


APA

Wall Bracing V: Wall Bracing Examples in High Seismic



By Aleeta Dene and Larry Oenning



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Questions related to specific materials, methods and services will be addressed at the conclusion of this presentation.

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Meet the Team



Aleeta Dene, P.E.
Southwest Region





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Pacific Northwest Region



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Learning Objectives

- ❑ Understand the basic procedure for designing wall bracing using the residential building code.
- ❑ Appreciate the effect various design choices have on the applicability of the residential building code.
- ❑ Explore various approaches to designing portions of a structure that do not meet the residential building code limitations.
- ❑ Discuss how the residential building code is applied to small additions.

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Resources

www.iccsafe.org
▪ Item no. 7102S18

www.apawood.org
▪ Form F430

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Example 1

(Example 4.6 from A Guide to the 2018 IRC Wood Wall Bracing Provisions)

Second Floor Plan

Wind Info:
110 mph
Exposure B


Seismic Info:
SDC D₂

Geometry:
2-story
8 ft. eave-to-ridge ht.
10 ft. story ht. (9 ft. wall ht.)
Slab-on-grade

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Example 1
(Example 4.6 from *A Guide to the 2018 IRC Wood Wall Bracing Provisions*)




Preliminary Check:

- Single family or townhome
- 3 stories or less, 2 for SDC D₂ (R301.2.2.7)
- Story height ≤ 11'-7" (R301.3, R602.3[5])
- Seismic Design Categories D₀-D₂ (R301.2.2, R301.2.2.1.1) and maybe E (R301.2.2.1.2)
- Weight of materials (R301.2.2.2) 15 psf for roof and ceiling (adjustments up to 25 psf per Table R602.10.3[4]), 10 psf for floor system, 15 psf for exterior wood walls

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Example 1
(Example 4.6 from *A Guide to the 2018 IRC Wood Wall Bracing Provisions*)



Preliminary Check:

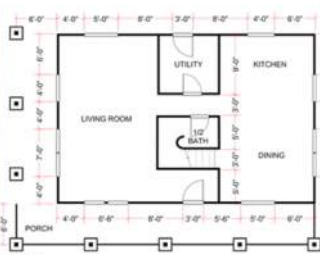
- Weight of materials (R301.2.2.2) 15 psf for roof and ceiling (adjustments up to 25 psf per Table R602.10.3[4]), 10 psf for floor system, 15 psf for exterior wood walls

<p>Roof/Ceiling Weight = 13 psf</p> <ul style="list-style-type: none"> • Asphalt shingles (3 psf) • Roof trusses (4 psf) • 15/32 OSB (1.5 psf) • Spray foam insulation (1 psf) • MEP (2 psf) • Gypsum board (1.5 psf) 	<p>Floor Weight = 10 psf</p> <ul style="list-style-type: none"> • Carpet (2 psf) • 23/32 OSB (2.5 psf) • Floor framing (2 psf) • MEP (2 psf) • Gypsum board (1.5 psf) <p>Wall Weight = 9 psf</p> <ul style="list-style-type: none"> • Gypsum board (1.5 psf) • Studs & sheathing (3.5 psf) • Siding (3 psf) • Insulation (1 psf)
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Example 1
(Example 4.6 from *A Guide to the 2018 IRC Wood Wall Bracing Provisions*)



Irregularity Check (First Story):

- No exterior braced wall panel (BWP) offsets out-of-plane
- Lateral support of roofs and floors provided on all edges (exceptions up to 6 ft.)
- No BWP offsets in plane (> 1 ft. over opening, some exceptions)
- Floor or roof opening < 50% least plan dimension or 12 ft.
- No vertical floor offset within a level
- All perpendicular shear wall and BWPs
- No wall stories containing masonry or concrete construction above grade (not including chimneys)

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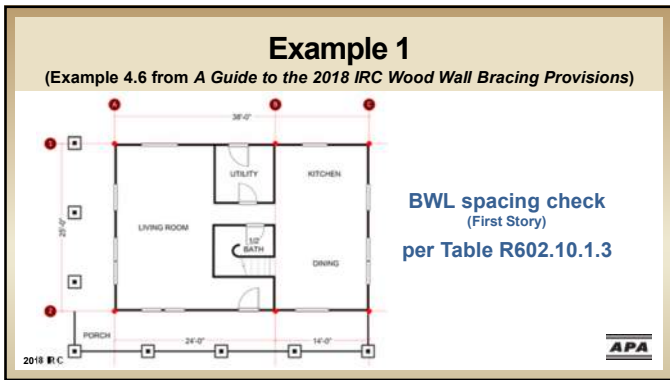
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Example 1
(Example 4.6 from *A Guide to the 2018 IRC Wood Wall Bracing Provisions*)

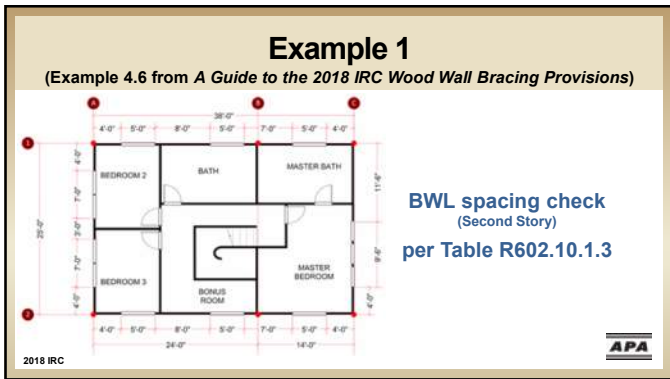
**TABLE R602.10.1.3
BRACED WALL LINE SPACING**

