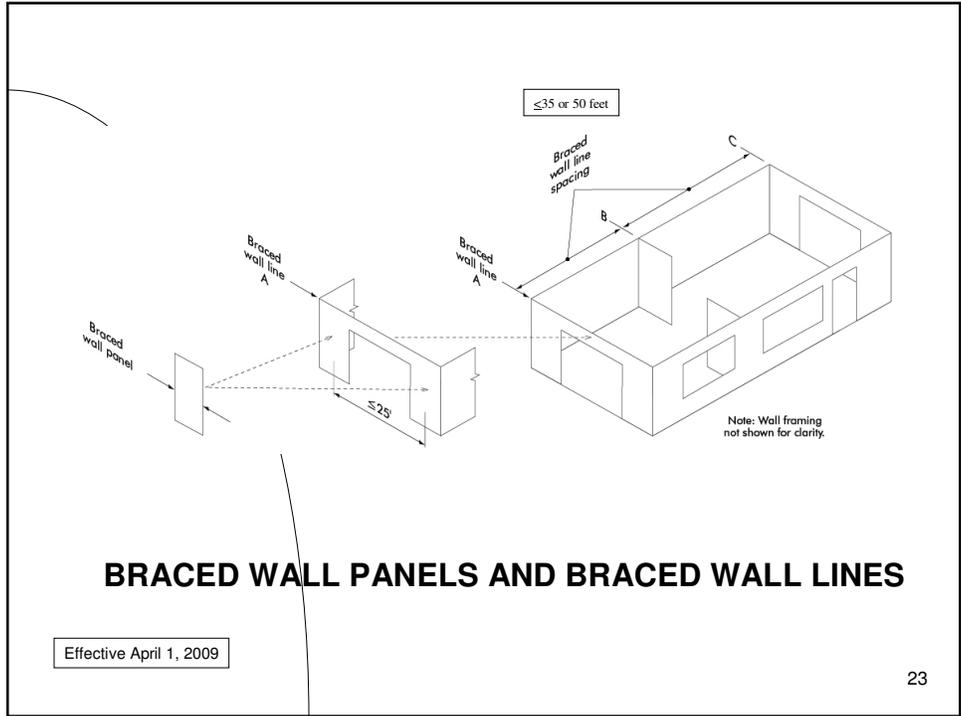
Actual Length of Braced Wall Panel (inches)	Effective Length of Braced Wall Panel (inches)		
	8-foot Wall Height	9-foot Wall Height	10-foot Wall Height
48	48	48	48
42	36	36	N/A
36	27	N/A	N/A

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Intermittent Wall Bracing
 Table 21.25-G

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➤ **From 2009 UDC Code and Commentary**

Question: If my braced wall line spacing is more than 35 feet and is less than, or equal to, 50 ft. may I use wood or metal let-in bracing in those braced wall lines that are spaced more than 35 ft. apart?

Answer: No. Braced wall lines that are more than 35 ft. apart must have the required length of braced wall panels specified in Table 21.25-H increased by a factor of the braced wall line spacing divided by 35. Let-in bracing does not provide an equivalent amount of wind resistance as compared to the added sheathing required by this section.

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Some Wisconsin contractors need the new **Building Contractor Registration**

