2024 IRC Wall Bracing Part II:
Wind Design





Presented By: Jacquelyn Miller, PE

1

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2

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3

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4

4

Portions of Webinar from ICC

Tables R602.10.3(1); R602.10.3(2); R602.10.5; R602.10.5.2; R602.10.3(3); R602.10.3(4); R602.10.6.5.4; and Table R602.3(5); and Figures R301.2(2); R301.2.2.1(1) and R301.2.2.1(2); and Figures R602.10.3.1, R602.10.2.2, R602.10.7, R602.10.8(1) & R602.10.8(2); and Figures R602.10.6.5.2, Figure R602.11.2, 602.10.9 and Figure R602.10.6.4 **are copyrighted excerpts from the 2024 *International Residential Code.* Copyright © 2024. International Code Council, Inc. All rights reserved. Reproduced with permission granted by ICC in August 2026. www.ICCSAFE.org.**

5

5

Today's Presenter



Jacquelyn Miller, PE
Engineered Wood Specialist

Engineered Wood Specialist

- Structural engineer
- In the 1% who love wall bracing
- Amateur baker

Your Feedback is Important to Us!

6

Learning Objectives

- Implement wall bracing to meet strength and stability requirements for wind design.
- Recognize when adjustment factors are needed and utilize them to ensure a complete design.
- Identify critical wall bracing connections and their role in a complete load path.
- Understand when prescriptive wall bracing design is insufficient and evaluate alternatives to maintain compliance.

7

7

2024 IRC Wall Bracing Part I:

Options, Limitations, and Common Mistakes

Now available on-demand



- Limits of wall bracing
- Laying out braced wall lines
- Mixing wall bracing methods
- Common mistakes
- Wall bracing resources

8

8

What's Next in the Series?



Part 3:
Wall Bracing Seismic Design
December 15th, 2026



Part 4:
Advanced Wall Bracing
January 20th, 2027

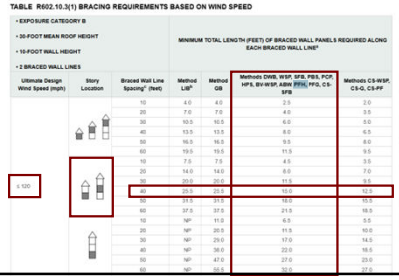
9

Wall Bracing Length Requirements for Wind

10

Table R602.10.3(1)

TABLE R602.10.3(1) BRACING REQUIREMENTS BASED ON WIND SPEED



Before you start, you need:

- Ultimate Design Wind Speed
- Story
- Braced Wall Line Spacing
- Bracing Method

Table Courtesy ICC

11

If Mixing Methods

TABLE R602.10.3(1) BRACING REQUIREMENTS BASED ON WIND SPEED

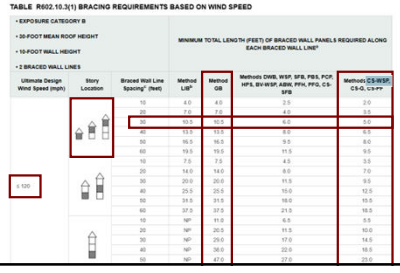
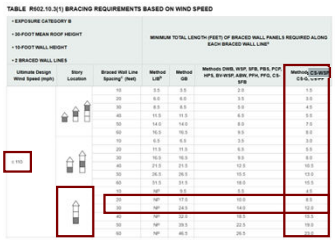


Table Courtesy ICC

12

Linear Interpolation



Braced Wall Line Spacing = 26'-7"

$$\frac{(12-8.5)}{(30-20)}\ (26.583-20) + 8.5 = 10.8$$

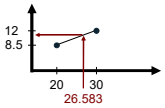


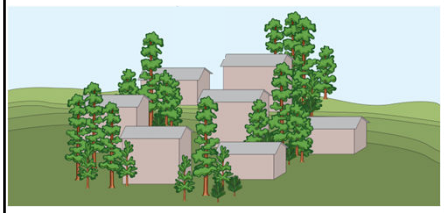
Table Courtesy ICC

13

Adjustment Factors Table R602.10.3(2)

14

Wind Exposure B

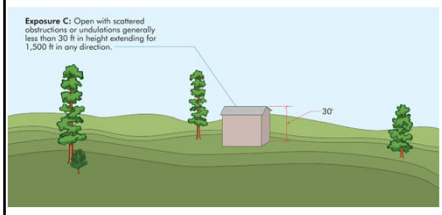


Section R301.2.1.4

Story	Adjustment Factor
One-story structure	1.00
Two-story structure	1.00
Three-story structure	1.00

15

Wind Exposure C Option 1



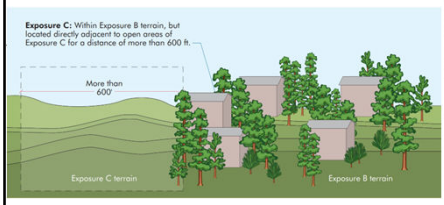
Story	Adjustment Factor
One-story structure	1.20
Two-story structure	1.30
Three-story structure	1.40