APPLICATION	CONDITION	BUILDING TYPE	BRACED WALL LINE SPACING CRITERIA		
			Maximum Spacing	Exception to Maximum Spacing	
Wind bracing	Ultimate design wind speed 100 mph to < 140 mph	Detached, townhouse	60 feet	None	
		SDC A – C	Detached	Use wind bracing	
Seismic bracing	SDC A – B	Townhouse		Use wind bracing	
		SDC C	Townhouse	35 feet	
		SDC D ₁ , D ₂ , D ₃	Detached, townhouses, one- and two-story only	25 feet ✓	Up to 50 feet when length of required bracing per Table R602.10.3(3) is adjusted in accordance with Table R602.10.3(4). Up to 35 feet to allow for a single room not to exceed 900 square feet. Spacing of all other braced wall lines shall not exceed 25 feet.
		SDC D ₁ , D ₂ , D ₃	Detached, townhouse	25 feet	Up to 35 feet when length of required bracing per Table R602.10.3(3) is adjusted in accordance with Table R602.10.3(4).

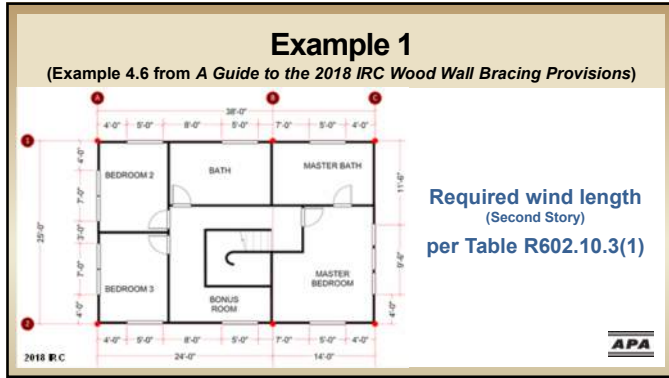
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**TABLE R602.10.3(1)
BRACING REQUIREMENTS BASED ON WIND SPEED**

• 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*

* Where three or more parallel braced wall lines are present and the distances between adjacent braced wall lines are different, the average dimension shall be permitted to be used for braced wall line spacing.

Wind Speed (mph)	Methods				
	PPG	CS	SB	B	Other
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		6.5	5.5	
50	14.0		8.0	7.0	
≤ 110	14 (BWL C)	4.50	4.50	2.60	2.10
	19 (BWL B)	5.75	5.75	3.35	2.85
	24 (BWL A)	7.00	7.00	4.10	3.60
	25 (BWL 1 & 2)	7.25	7.25	4.25	3.75
	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	

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Example 1

(Example 4.6 from *A Guide to the 2018 IRC Wood Wall Bracing Provisions*)

**Second Story
Wind Adjustments
per Table R602.10.3(2):**

- Exposure Category > B
- 0.88** Roof Eave-to-Ridge Ht.
- Story Ht.
- 1.30** Number of BWLs
- Extra Hold-downs at the Roof
- No Gypsum Board
- 4" o.c. Gypsum Board Fastening
- No Horizontal Blocking

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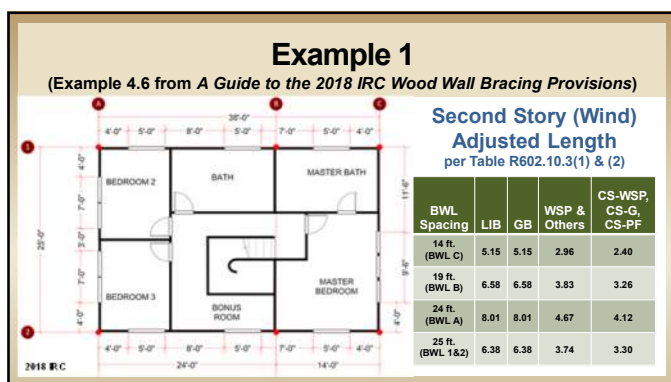
TABLE R602.10.3(1)
BRACING REQUIREMENTS BASED ON WIND SPEED

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

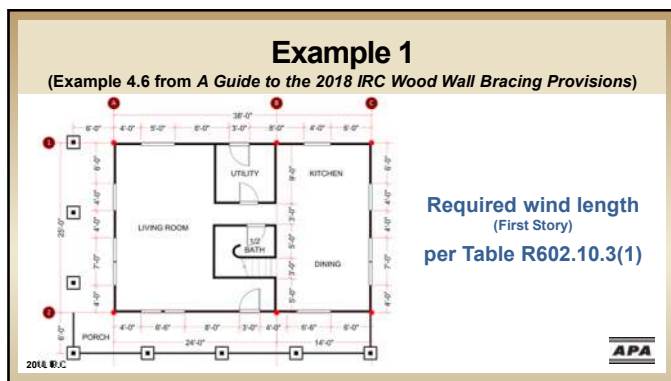
MINIMUM TOTAL LENGTH (FEET) OF BRACED WALL PANELS REQUIRED ALONG EACH BRACED WALL LINE*