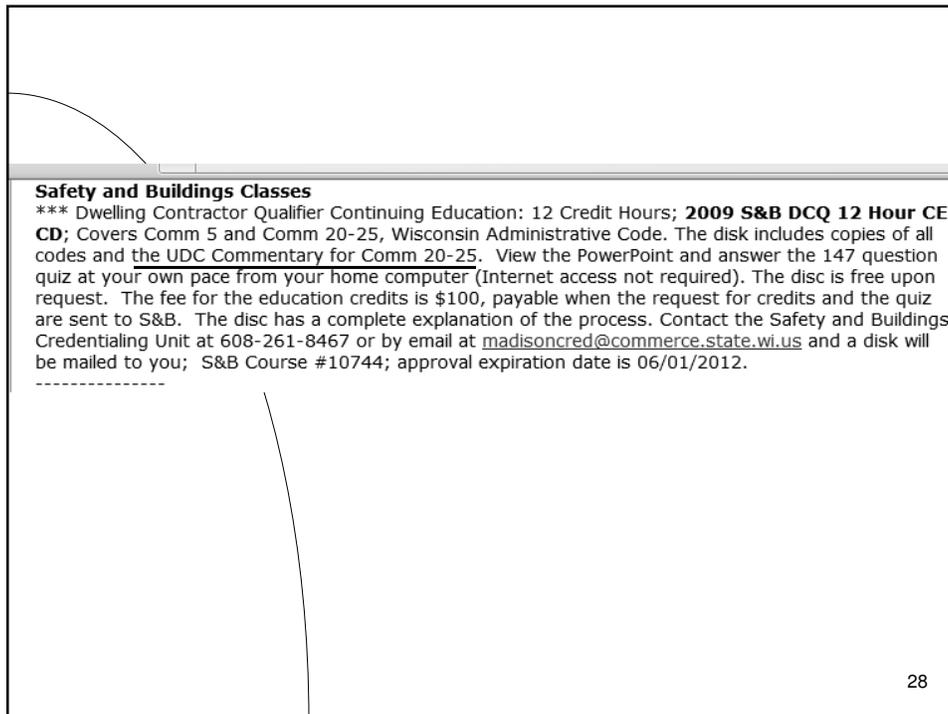
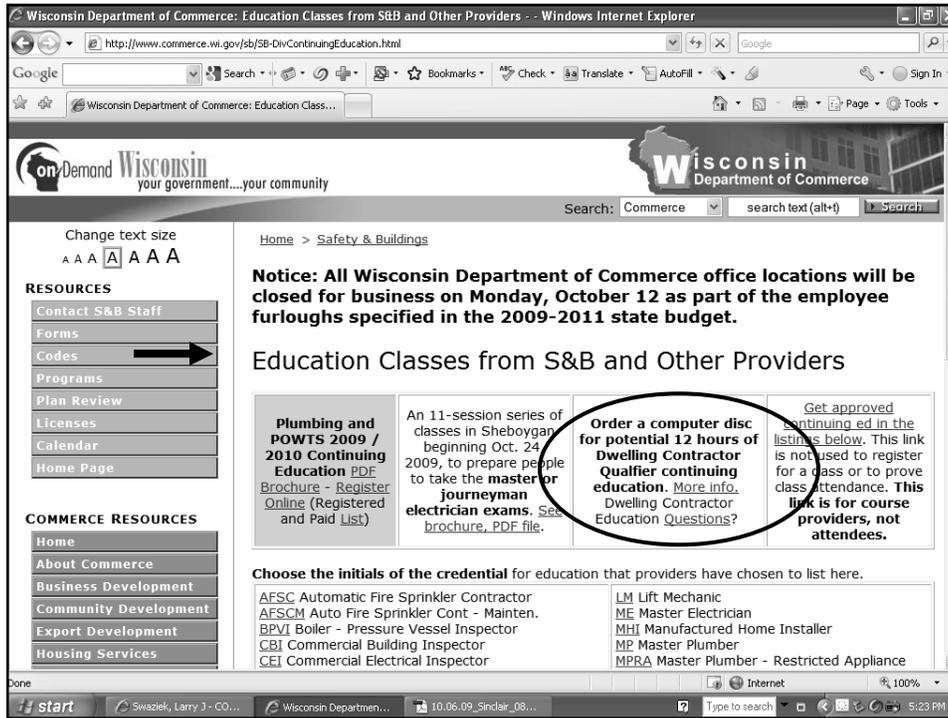
Online Renewal Payment	Office Locations	Search S&B Records	Choose Program
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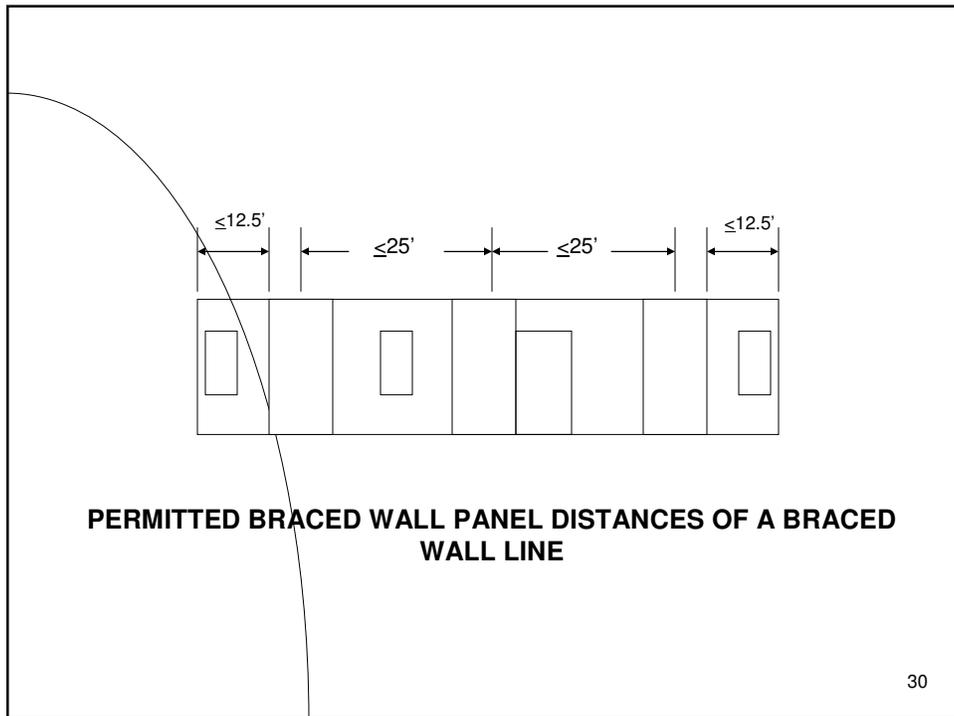
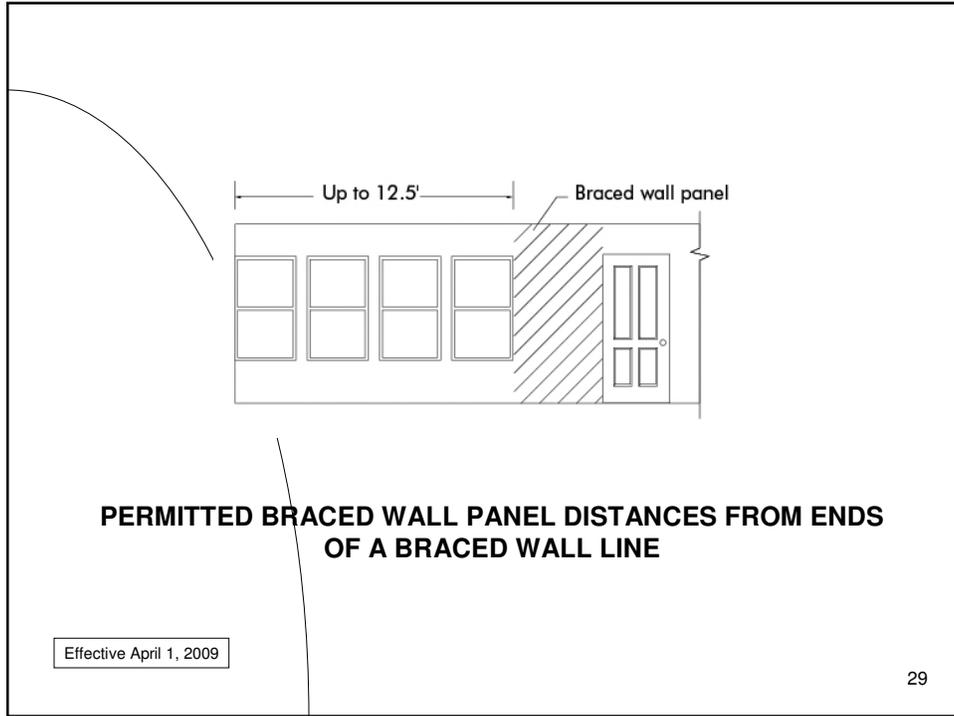
Wisconsin Office of Recovery and Reinvestment Link to Available Stimulus Projects and Grants