Section R301.2.1.4

16

16

Wind Exposure C Option 2



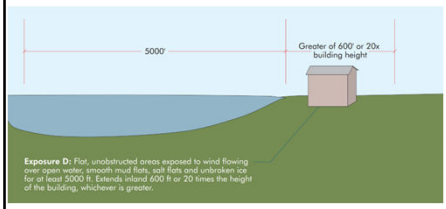
Story	Adjustment Factor
One-story structure	1.20
Two-story structure	1.30
Three-story structure	1.40

Section R301.2.1.4

17

17

Wind Exposure D



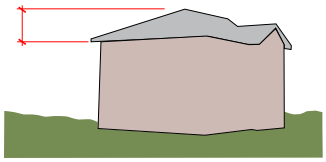
Story	Adjustment Factor
One-story structure	1.50
Two-story structure	1.60
Three-story structure	1.70

Section R301.2.1.4

18

18

Roof Eave-to-Ridge Height



	Eave-to-Ridge Height	Adjustment Factor
Roof only	≤ 5 feet	0.70
	10 feet	1.00
	15 feet	1.30
	20 feet	1.60
Roof + 1 floor	≤ 5 feet	0.85
	10 feet	1.00
	15 feet	1.15
	20 feet	1.30
Roof + 2 floors	≤ 5 feet	0.90
	10 feet	1.00
	15 feet	1.10
	20 feet	Not permitted

19

19

Wall Height

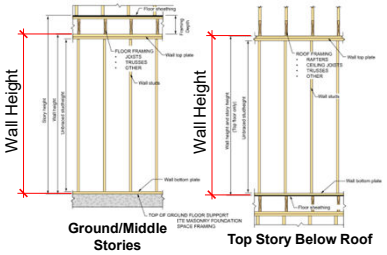


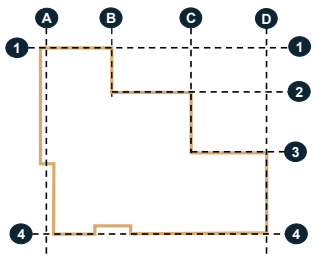
Figure Courtesy ICC

Wall Height	Adjustment Factor
8 feet	0.90
9 feet	0.95
10 feet	1.00
11 feet	1.05
12 feet	1.10

20

20

Number of Braced Wall Lines

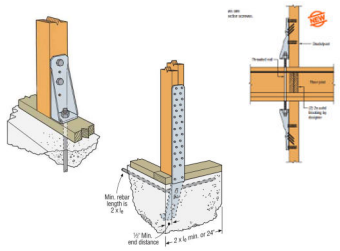


Number of Braced Wall Lines	Adjustment Factor
2	1.00
3	1.30
4	1.45
≥ 5	1.60

21

21

Hold-down Device



Additional 800-Pound Hold-Down Device	Adjustment Factor
Fastened to end studs of BWP and foundation or framing below	0.80

22

Figure Courtesy Simpson Strong-Tie

22

Interior Gypsum Board (Omitted)

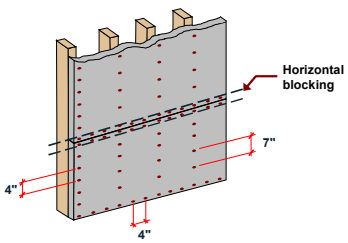


Interior Gypsum Board	Adjustment Factor
Omitted from inside face of BWP	1.40

23

23

Gypsum Board Fastening



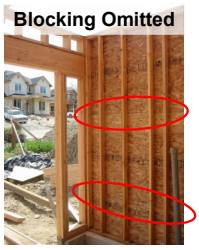
Gypsum Board Fastening	Adjustment Factor
4" o.c. at panel edges, and all horizontal joints blocked	0.70

24

24

Horizontal Blocking (Omitted)





Horizontal Blocking	Adjustment Factor
Horizontal blocking omitted	2.00

25

25

Minimum Length of BWP Table R602.10.5

26

26

Aspect Ratios





27

27

Minimum Length (inches)

Method (See Table R602.10.5)		Minimum Length[a] (inches) Wall Height 8 ft	9 ft	10 ft	11 ft	12 ft	Contributing Length (inches)
DWB, WSP, SFB, PBS, PCP, HPS, BV-WSP		48	48	48	53	58	Actual[b]
GB		48	48	48	53	58	Double sided = Actual Single sided = 0.5 Actual
LIB		55	62	69	NP	NP	Actual[b]
ABW	SDC A, B and C	28	32	34	38	42	48
	SDC D_b, D_1 and D_2	32	32	34	NP	NP	
CS-G		24	27	30	33	36	Actual[b]