Ultimate Design Wind Speed (mph)	Story Location	Braced Wall Line Spacing ¹ (feet)	Methods			
			Method LIB ²	Method GB	DWB, WSP, SFB, PBS, PCF, HSB, BV-WSP, ABW, PFH, PFC, 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		6.5	5.5
		50	14.0		8.0	7.0
		14 (BWL C)	5.15	5.15	2.96	2.40
		19 (BWL B)	6.58	6.58	3.83	3.26
		24 (BWL A)	8.01	8.01	4.67	4.12
		25 (BWL 1 & 2)	6.38	6.38	3.74	3.30
		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	

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Example 1
 (Example 4.6 from *A Guide to the 2018 IRC Wood Wall Bracing Provisions*)

**First Story (Wind)
 Adjusted Length
 per Table R602.10.3(1) & (2)**

BWL Spacing	LIB	GB	WSP & Others	CS-WSP, CS-G, CS-PF
14 ft. (BWL C)	10.4	10.4	5.73	4.89
19 ft. (BWL B)	13.4	13.4	7.58	6.42
24 ft. (BWL A)	16.5	16.5	9.39	7.94
25 ft. (BWL 1&2)	13.2	13.2	7.52	6.35

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Example 1
 (Example 4.6 from *A Guide to the 2018 IRC Wood Wall Bracing Provisions*)

**First Story (Wind)
 Adjusted Length
 per Table R602.10.3(1) & (2)**

BWL Spacing	LIB	GB	WSP & Others	CS-WSP, CS-G, CS-PF
14 ft. (BWL C)	10.4	10.4	5.73	4.89
19 ft. (BWL B)	13.4	13.4	7.58	6.42
24 ft. (BWL A)	16.5	16.5	9.39	7.94
25 ft. (BWL 1&2)	13.2	13.2	7.52	6.35

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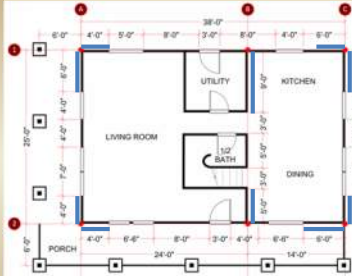
Example 1
 (Example 4.6 from *A Guide to the 2018 IRC Wood Wall Bracing Provisions*)

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Example 1

(Example 4.6 from *A Guide to the 2018 IRC Wood Wall Bracing Provisions*)



First Story (Wind) Adjusted Length per Table R602.10.3(1) & (2)


BWL Spacing	LIB	GB	WSP & Others	CS-WSP, CS-G, CS-PF
14 ft. (BWL C)	16.3	10.4	5.73	4.89
19 ft. (BWL B)	13.4	13.4	7.58	6.42
24 ft. (BWL A)	16.5	16.5	9.39	7.94
25 ft. (BWL 1&2)	13.2	13.2	7.52	6.35

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Example 1

(Example 4.6 from *A Guide to the 2018 IRC Wood Wall Bracing Provisions*)



BWP Check:

- BWP required at each BWL end... (R602.10.2.2.1)
- Distance between BWP edges ≤ 20 ft. (R602.10.2.2)
- All BWP meet minimum length per method (Table R602.10.5)
- Minimum number of BWPs (R602.10.2.3) for any BWL ≤ 16 ft. is (2) of any length or (1) at least 48". BWLs > 16 ft. shall have at least (2) BWPs.


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Example 1

(Example 4.6 from *A Guide to the 2018 IRC Wood Wall Bracing Provisions*)

BWP Method	Minimum Length (9 ft. ht.) per Table R602.10.5	<h4 style="color: blue;">BWP Check:</h4> <ul style="list-style-type: none"> <input checked="" type="checkbox"/> BWP required at each BWL end... (R602.10.2.2.1) <input checked="" type="checkbox"/> Distance between BWP edges ≤ 20 ft. (R602.10.2.2) <input checked="" type="checkbox"/> All BWP meet minimum length per method (Table R602.10.5) <input checked="" type="checkbox"/> Minimum number of BWPs (R602.10.2.3) for any BWL ≤ 16 ft. is (2) of any length or (1) at least 48". BWLs > 16 ft. shall have at least (2) BWPs.
CS-PF	18 inches	
PFH	24 inches	
PFG	27 inches	
CS-G		
CS-WSP	27 inches (for adjacent openings ≤ 72 inches high)	
ABW	32 inches	
WSP & Other	48 inches	

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Example 1
 (Example 4.6 from *A Guide to the 2018 IRC Wood Wall Bracing Provisions*)

Second Story (Wind) Adjusted Length per Table R602.10.3(1) & (2)

BWL Spacing	LIB	GB	WSP & Others	CS-WSP, CS-G, CS-PF
14 ft. (BWL C)	5.15	5.15	2.96	2.40
19 ft. (BWL B)	6.58	6.58	3.83	3.26
24 ft. (BWL A)	8.01	8.01	4.67	4.12
25 ft. (BWL 18.2)	6.38	6.38	3.74	3.30

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Example 1
 (Example 4.6 from *A Guide to the 2018 IRC Wood Wall Bracing Provisions*)

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Example 1
 (Example 4.6 from *A Guide to the 2018 IRC Wood Wall Bracing Provisions*)

BWP Check (Second Story):

- BWP required at each BWL end... (R602.10.2.2.1)
- Distance between BWP edges ≤ 20 ft. (R602.10.2.2)
- All BWP meet minimum length per method (Table R602.10.5)
- Minimum number of BWPs (R602.10.2.3) for any BWL ≤ 16 ft. is (2) of any length or (1) at least 48". BWLs > 16 ft. shall have at least (2) BWPs.