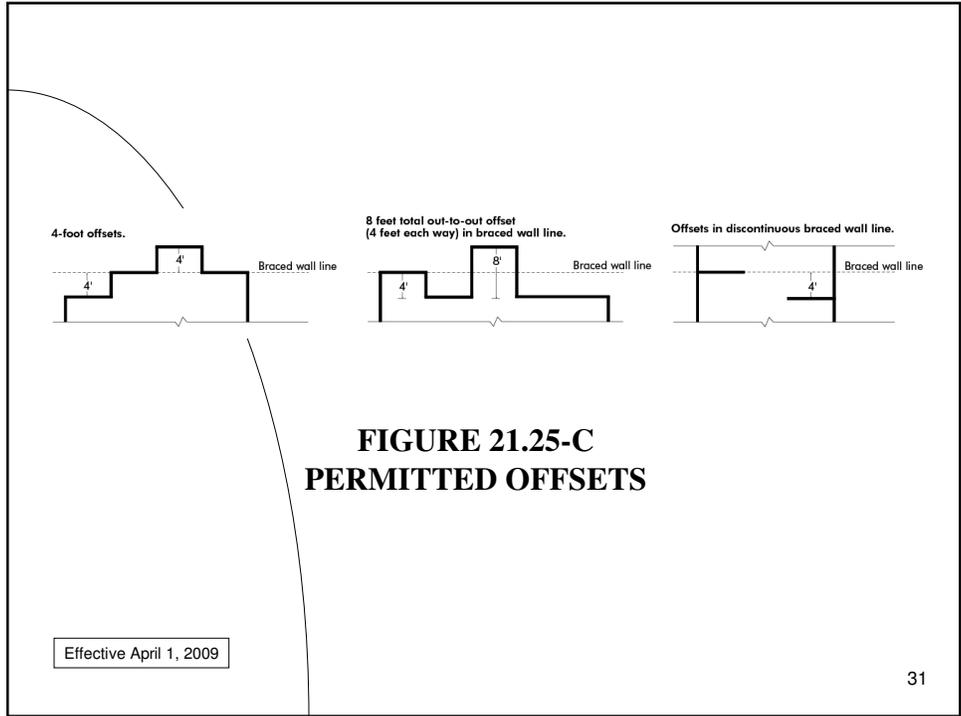
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➤ **From 2009 UDC Code and Commentary**

Question: Must a braced wall line with 4' offsets be in line with an actual building wall line as shown in Fig. 21.25-C?

Answer: No. A braced wall line can be located within actual building wall lines as long as the physical building wall lines are not offset by more than 4 ft. (See Fig. below). This method of determining the braced wall line is consistent with the wall bracing provisions of the 2009 International Residential Code which is an approved engineering analysis as set forth in Comm. 21.25(8)(1), footnote.

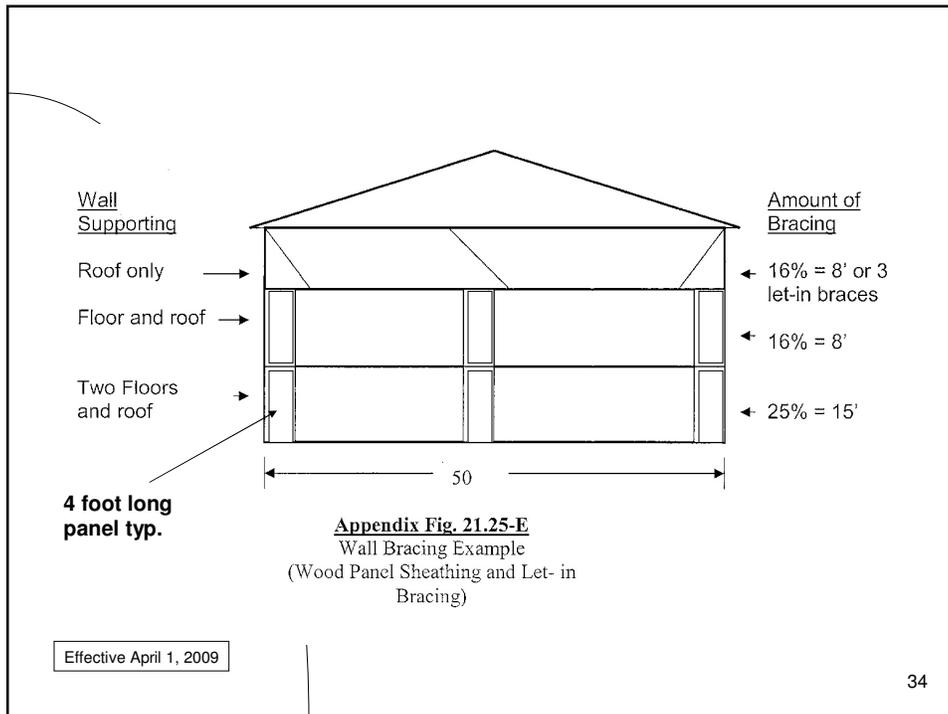
32

**TABLE 21.25-H
MINIMUM REQUIRED BRACING AMOUNTS FOR WALLS**

Wall Supporting:	AMOUNT OF BRACING PER WALL LINE ⁴ Braced segments shall be located at least every 25-ft o.c. but not less than the following percentages:	
	Wood Structural Panel Sheathing [Sub. (8) (b) 4., (9) (b) &(9) (c)]	Other Methods Permitted [Sub. (8) (b) 1, 2, 3, 5& 6.]
Roof only ¹	16%	16% ²
Floor and roof	16%	25% ²
Two Floors and roof	25%	35% ³

- ¹ The 'Roof only' condition also applies to one braced wall line of wood frame construction on the ground floor where all other exterior walls on the ground floor are constructed of masonry or concrete in accordance with s. Comm. 21.18.
- ² Wood and metal let in bracing exempt from % bracing requirement, but not spacing requirement.
- ³ Wood and metal let in bracing not permitted as a bracing method.
- ⁴ Maximum wall heights equal 12 feet. For wall heights over 10 feet, increase percent bracing requirement an additional 20%.
- ⁵ For continuous sheathing method with wood structural panels, percent requirement may be decreased 10% when openings on the wall line do not exceed 85% of wall height and may be decreased 20% when openings do not exceed 67% of wall height. [See Table 21.25-J](#)

Effective April 1, 2009





Example
This is a test!