NP = Not Permitted

a. Linear interpolation shall be permitted.

b. Use the actual length where it is greater than or equal to the minimum length. The actual…

28

Table Courtesy ICC

28

Minimum Length (inches)

Method	Adjacent Clear Opening Height (in)	Wall Height (ft) 8	9	10	11	12	Contributing Length
CS-WSP	≤ 64	24	27	30	33	36	Actual[b]
	68	26	27	30	33	36	
	72	27	27	30	33	36	
	76	30	29	30	33	36	
	80	32	30	30	33	36	
	84	35	32	32	33	36	
	88	38	35	33	33	36	
	92	43	37	35	35	36	
	96	48	41	38	36	36	
	100		44	40	38	38	
	104		49	43	40	39	
	108		54	46	43	41	
	112			50	45	43	
	116			55	48	45	
	120			60	52	48	

b. Use the actual length where it is greater than or equal to the minimum length. The actual…

29

Table Courtesy ICC

29

Minimum Length (inches)

Method	Adjacent Clear Opening Height (in)	Wall Height (ft)/Portal Header Height 8	9	10	11	12	Contributing Length
CS-WSP	124				56	51	Actual[b]
	128				61	54	
	132				66	58	
	136					62	
	140					66	
	144					72	
PFH	Supporting roof only	16	16	16	Note c	Note c	48
	Supporting one story and roof	24	24	24	Note c	Note c	48
PFG	SDC A, B and C	24	27	30	Note d	Note d	1.5 × Actual[b]
CS-PF	SDC A, B and C	16	18	20	Note e	Note e	1.5 x Actual[b]
	SDC D0, D1 and D2	16	18	20	Note e	Note e	Actual[b]

b. Use the actual length where it is greater than or equal to the minimum length. The actual…

c. d. e. Maximum header height for PFH, PFG, and CS-PF is 10ft … but wall height shall be permitted to be increased to 12 feet with pony wall.

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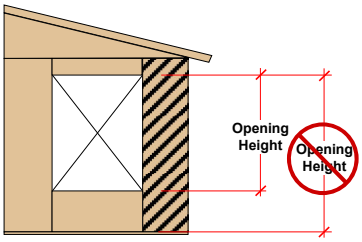
Table Courtesy ICC

30

Opening Height for CS-WSP



31

31

Partial Credit (Table R602.10.5.2)

Method (See Table R602.10.5)	Minimum Length[a] (inches)		
	Wall Height		
	8 ft	9 ft	10 ft
DWB, WSP, SFB, PBS, PCP, HPS	48	48	48

Actual Length of BWP	Contributing Length of BWP (inches)[a]	
	8-foot Wall Height	9-foot Wall Height
48	48	48
42	36	36
36	27	N/A

a. Linear interpolation shall be permitted.

Table Courtesy ICC

32

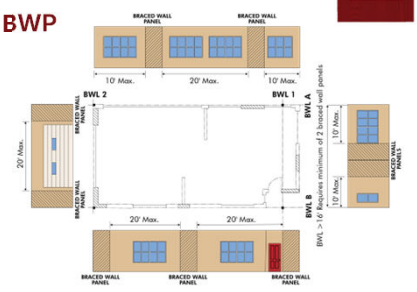
32

Spacing Requirements

33

Location Rules of BWP

- Figure R602.10.2.2



34

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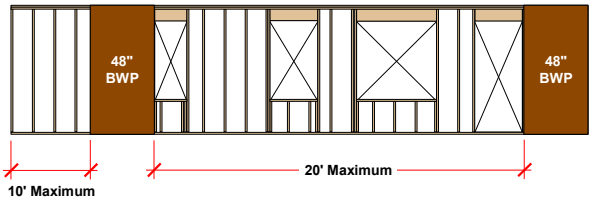
Spacing Along a Braced Wall Line



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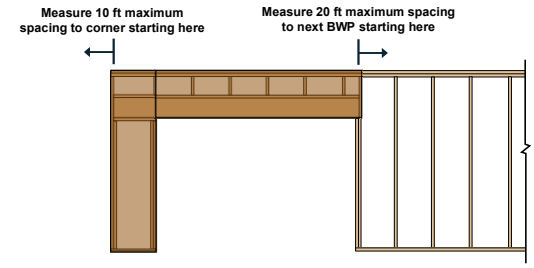
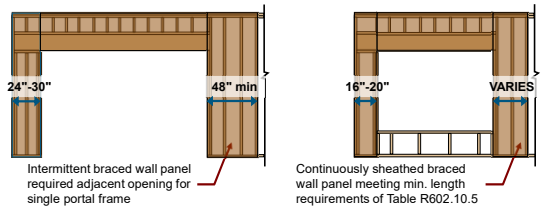
Single Portal Frame Spacing Rules