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Example 1
(Example 4.6 from *A Guide to the 2018 IRC Wood Wall Bracing Provisions*)

Irregularity Check (First Story):

- No exterior braced wall panel (BWP) offsets out-of-plane
- Lateral support of roofs and floors provided on all edges (exceptions up to 6 ft.)
- No BWP offsets in plane (> 1 ft. over opening, some exceptions)
- Floor or roof opening ≤ 50% least plan dimension or 12 ft.
- No vertical floor offset within a level
- All perpendicular shear wall and BWPs
- No wall stories containing masonry or concrete construction above grade (not including chimneys)

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Example 1
(Example 4.6 from *A Guide to the 2018 IRC Wood Wall Bracing Provisions*)

First Floor Plan **Second Floor Plan**

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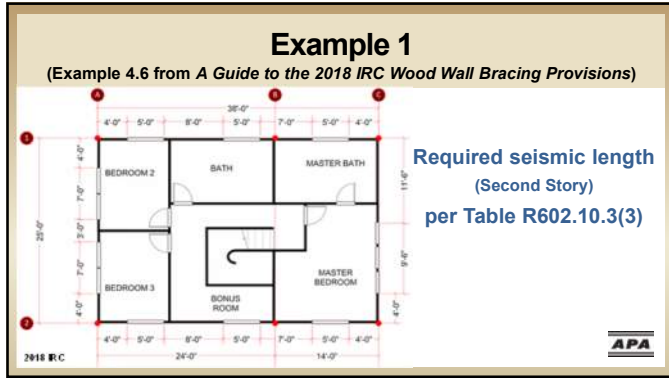
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Example 1
(Example 4.6 from *A Guide to the 2018 IRC Wood Wall Bracing Provisions*)

First Floor Plan **Second Floor Plan**

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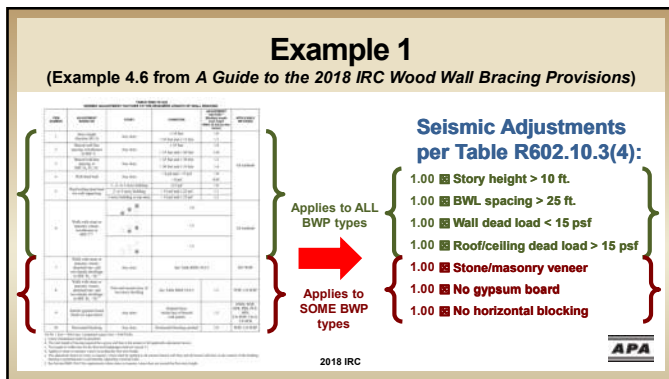
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TABLE R602.10.3(3)—continued
BRACING REQUIREMENTS BASED ON SEISMIC DESIGN CATEGORY

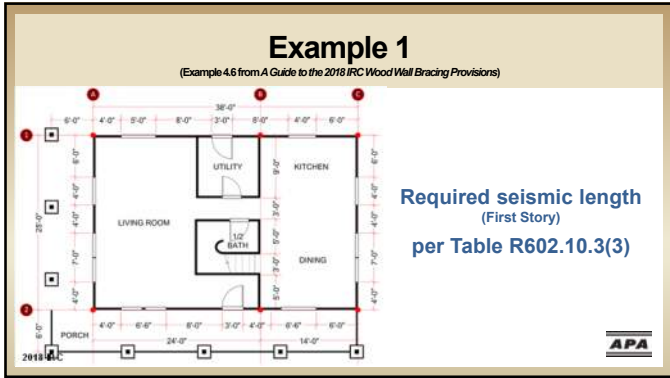
* SOIL CLASS D_s
 * WALL HEIGHT = 10 FEET
 * 10 PSF FLOOR DEAD LOAD
 * 15 PSF ROOF/CEILING DEAD LOAD
 * BRACED WALL LINE SPACING = 25 FEET

Seismic Design Category	Story Location	Braced Wall Line Length (feet)	MINIMUM TOTAL LENGTH (FEET) OF BRACED WALL PANELS REQUIRED ALONG EACH BRACED WALL LINE*				
			Method LIB ¹	Method GB	Methods DWL, SFB, PBS, PCP, HPS, CS-SFB ²	Methods WSP, ABW, PFH and PFG ³	Methods CS-WSP CS-G, CS-PF
D _s	1st	10	NP	3.0	3.0	2.0	1.7
		50	NP	42.5	42.5	30.0	25.5
		10	NP	4.0	4.0	3.5	2.1
		20	NP	8.0	8.0	5.0	4.3
		30	NP	12.0	12.0	7.5	6.4
	40	NP	16.0	16.0	10.0	8.5	
	50	NP	20.0	20.0	12.5	10.6	
	10	NP	7.5	7.5	5.5	4.7	
	25 (BWL A/B/C)	NP	10.0	10.0	6.25	5.35	
	38 (BWL 1/2)	NP	15.2	15.2	9.50	8.08	
2nd	50	NP	37.5	37.5	27.5	23.4	
	10	NP	NP	NP	NP	NP	
	20	NP	NP	NP	NP	NP	