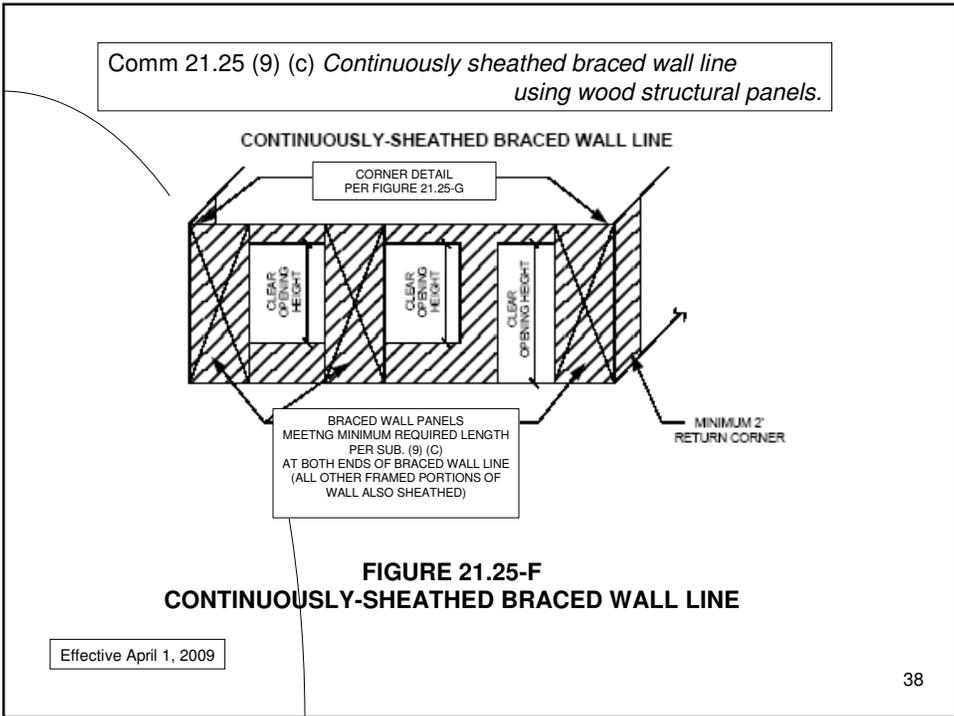
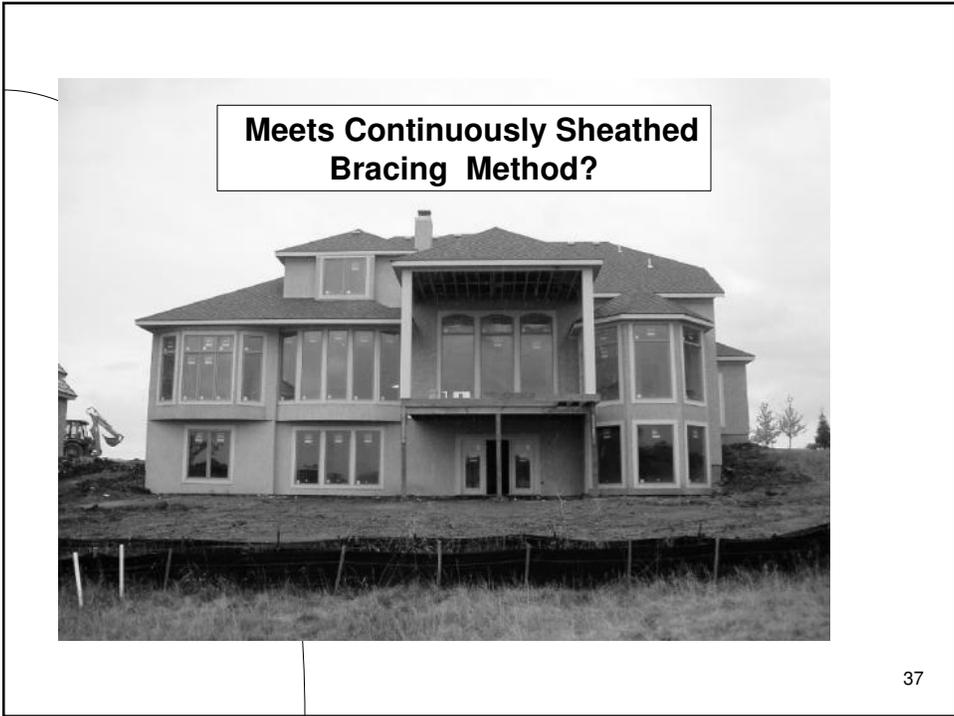
35

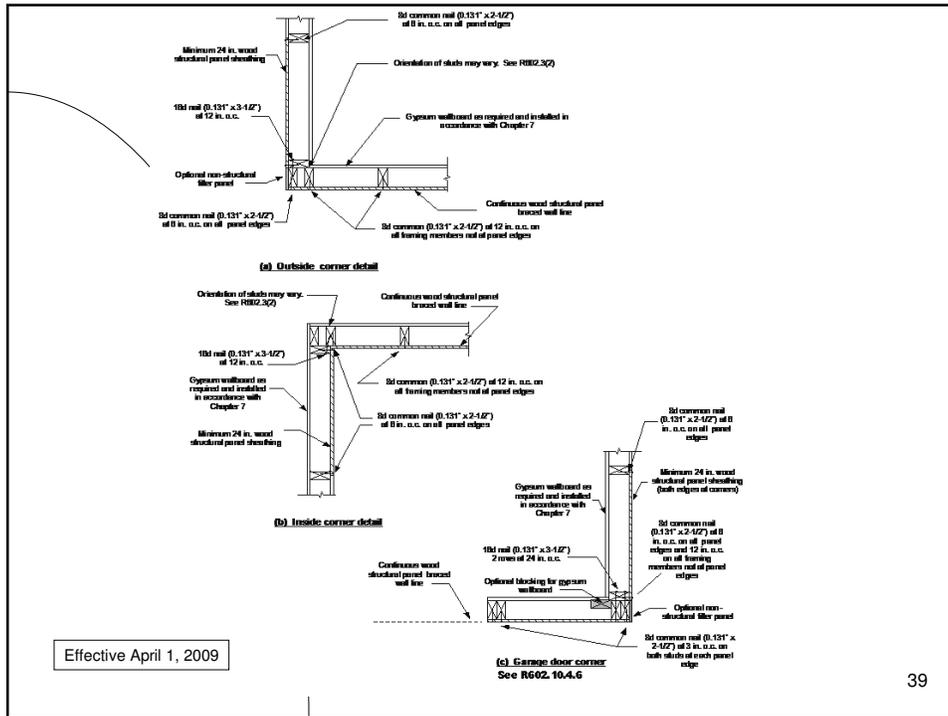
➤ **From 2009 UDC Code and Commentary**

Question: If I fully sheath my homes have I automatically satisfied the requirements of the wall bracing provisions of the UDC?

Answer: No. The plans will have to clearly show the location and design detail of the braced wall panels, the location and details of required interior braced wall lines and their panel(s), location and details of required corner and 2- foot end-wall return(s), location and details of required tie-downs, etc. as specified in Comm 21.15 (8) and (9)(c).