36

36

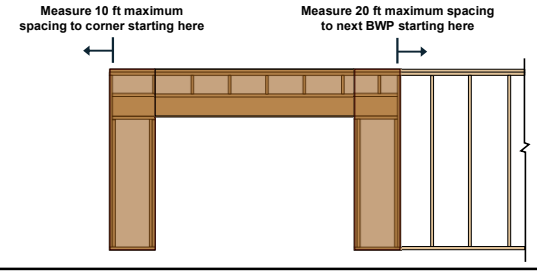
PFG and CS-PF Requirement



37

37

Double Portal Frame Spacing Rules



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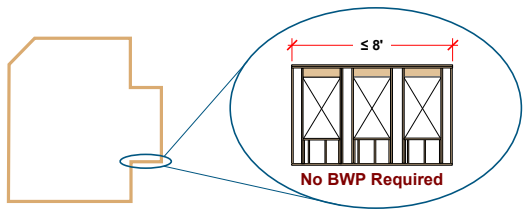
38

Minimum Number of BWP



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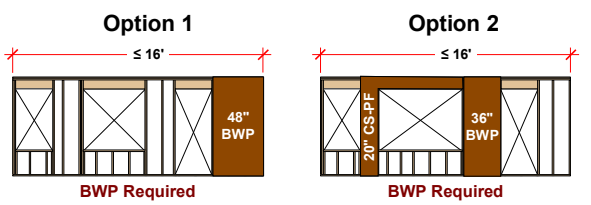
39

Minimum Number of BWP



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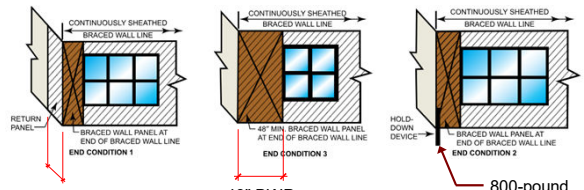
End Conditions In CS-WSP or CS-SFB



24" for WSP
32" for SFB

48" BWP

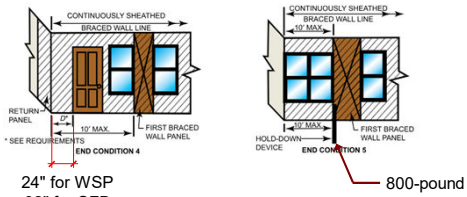
800-pound hold-down

Figure Courtesy ICC

41

41

End Conditions In CS-WSP or CS-SFB



24" for WSP
32" for SFB

800-pound hold-down

Figure Courtesy ICC

42

42

Braced Wall Panel Connections

43

Sheathing to Stud Connection



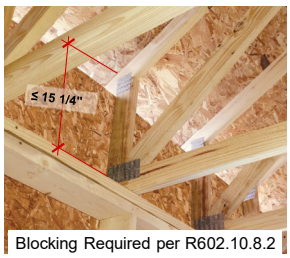
44

44

Roof to BWP Connection



No Blocking Required



Blocking Required per R602.10.8.2

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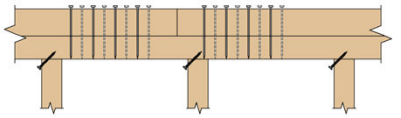
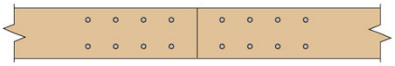
45

Top Plate Splice



ELEVATION



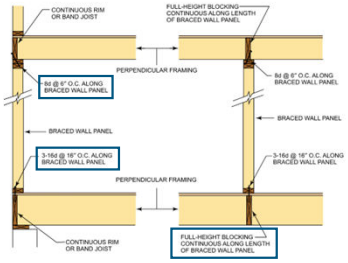
PLAN

46

46

Floor to Floor Connections



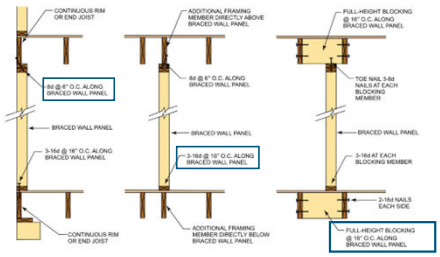


47

Figure Courtesy ICC

47

Floor to Floor Connections

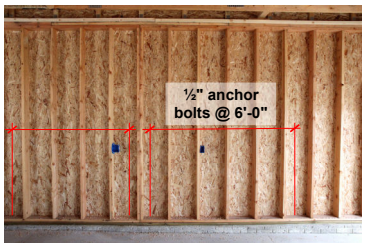


48

Figure Courtesy ICC

48

Anchor Bolts for BWP (R403.1.6)







49

49

Final Review

1. Gather your background information
2. Lay out braced wall lines
3. Find the required length of BWP base value
4. Multiple the base value by the adjustment factors
5. Identify the minimum length of BWP
6. Lay out BWP to meet spacing requirements
7. Check BWP connections