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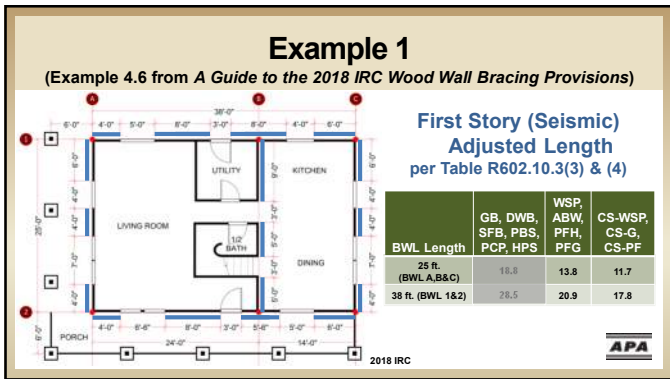


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TABLE R602.10.3(3)—continued
BRACING REQUIREMENTS BASED ON SEISMIC DESIGN CATEGORY

Seismic Design Category	Story Location	Braced Wall Line Length (feet) ¹	Method LIB ²	Method GB	MINIMUM TOTAL LENGTH (FEET) OF BRACED WALL PANELS REQUIRED ALONG EACH BRACED WALL LINE ¹		
					Methods DWB, SFB, PPS, PCP, HPS, CS-SFB ³	Methods WSP, ABW, PFG and PFG ⁴	Methods CS-WSP, CS-G, CS-PF
D _s		10	NP	3.0	3.0	2.0	1.7
		50	NP	42.5	42.5	30.0	25.5
		10	NP	4.0	4.0	3.5	3.1
		25 (BWL A/B/C)	NP	18.8	18.8	13.8	11.7
		38 (BWL 1/2)	NP	28.5	28.5	20.9	17.8
		50	NP	20.0	20.0	12.5	10.6
		10	NP	7.5	7.5	5.5	4.7
		20	NP	15.0	15.0	11.0	9.4
		30	NP	22.5	22.5	16.5	14.0
		40	NP	30.0	30.0	22.0	18.7
	50	NP	37.5	37.5	27.5	23.4	
	10	NP	NP	NP	NP	NP	
	20	NP	NP	NP	NP	NP	

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Example 1

(Example 4.6 from *A Guide to the 2018 IRC Wood Wall Bracing Provisions*)

BWP Check (First Story):

- BWP required at each BWL end... (R602.10.2.2.1)
- Distance between BWP edges ≤ 20 ft. (R602.10.2.2)
- All BWP meet minimum length per method (Table R602.10.5)
- Minimum number of BWPs (R602.10.2.3) for any BWL ≤ 16 ft. is (2) of any length or (1) at least 48". BWLs > 16 ft. shall have at least (2) BWPs.

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Example 1

(Example 4.6 from *A Guide to the 2018 IRC Wood Wall Bracing Provisions*)

Second Story (Seismic) Adjusted Length per Table R602.10.3(3) & (4)

BWL Length	GB, DWB, SFB, PBS, PCP, HPS	WSP, ABW, PFH, PFG	CS-WSP, CS-G, CS-PF
25 ft. (BWL A,B&C)	10.0	6.25	5.35
38 ft. (BWL 1&2)	15.2	9.50	8.08

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Example 1

(Example 4.6 from *A Guide to the 2018 IRC Wood Wall Bracing Provisions*)

Second Story (Wind) Adjusted Length per Table R602.10.3(1) & (2)

BWL Spacing	GB	DWB, SFB, PBS, PCP, HPS	WSP, ABW, PFH, PFG	CS-WSP, CS-G, CS-PF
14 ft. (BWL C)	5.15	2.96	2.96	2.40
19 ft. (BWL B)	6.58	3.83	3.83	3.26
24 ft. (BWL A)	8.01	4.67	4.67	4.12
25 ft. (BWL 1&2)	6.38	3.74	3.74	3.30

Second Story (Seismic) Adjusted Length per Table R602.10.3(3) & (4)

BWL Length	GB	DWB, SFB, PBS, PCP, HPS	WSP, ABW, PFH, PFG	CS-WSP, CS-G, CS-PF
25 ft. (BWL C)	10.0	10.0	6.25	5.35
25 ft. (BWL B)	10.0	10.0	6.25	5.35
25 ft. (BWL A)	10.0	10.0	6.25	5.35
38 ft. (BWL 1&2)	15.2	15.2	9.50	8.08

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Example 1
(Example 4.6 from A Guide to the 2018 IRC Wood Wall Bracing Provisions)