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➤ From 2009 UDC Code and Commentary

Question: Fig. 21.25-G specifies that 8d nails be used while the fastener table in the appendix permits 6d nails for wall bracing panels with a thickness of 5/16" to 1/2". Is the 6d nail permitted in these corners when use sheathing in that thickness range?

~~*Answer:* No. The most restrictive applies. 8d nails shall provided in those areas shown in Figure 21.25-G.~~

Modified Answer: Yes.

UDC Appendix MINIMUM FASTENER SCHEDULE TABLE

Material	Fastener	Panel Sheathing	
		Spacing of Fastener	
		Edges	Intermediate Supports
Engineered wood panel for sub-floor and roof sheathing and wall corner wind bracing to framing			
5/16" to 1/2"	6d common or deformed nail or staple, 1 1/2"	6"	12" 4
5/8" to 3/4"	8d smooth or common, 6d deformed nail, or staple, 14 ga. 1 1/4"	6"	12" 4
7/8" to 1"	8d common or deformed nail	6"	12"
1 1/8" to 1 1/4"	10d smooth or common, or 8d deformed nail	6"	12"
Combination subfloor/ underlayment to framing			
3/4" or less	6d deformed or 8d smooth or common nail	6"	12"
7/8" to 1"	8d smooth, common or deformed nail	6"	12"
1 1/8" to 1 1/4"	10d smooth or common or 8d deformed nail	6"	12"
Wood panel siding to framing			
1/2" or less	6d corrosion-resistant siding and casing nails	6"	12"
5/8"	8d corrosion-resistant siding and casing nails	6"	12"
1/2" structural cellulose fiberboard sheathing	1 1/2" galvanized roofing nail; 8d common nail; staple 16 ga., 1 1/2" long	3"	6"

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Note: As an alternative to Fastener Table in UDC Appendix can use alternate fasteners specified in ICC ESR report 1539. You may access that at <http://www.icc-es.org/>


Most Widely Accepted and Trusted

ICC-ES Evaluation Report
ESR-1539

Reissued July 1, 2009
This report is subject to re-examination in two years.

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DIVISION: 06—WOOD AND PLASTICS
Section: 06095—Nails

REPORT HOLDER:

INTERNATIONAL STAPLE, NAIL AND TOOL ASSOCIATION
512 WEST BURLINGTON AVENUE, SUITE 203
LA GRANGE, ILLINOIS 60525-2245
(708) 482-8138
www.isanta.org
isanta@ameritech.net

EVALUATION SUBJECT:

"NAILPRO"—BRAND NAME
JAACO CORPORATION
18080 NE 68TH STREET, SUITE C130
REDMOND, WASHINGTON 98052

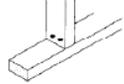
"MASTER FASTENERS"—BRAND NAME
MASTER FASTENERS INTERNATIONAL, LLC
724 WEST COWLES STREET
LONG BEACH, CALIFORNIA 90813

"MAX"—BRAND NAME
MAX USA CORP.
257 EAST 2ND STREET
MINEOLA, NEW YORK 11501

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From ESR Report 1539

TABLE 23—WALL FRAMING¹

CONNECTION ² (NAIL SIZE AND POSITION EXAGGERATED FOR ILLUSTRATIVE PURPOSES)	FASTENER MINIMUM NOMINAL LENGTH IN INCHES X MINIMUM NOMINAL NAIL DIAMETER IN INCHES	QUANTITY PER CONNECTION, OR SPACING BETWEEN FASTENERS (INCHES ON CENTER) ³
 Top or sole plate to stud (face nail)	3½" x 0.162" nail (16d common) ²	2
	3" x 0.148" nail (10d common)	3
	3½" x 0.131" nail	
	3" x 0.131" nail	
	3½" x 0.120" nail	4
3" x 0.120" nail		
 Stud to top or sole plate (toe nail)	2½" x 0.131" nail (8d common) ²	4
	3½" x 0.162" nail (16d common)	3
	3" x 0.148" nail (10d common)	4
	3½" x 0.131" nail	
	3" x 0.131" nail	
	3½" x 0.120" nail	
	2½" x 0.113" nail	5
	2" x 0.113" nail	
	2½" x 0.105" nail	
	2½" x 0.099" nail	
 Captop plate laps and intersections	3½" x 0.162" nail (16d common) ²	2 each side of lap
	3" x 0.148" nail	3 each side of lap
	3½" x 0.131" nail	
	3" x 0.131" nail	
	3½" x 0.120" nail	
 Diagonal bracing	3" x 0.120" nail	2
	3½" x 0.162" nail (16d common)	
	2½" x 0.131" nail (8d common) ²	
	3" x 0.148" nail (10d common)	3
	3½" x 0.131" nail	
	3" x 0.120" nail	

**TABLE 21.25-J
LENGTH REQUIREMENTS FOR BRACED WALL PANELS
IN A CONTINUOUSLY SHEATHED WALL¹**

MINIMUM LENGTH OF BRACED WALL PANEL (inches)			MAXIMUM OPENING CLEAR HEIGHT NEXT TO THE BRACED WALL PANEL (% of wall height)	BRACED WALL PANEL HEIGHT TO WIDTH RATIO
8-foot wall	9-foot wall	10-foot wall		
48	54	60	100%	2:1
32	36	40	85%	3:1
24	27	30	67%	4:1 ²

¹ Interpolation is permitted.
² A 4:1 aspect ratio is permitted for full-height sheathed wall segments on either side of garage openings. (Supporting roof only.)

Effective April 1, 2009

- A person may extrapolate table for wall heights up to 12 ft. by using the aspect ratios listed in the right-hand column.
- For example, a wall of 12 ft. height with adjacent opening no than 67% of wall would be permitted to have a wall bracing panel length of 36".
(12' / 4)

Comm 21.25 (9) (c) *Continuously sheathed braced wall line using wood structural panels.*