50

50

Example

51

Gather Background Info

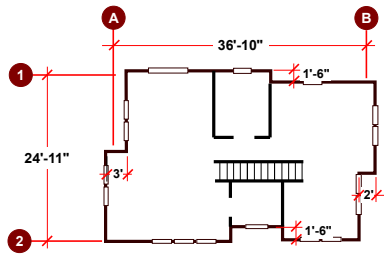


- V = 110 mph
- Wall Height =
  - 10'-0" first floor
  - 9'-0" second floor
- Wind Exposure = C
- Using Intermittent WSP

52

52

Lay Out Braced Wall Lines



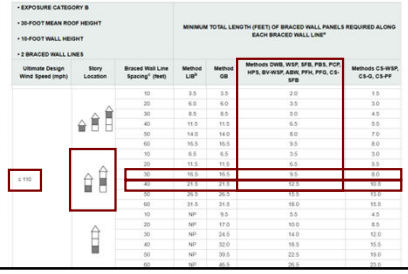
53

53

Find Base Value

Table Courtesy ICC

BWL Spacing
- 36'-10"
- 24'-11"



54

54

Multiply by Adjustment Factor

Number of Stories	Exposure/Height Factor		
	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

Support Condition	Roof Eave-to-Ridge Height			
	≤ 5'	10'	15'	20'
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

NP = Not Permitted

55

55

Multiply by Adjustment Factor

Wall Height (ft)	Adjustment Factor
8'	0.90
9'	0.95
10'	1.00
11'	1.05
12'	1.10

Number of Braced Wall Lines	Adjustment Factor
2	1.00
3	1.30
4	1.45
≥ 5	1.60

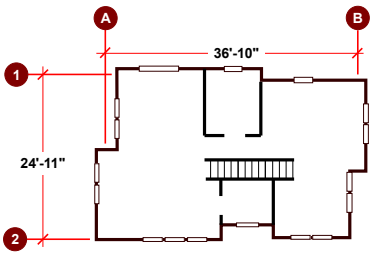
56

56

Final Strength Requirement

Line 1 & 2
9.5' x 1.3 x 1.15 x
1.0 x 1.0 = 14.2'

Line A & B
12.5' x 1.3 x 1.15
x 1.0 x 1.0 = 18.7'



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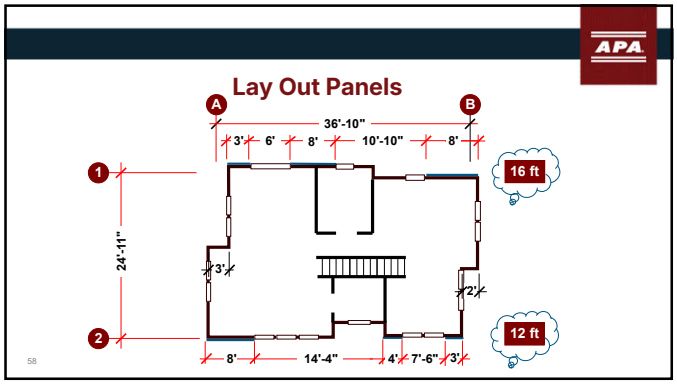
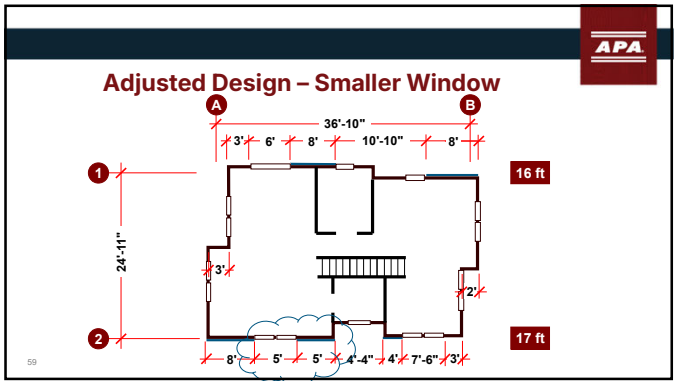
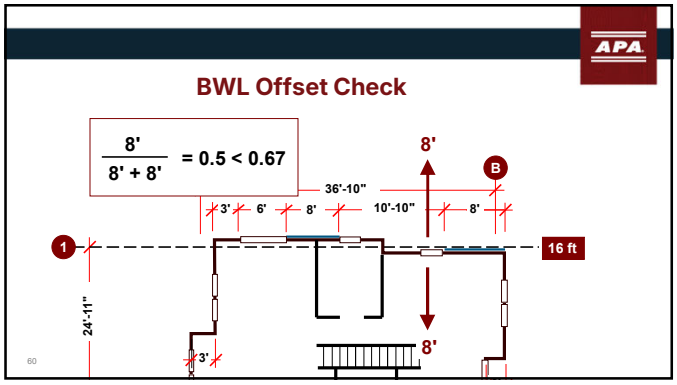
57