First Story (Wind) Adjusted Length per Table R602.10.3(1) & (2)					First Story (Seismic) Adjusted Length per Table R602.10.3(3) & (4)				
BWL Spacing	GB	DWB, SFB, PBS, PCP, HPS	WSP, ABW, PFH, PFG	CS-WSP, CS-G, CS-PF	BWL Length	GB	DWB, SFB, PBS, PCP, HPS	WSP, ABW, PFH, PFG	CS- WSP, CS-G, CS-PF
14 ft. (BWL C)	10.4	5.73	5.73	4.89	25 ft. (BWL C)	18.8	18.8	13.8	11.7
19 ft. (BWL B)	13.4	7.58	7.58	6.42	25 ft. (BWL B)	18.8	18.8	13.8	11.7
24 ft. (BWL A)	16.5	9.39	9.39	7.94	25 ft. (BWL A)	18.8	18.8	13.8	11.7
25 ft. (BWL 1&2)	13.2	7.52	7.52	6.35	38 ft. (BWL 1&2)	28.5	28.5	20.9	17.8

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Example 1
(Example 4.6 from A Guide to the 2018 IRC Wood Wall Bracing Provisions)

Irregularity Check (Second Story):

- No exterior braced wall panel (BWP) offsets out-of-plane
- Lateral support of roofs and floors provided on all edges (exceptions up to 6 ft.)
- No BWP offsets in plane (> 1 ft. over opening, some exceptions)
- Floor or roof openings ≤ 50% least plan dimension or 12 ft.
- No vertical floor offset within a level
- All perpendicular shear wall and BWPs
- No wall stories containing masonry or concrete construction above grade (not including chimneys)

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Example 1
(Example 4.6 from A Guide to the 2018 IRC Wood Wall Bracing Provisions)

**Adjusted Length for BWL A
per Table R602.10.3(3) & (4)**

Story	GB, DWB, SFB, PBS, PCP, HPS	WSP, ABW, PFH, PFG	CS-WSP, CS-G, CS-PF
2nd	10.0	6.25	5.35
1st	18.8	13.8	11.7

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Example 1
 (Example 4.6 from *A Guide to the 2018 IRC Wood Wall Bracing Provisions*)

Adjusted Length for BWL B per Table R602.10.3(3) & (4)

Story	GB, DWB, SFB, PBS, PCP, HPS	WSP, ABW, PFH, PFG	CS-WSP, CS-G, CS-PF
2nd	10.0	6.25	5.35
1st	18.8	13.8	11.7

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Example 1
 (Example 4.6 from *A Guide to the 2018 IRC Wood Wall Bracing Provisions*)

Adjusted Length for BWL C per Table R602.10.3(3) & (4)

Story	GB, DWB, SFB, PBS, PCP, HPS	WSP, ABW, PFH, PFG	CS-WSP, CS-G, CS-PF
2nd	10.0	6.25	5.35
1st	18.8	13.8	11.7

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Example 1
 (Example 4.6 from *A Guide to the 2018 IRC Wood Wall Bracing Provisions*)

Adjusted Length for BWL 1 per Table R602.10.3(3) & (4)

Story	GB, DWB, SFB, PBS, PCP, HPS	WSP, ABW, PFH, PFG	CS-WSP, CS-G, CS-PF
2nd	15.2	9.50	8.88
1st	28.5	20.9	17.8

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Example 1

(Example 4.6 from *A Guide to the 2018 IRC Wood Wall Bracing Provisions*)

Adjusted Length for BWL 2 per Table R602.10.3(3) & (4)

Story	GB, DWB, SFB, PBS, PCP, HPS	WSP, ABW, PFH, PFG	CS-WSP, CS-G, CS-PF
2nd	15.2	9.50	8.68
1st	28.5	20.9	17.8

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Example 1

(Example 4.6 from *A Guide to the 2018 IRC Wood Wall Bracing Provisions*)

Irregularity Check (Second Story):

- No exterior braced wall panel (BWP) offsets out-of-plane
- Lateral support of roofs and floors provided on all edges (exceptions up to 6 ft.)
- No BWP offsets in plane (> 1 ft. over opening, some exceptions)
- Floor or roof openings ≤ 50% least plan dimension or 12 ft.
- No vertical floor offset within a level
- All perpendicular shear wall and BWPs
- No wall stories containing masonry or concrete construction above grade (not including chimneys)

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Example 1

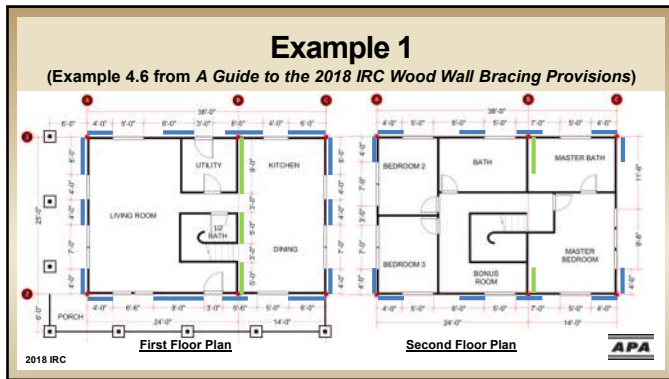
(Example 4.6 from *A Guide to the 2018 IRC Wood Wall Bracing Provisions*)