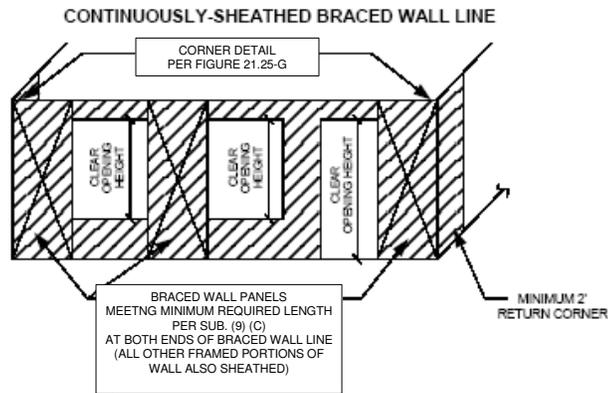


FIGURE 21.25-F
CONTINUOUSLY-SHEATHED BRACED WALL LINE

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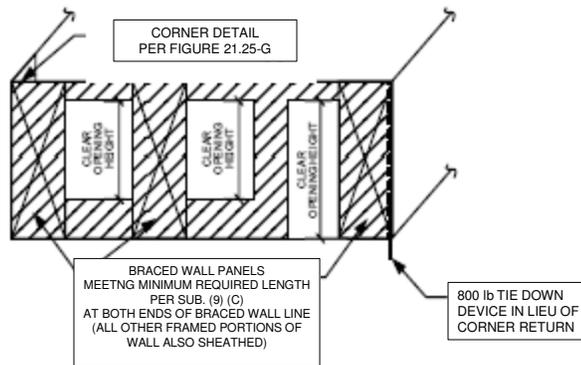
**TABLE 21.25-K
 ADJUSTMENT FACTORS TO THE PERCENTAGE OF REQUIRED BRACING
 PER WALL LINE – CONTINUOUSLY SHEATHED**

ADJUSTMENT BASED ON MAXIMUM WALL CLEAR OPENING HEIGHT:		MULTIPLY PERCENTAGE OF BRACING PER WALL LINE BY:
Continuous wood structural panel sheathing when maximum opening height in wall line does not exceed *	85% of wall height	0.9
	67% of wall height	0.8

* Percentage of bracing for continuous wood structural panel sheathing shall be based on sub. (8) (b) 4 requirements.

Effective April 1, 2009

Comm 21.25 (9) (c) *Continuously sheathed braced wall line using wood structural panels.*



**FIGURE 21.25-H
 CONTINUOUSLY-SHEATHED BRACED WALL LINE
 WITHOUT CORNER RETURN**

Comm 21.25 (9) (c) *Continuously sheathed braced wall line using wood structural panels.*

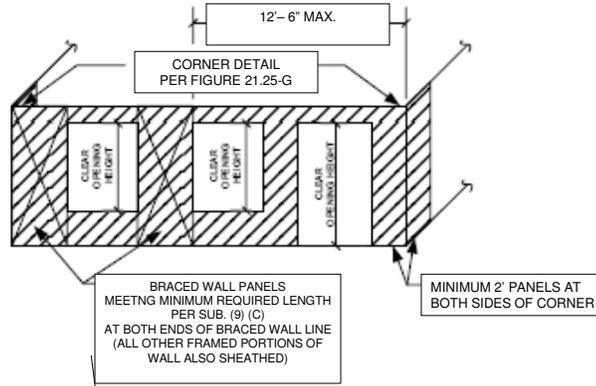


FIGURE 21.25-I
CONTINUOUSLY-SHEATHED BRACED WALL LINE – FIRST BRACED WALL PANEL AWAY FROM END OF WALL LINE WITHOUT TIE DOWN

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Comm 21.25 (9) (c) *Continuously sheathed braced wall line using wood structural panels.*