Lay Out Panels
A
B
36'-10"
3'
6'
8'
10'-10"
8'
1
2
24'-11"
16 ft
12 ft
3'
2'
8'
14'-4"
4'
7'-6"
3'
58

58

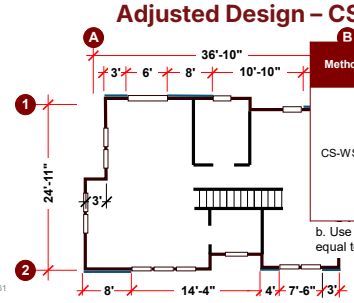

Adjusted Design – Smaller Window
A
B
36'-10"
3'
6'
8'
10'-10"
8'
1
2
24'-11"
16 ft
17 ft
3'
2'
8'
5'
5'
4'-4"
4'
7'-6"
3'
59

59


BWL Offset Check
8'
8' + 8'
= 0.5 < 0.67
8'
B
36'-10"
3'
6'
8'
10'-10"
8'
1
16 ft
24'-11"
3'
8'
60

60

Adjusted Design – CS-WSP



Method	Adjacent Clear Opening Height (in)	Wall Height 10	Contributing Length
CS-WSP	≤ 64	30	Actual[b]
	68	30	
	72	30	
	76	30	
	80	30	
	84	32	
	88	33	
	92	35	
	96	38	
	100	40	

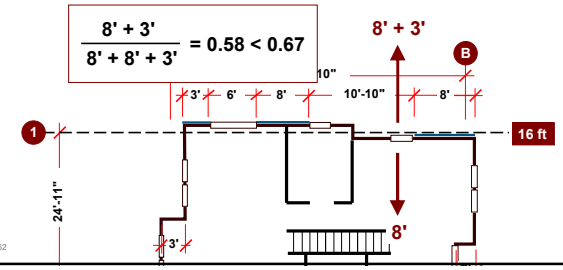
b. Use the actual length where it is greater than or equal to the minimum length. The actual…

61

61

BWL Offset Check with CS-WSP

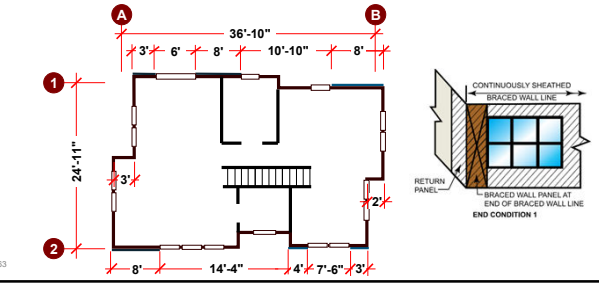
$$\frac{8' + 3'}{8' + 8' + 3'} = 0.58 < 0.67$$



62

62

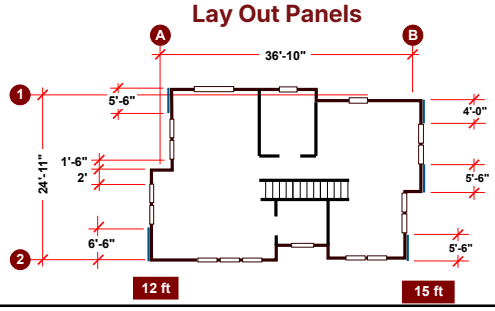
CS-WSP End Conditions



63

63

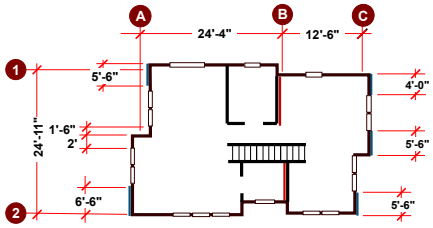
Lay Out Panels



64

64

Now What?



- Use interpolation to check requirements
- Change to CS-WSP
- Add a BWL
- Engineer a solution
- Remove a window

65

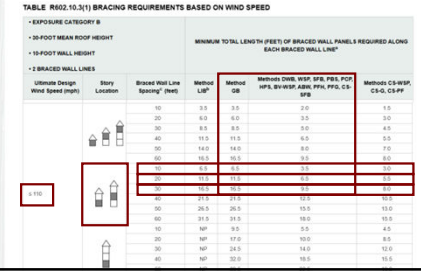
65

Adjusted Design – Add a BWL

BWL Spacing
- A: 24'-4"
- B: 18'-5"
- C: 12'-6"

Table Courtesy ICC

TABLE R602.10.3(1) BRACING REQUIREMENTS BASED ON WIND SPEED



66

66

Adjusted Design – Add a BWL

A: $9.5\text{ft} - \frac{9.5\text{ft} - 6.5\text{ft}}{30\text{ft} - 20\text{ft}} \times (30\text{ft} - 24.33\text{ft}) = 7.8\text{ft}$