Mixing Methods Check: (R602.10.4.1)

- Mixing intermittent bracing and continuous sheathing methods from story to story is permitted.
- Mixing intermittent methods only BWL-to-BWL within a story is permitted.
- Mixing of continuous sheathing methods CS-WSP, CS-G & CS-PF along a BWL is permitted.
- ABWL PFH & PFG shall be permitted within a BWL using continuous sheathing if using the highest value from R602.10.3(3) [R602.10.4.1.4]

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Example 1

(Example 4.6 from *A Guide to the 2018 IRC Wood Wall Bracing Provisions*)

Mixing Methods Check: (R602.10.4.1)

- Mixing intermittent bracing and continuous sheathing methods from story to story is permitted.
- Mixing intermittent methods only BWL-to-BWL within a story is permitted.
- Mixing of continuous sheathing methods CS-WSP, CS-G & CS-PF along a BWL is permitted.
- ASW, PFH & PFG shall be permitted within a BWL using continuous sheathing if using the highest value from R602.10.3(3) [R602.10.4.1.4]

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Example 2


Seismic Info:
SDC D₀

Geometry:
2-story
24.3 ft. mean roof ht.
10.5 ft. story ht. (9 ft. wall ht.)
Slab-on-grade

APA


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Example 2




Preliminary Check:

- Single family or townhome
- 3 stories or less, 2 for SDC D₂ (R301.2.2.7)
- Story height ≤ 11'-7" (R301.3, R602.3[5])
- Seismic Design Categories D₀-D₂ (R301.2.2, R301.2.2.1.1) and maybe E (R301.2.2.1.2)
- Weight of materials (R301.2.2.2) 15 psf for roof and ceiling (adjustments up to 25 psf per Table R602.10.3[4]), 10 psf for floor system, 15 psf for exterior wood walls

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Example 2



Preliminary Check:


- Weight of materials (R301.2.2.2) 15 psf for roof and ceiling (adjustments up to 25 psf per Table R602.10.3[4]), 10 psf for floor system, 15 psf for exterior wood walls

<p>Roof/Ceiling Weight = 11 psf</p> <ul style="list-style-type: none"> • Asphalt shingles (3 psf) • Roof trusses (2.5 psf) • 7/16 plywood (1.3 psf) • Batt insulation (0.8 psf) • MEP & misc. (1.4 psf) • 5/8" gypsum board (2 psf) 	<p>Floor Weight = 10 psf</p> <ul style="list-style-type: none"> • Hardwood (2.4 psf) • 23/32 OSB (2.4 psf) • Floor framing (1.8 psf) • MEP & misc. (1.4 psf) • 5/8" gypsum board (2 psf) <p>Wall Weight = 13 psf</p> <ul style="list-style-type: none"> • Gypsum board (2 psf) • Studs & sheathing (4 psf) • 1-coat stucco (6 psf) • Batt Insulation (1 psf)
--	---

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Example 2



Irregularity Check (All Stories):

- No exterior braced wall panel (BWP) offsets out-of-plane
- Lateral support of roofs and floors provided on all edges (exceptions up to 6 ft.)
- No BWP offsets in plane (> 1 ft. over opening, some exceptions)
- Floor or roof openings ≤ 50% least plan dimension or 12 ft.
- No vertical floor offset within a level
- All perpendicular shear wall and BWPs
- No wall stories containing masonry or concrete construction above grade (not including chimneys)

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Example 2

Wall Bracing Lines:

- ☑ Determine the braced wall line "BWL" locations (R602.10.1, offset BWL R602.10.1)
- ☑ BWL spacing ≤ 25 ft., 35 ft. for townhomes, some exceptions (Table R602.10.1.3)

Exceptions:

- "Up to 35 feet to allow for a single room not to exceed 900 square feet."
- "Up to 35 feet when length of required bracing per Table R602.10.3(3) is adjusted in accordance with Table R602.10.3(4)."

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Example 2

Table R602.10.3(4)

ADJUSTMENT FACTOR	ROOM NUMBER	ALLOWED BRACED WALL LINE LENGTH, IN FEET (L _{BWL})	STORY	CONDITION	ADJUSTMENT FACTOR (F _{adj})
1.0	1	Based on wall line length, in feet (L _{BWL})	Any story	< 35 feet and ≤ 100 feet	1.0
0.75	2			> 35 feet and ≤ 100 feet	0.75
0.5	3			> 100 feet and ≤ 150 feet	0.5
0.25	4			> 150 feet and ≤ 200 feet	0.25
0.1	5			> 200 feet	0.1

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Example 2

Braced Wall Lines:

- ☑ Determine the braced wall line "BWL" locations (R602.10.1, offset BWL R602.10.1)
- ☑ BWL spacing ≤ 25 ft., 35 ft. for townhomes, some exceptions (Table R602.10.1.3)

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Example 2

- ☑ Are there cripple walls?
- ☑ Is there stone or masonry veneer?