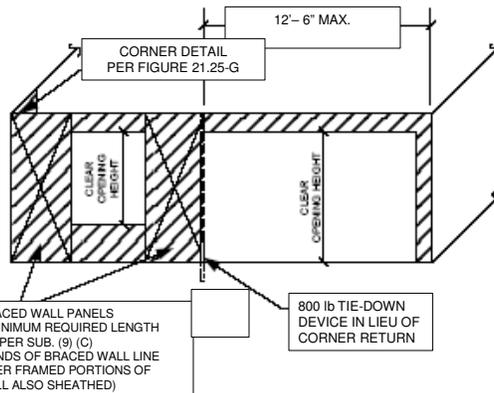
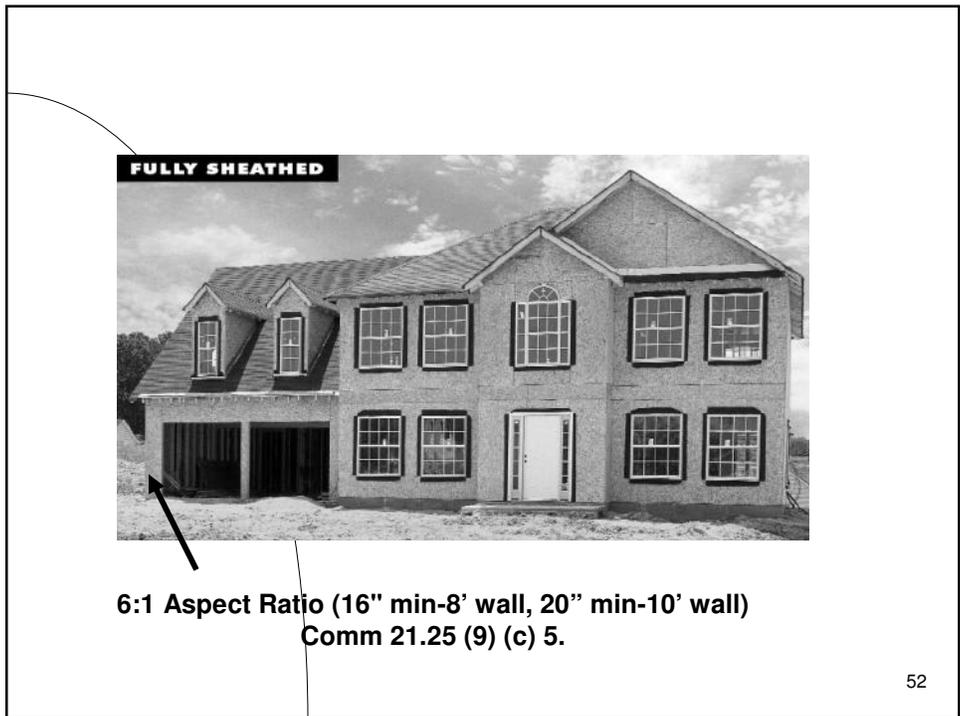
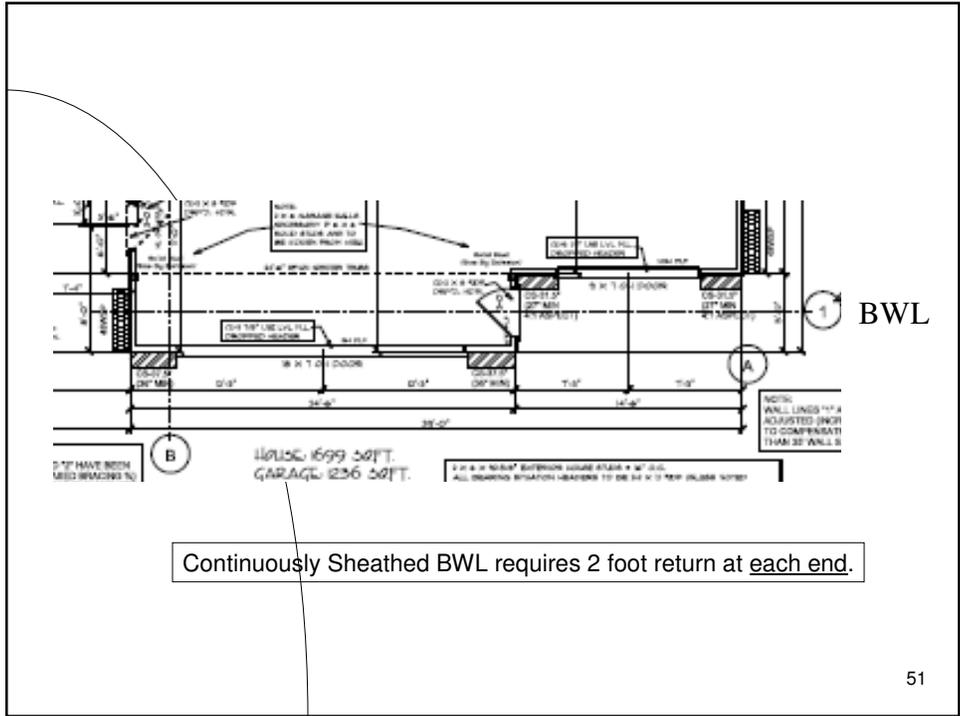
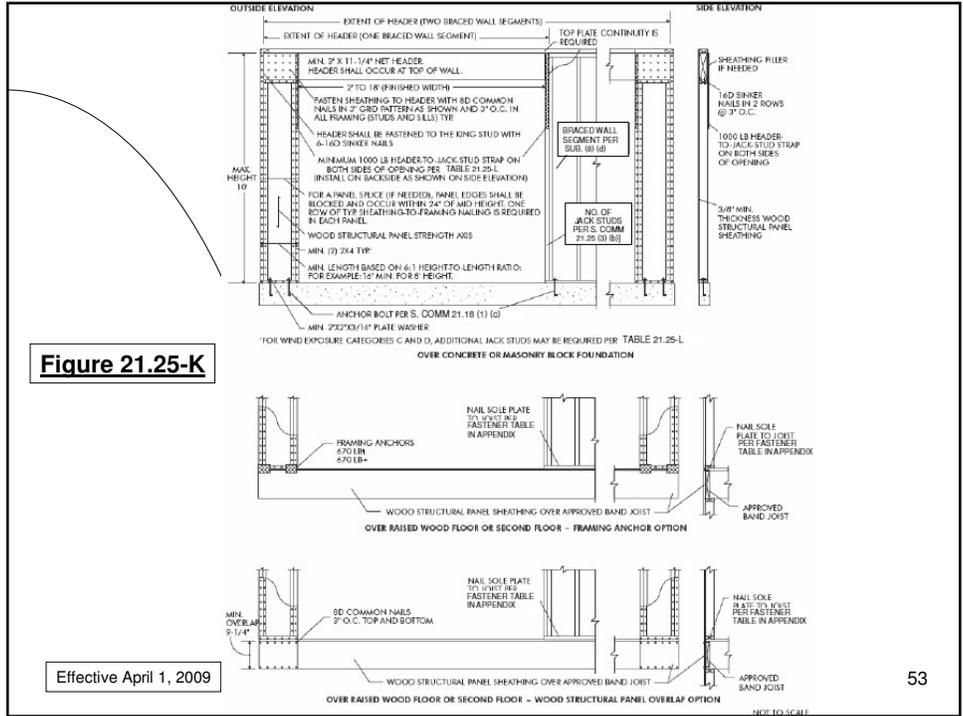


FIGURE 21.25-J
CONTINUOUSLY-SHEATHED BRACED WALL LINE – FIRST BRACED WALL PANEL AWAY FROM END OF WALL LINE WITH TIE DOWN

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The department will accept the use the Portal Frame Bracing method set forth in APA Technical Note Number J740