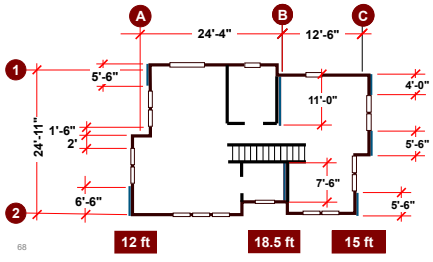
B: $11.5\text{ft} - \frac{11.5\text{ft} - 6.5\text{ft}}{20\text{ft} - 10\text{ft}} \times (20\text{ft} - 18.58\text{ft}) = 10.8\text{ft}$

Number of Braced Wall Lines	Adjustment Factor
2	1.00
3	1.30
4	1.45
≥ 5	1.60

67

67

Adjusted Design – Add a BWL



- **Line A**
  7.8' x 1.3 x 1.15 x 1.0 x 1.3 = 15.2'
- **Line B**
  10.8' x 1.3 x 1.15 x 1.0 x 1.3 = 21'
- **Line C**
  6.5' x 1.3 x 1.15 x 1.0 x 1.3 = 12.6'

68

68

Adjusted Design – CS-WSP

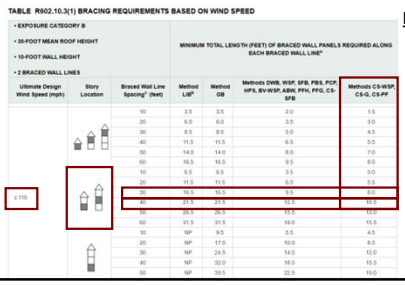


TABLE R602.10.3(1) BRACING REQUIREMENTS BASED ON WIND SPEED

- EXPOSURE CATEGORY B
- 30-FOOT MEAN ROOF HEIGHT
- 10-FOOT WALL HEIGHT
- 2 BRACED WALL LINES

MINIMUM TOTAL LENGTH (FEET) OF BRACED WALL PANELS REQUIRED ALONG EACH BRACED WALL LINE[a]

Ultimate Design Wind Speed (mph)	Story Location	Braced Wall Line Spacing[c] (feet)	Method LIB[b]	Method GB	Methods DWB, WSP, SFB, PBS, PCP, HPS, BV-WSP, ABW, PFH, PFG, CS-SFB	Methods CS-WSP, CS-G, CS-PF
≤ 110		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
		10	6.5	6.5	3.5	3.0
		20	11.5	11.5	6.0	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	15.5	13.0
		60	31.5	31.5	18.0	15.5
		10	NP	9.5	5.5	4.5
		20	NP	17.0	10.0	8.5
		30	NP	24.5	14.0	12.0
		40	NP	32.0	18.5	15.5
		50	NP	39.5	22.5	19.0

Linear Interpolation:

$10.5\text{ft} - \frac{10.5\text{ft} - 8\text{ft}}{40\text{ft} - 30\text{ft}} \times (40\text{ft} - 36.83\text{ft}) = 9.7\text{ft}$

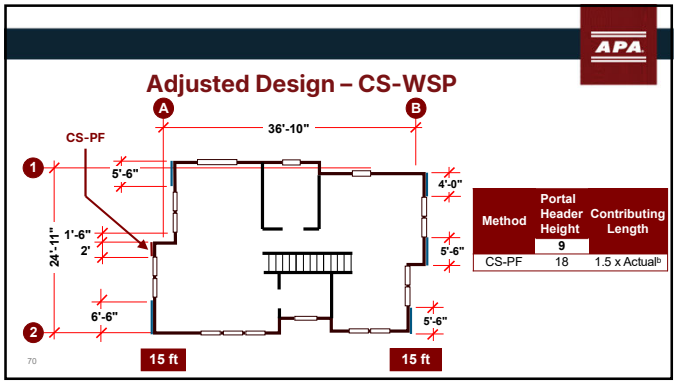
With Adjustment Factors:

9.7ft x 1.3 x 1.15 = 14.5ft

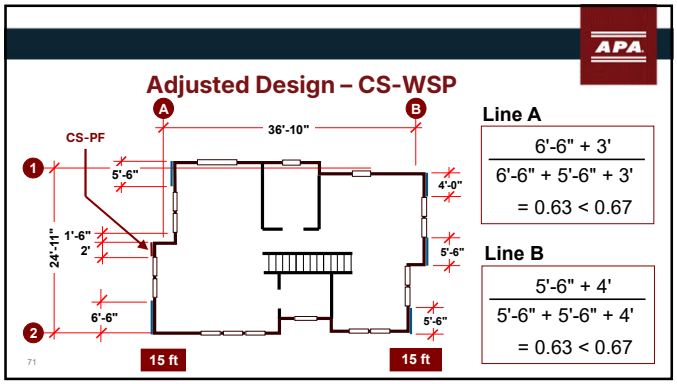
Table Courtesy ICC

69

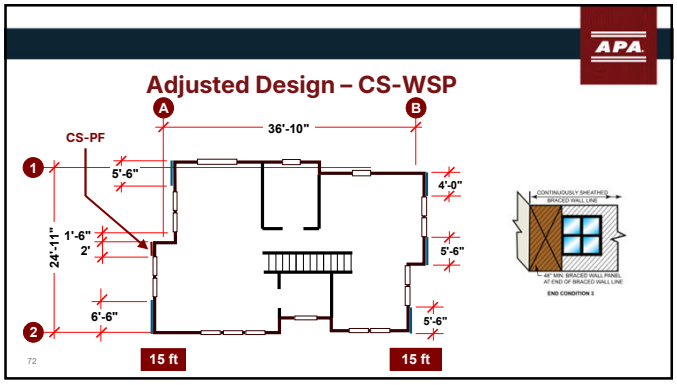
69


Adjusted Design – CS-WSP
A
B
36'-10"
CS-PF
1
2
5'-6"
4'-0"
1'-6"
2'
24'-11"
5'-6"
6'-6"
5'-6"
15 ft
15 ft
70
Method
Portal Header Height
9
Contributing Length
CS-PF
18
1.5 x Actual[b]

70


Adjusted Design – CS-WSP
A
B
36'-10"
CS-PF
1
2
5'-6"
4'-0"
1'-6"
2'
24'-11"
5'-6"
6'-6"
5'-6"
15 ft
15 ft
71
Line A
6'-6" + 3'
6'-6" + 5'-6" + 3'
= 0.63 < 0.67
Line B
5'-6" + 4'
5'-6" + 5'-6" + 4'
= 0.63 < 0.67

71


Adjusted Design – CS-WSP
A
B
36'-10"
CS-PF
1
2
5'-6"
4'-0"
1'-6"
2'
24'-11"
5'-6"
6'-6"
5'-6"
15 ft
15 ft
72

72

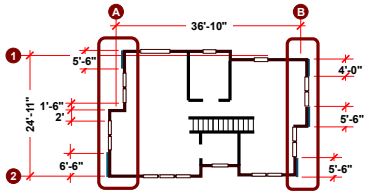
Continuously Sheathed Portal Frame



73

Engineering a Solution

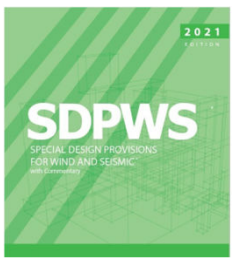
- Identify the portion out of compliance with the prescriptive code
- Hire a registered design professional
- Include their calculations or requirements in the drawings or submission



74

74

Engineering Guide



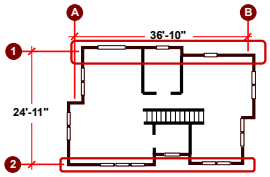
- SDPWS is a code accepted resource from AWC used to design shear walls
- Segmented
- FTAO
- Perforated

75

75

CS-WSP End Conditions

Walls that meet the prescriptive codes



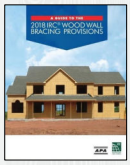
Other Stories



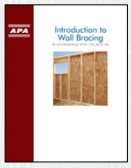
76

76

Published Resources



www.iccsafe.org



APA Form F430



APA Form SR-102

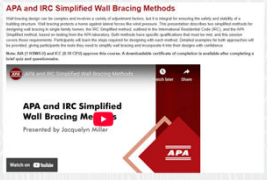


APA Form Q230

77

77

Simplified Methods



APA and IRC Simplified Wall Bracing Methods Webinar



Form SR-102

78

78

Digital Resources



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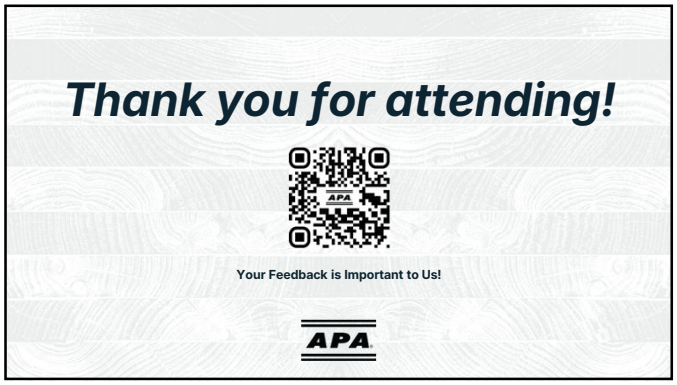
Thank you for attending!
Your Feedback is Important to Us!
APA

83