TECHNICAL NOTE

Portal Frame Bracing Without Hold-Down Devices

FOR USE IN CONTINUOUSLY SHEATHED WALLS

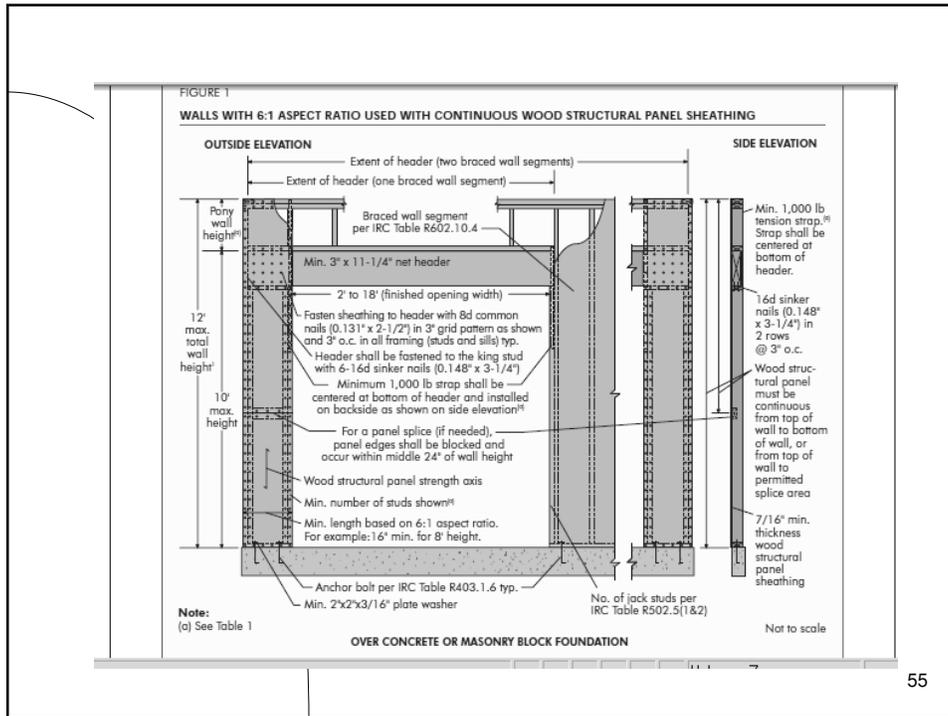
Number J740
July 2008

BACKGROUND

Wall bracing is required by the International Residential Code (IRC) to resist wall racking due to wind or seismic forces. Historically, wall bracing segments had to be a minimum of 48 inches in width. With modern home designs maximizing windows and minimizing wall sections, finding 48 inches to count toward bracing can be a challenge. APA developed the portal frame for wall bracing to help provide a segment as narrow as 16 inches that can be counted toward the overall bracing amount required by the code. The portal frame design relies on additional nailing and a semi-rigid connection between the wall segment sheathing and header to improve performance in a narrow wall segment. For information on IRC wall bracing requirements, refer to APA's publication, *Introduction to Wall Bracing*, Form F430.

This portal frame without hold downs is also sometimes referred to as "6:1 aspect ratio segments used with continuous structural panel sheathing" and/or the "APA narrow wall bracing method." This portal frame design has been tested to show bracing performance comparable to existing code-permitted bracing for residential structures. APA and three other independent labs have conducted nearly 100 cyclic tests[®] showing that the 16-inch-wide portal frame design used in continuously sheathed wood structural panel walls with a 6:1 aspect ratio is equivalent to the vertical

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Comm 21.25 (8) WALL BRACING. (a) General.

..... 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.

Note: Acceptable engineering wall bracing practices include the provisions under s. R602.10 of the International Residential Code—2009.

Effective April 1, 2009

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The International Residential Code (IRC) ?

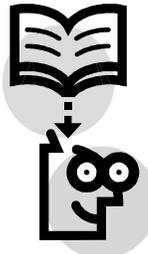


TABLE R602.10.1.2(1)^{a,b,c,d}
BRACING REQUIREMENTS BASED ON WIND SPEED
(AS A FUNCTION OF BRACED WALL LINE SPACING)

EXPOSURE CATEGORY B 30 FT MEAN ROOF HEIGHT 10 FT EAVE TO RIDGE HEIGHT 10 FT WALL HEIGHT 2 BRACED WALL LINES		MINIMUM TOTAL LENGTH (FEET) OF BRACED WALL PANELS REQUIRED ALONG EACH BRACED WALL LINE						
BASIC WIND SPEED	STORY LOCATION	BRACED WALL LINE SPACING (FT)	METHOD LIB ^a	METHOD GB (DOUBLE SIDED) ^b	METHODS DWB, WSPS, SFB, PBS, PCP, HPS ^c	CONT. SHEATHING		
≤65 MPH		10	3.5	3.5	2.0	1.5		
		20	6.0	6.0	3.5	3.0		
		30	8.5	8.5	5.0	4.5		
		40	11.5	11.5	6.5	5.5		
		50	14.0	14.0	8.0	7.0		
		60	16.5	16.5	9.5	8.0		
	≤80 MPH		10	6.0	6.0	3.0	3.0	
			20	11.5	11.5	5.5	5.5	
			30	16.5	16.5	9.5	8.0	
			40	21.5	21.5	12.5	10.5	
			50	26.5	26.5	16.0	13.0	
			60	31.5	31.5	18.0	15.5	
		≤100 MPH		10	NP ^d	9.0	5.5	4.5
				20	NP	17.0	10.0	8.5
				30	NP	24.5	14.0	12.0
				40	NP	32.0	18.0	15.5
				50	NP	39.0	22.5	19.0
				60	NP	46.5	28.5	22.5
≤120 MPH			10	3.5	3.5	2.0	2.0	
			20	7.0	7.0	4.0	3.5	
			30	9.5	9.5	5.5	5.0	
			40	12.5	12.5	7.5	6.0	
			50	15.5	15.5	9.0	7.5	
			60	18.5	18.5	10.5	9.0	
	≤140 MPH		10	7.0	7.0	4.0	3.5	
			20	13.0	13.0	7.5	6.5	
			30	18.5	18.5	10.5	9.0	
			40	24.0	24.0	14.0	12.0	
			50	29.5	29.5	17.0	14.5	
			60	35.0	35.0	20.0	17.0	
		Effective April 1, 2009		10	NP	10.5	6.0	5.0
				20	NP	19.0	11.0	9.5
				30	NP	27.5	15.5	13.5
				40	NP	35.5	20.5	17.5
				50	NP	44.0	25.0	21.5
				60	NP	52.0	30.0	25.5

Number of Stories	Exposure/Height Factors		
	Exposure B	Exposure C	Exposure D
1	1.0	1.2	1.5
2	1.0	1.3	1.6
3	1.0	1.4	1.7

c. For other roof-to-eave ridge heights, the required bracing length shall be multiplied by the appropriate factor from the following table:

Support Condition	Roof Eave-to-Ridge Height			
	5'-0" or less	10 ft	15 ft	20 ft
Roof Only	0.7	1.0	1.3	1.6
Roof+Floor	0.85	1.0	1.15	1.3
Roof + 2 Floors	0.9	1.0	1.1	NP

1. Interpolation shall be permitted.

d. For a maximum 9-foot wall height, the table values shall be permitted to be multiplied by 0.95. For a maximum 8-foot wall height, the table values shall be permitted to be multiplied by 0.90. For a maximum 12-foot wall height, the table values shall be permitted to be multiplied by 1.1.

e. For three or more braced wall lines in a given plan direction, the required bracing length on each braced wall line shall be multiplied by the appropriate factor from the following table:

Number of Braced Wall Lines	Adjustment Factor
3	1.30
4	1.45
≥5	1.60

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This information prepared by the ICC Ad Hoc Wall Bracing Committee of the 2009 IRC wall bracing provisions can be found by accessing the ICC website

www.iccsafe.org

[ICC Ad Hoc Committee on Wall Bracing (AHC-WB)]

The final version of the IRC wall bracing provisions will be reprinted, with the approval of ICC, in the UDC appendix. This reprint may not be available prior to the effective of the UDC, April 1, 2009.

Websites

- **Safety and Buildings Home Page**
 - ☞ www.commerce.wi.gov/SB
- **Commerce Codes**
 - ◆ www.commerce.wi.gov/SB/SB-DivCodes.html
- **Wisconsin Administrative Codes**
 - ☞ www.legis.state.wi.us/rsb/code/codtoc.html

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