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Example 2

BWL Length:
1 thru 4 ⇒ 23'-5"
A & B ⇒ 54'-8"

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Example 2

Second Story (Seismic) BWP Length Required:

Seismic Design Category	Story Location	Minimum Wall Length (feet)	Minimum Total Length (feet) of Braced Wall Panels Required Along Each Braced Wall Line*			
			WSP	ABW	CS-G	CS-PF
II	1	30	11.0	11.0	11.0	11.0
		40	11.0	11.0	11.0	11.0
		50	11.0	11.0	11.0	11.0
		60	11.0	11.0	11.0	11.0
		70	11.0	11.0	11.0	11.0
		80	11.0	11.0	11.0	11.0
	2	30	11.0	11.0	11.0	11.0
		40	11.0	11.0	11.0	11.0
		50	11.0	11.0	11.0	11.0
		60	11.0	11.0	11.0	11.0
		70	11.0	11.0	11.0	11.0
		80	11.0	11.0	11.0	11.0

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@ BWL 1 thru 4
 Using GB, DWB, SFB, PBS, PCP, HPS...
 $5.5 \text{ ft.} + (23.4 \text{ ft.} - 20 \text{ ft.}) \times (3.1 \text{ ft.} - 5.5 \text{ ft.}) = 6.45 \text{ ft.}$
 (30 ft. - 20 ft.)
 Using WSP, ABW, PFH...
 $3.6 \text{ ft.} + (23.4 \text{ ft.} - 20 \text{ ft.}) \times (5.4 \text{ ft.} - 3.6 \text{ ft.}) = 4.21 \text{ ft.}$
 (30 ft. - 20 ft.)
 Using CS-WSP, CS-G, CS-PF...
 $3.1 \text{ ft.} + (23.4 \text{ ft.} - 20 \text{ ft.}) \times (4.6 \text{ ft.} - 3.1 \text{ ft.}) = 3.61 \text{ ft.}$
 (30 ft. - 20 ft.)

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Example 2

TABLE BRG10 10B
SEISMIC ADJUSTMENT FACTORS TO THE REQUIRED LENGTH OF WALL BRACING

ITEM NUMBER	ADJUSTMENT BASED ON	NOTES	CONSERVATIVE	ADJUSTMENT FACTOR	APPLICABLE MEMBERS
1	Story height (Minimum 10'-0")	Any story	> 10'-0" add = 10' Base add = 1.25 fact	1.2	All exterior
2	Horizontal load (shear, overturning in VSC)	Any story	> 10' Base add = 1.0 fact	1.0	
3	Roof or wall framing (SFB, H, G, H, V)	Any story	> 10' Base add = 1.0 fact	1.0	
4	Roof or wall framing (SFB, H, G, H, V)	Any story	> 10' Base add = 1.0 fact	1.0	
5	Wall load limit	Any story	> 10' Base add = 1.0 fact	1.0	
6	Roof or wall framing (SFB, H, G, H, V)	1.5-2.0 times building 1.5-2.0 times building Lateral bracing on top story	> 10' Base add = 1.0 fact	1.0	

BWP Length Seismic Adjustment:

Actual Story Height = 10'-6"
 $1.0 + 0.5 \text{ ft.} \times \frac{1.2 - 1.0}{1.0} = 1.05$
 (12 ft. - 10 ft.)

@ BWL 1 thru 4
 Using GB, DWB, SFB, PBS, PCP, HPS...
 6.45 ft. x 1.05 = 6.77 ft.
 Using WSP, ABW, PFH...
 4.21 ft. x 1.05 = 4.42 ft.
 Using CS-WSP, CS-G, CS-PF...
 3.61 ft. x 1.05 = 3.79 ft.

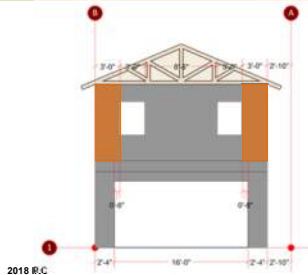


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Example 2



Seismic Adjusted Length:
 @ BWL 1 thru 4

Story	GB, DWB, SFB, PBS, PCP, HPS	WSP, ABW, PFH, PFG	CS-WSP, CS-G, CS-PF
2nd	6.77	4.42	3.79
1st	-	-	-

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Example 2

TABLE BRG10 10C
BRACING REQUIREMENTS BASED ON SEISMIC DESIGN CATEGORY

Seismic Design Category	Story Location	Minimum Wall Line Length (ft)	Minimum Total Length (Feet) of Braced Wall Panels Required Along Each Braced Wall Line			
			Minimum SFB	Minimum HPS	Minimum WSP, ABW, PFH, PFG (SFB, HPS)	Minimum CS-WSP, CS-G, CS-PF (SFB, HPS)
B, S	1st	10	1.0	2.0	4.0	3.0
		20	2.0	3.0	3.0	3.0
		40	4.0	4.0	3.0	3.0
	2nd	10	1.0	2.0	4.0	3.0
		20	2.0	3.0	3.0	3.0
		40	4.0	4.0	3.0	3.0

Seismic Adjusted Length:
 @ BWL 1 thru 4

Story	GB, DWB, SFB, PBS, PCP, HPS	WSP, ABW, PFH, PFG	CS-WSP, CS-G, CS-PF
2nd	-	-	3.79
1st	12.9	9.24	7.88

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Example 2

TABLE R602.10.5
MINIMUM LENGTH OF BRACED WALL PANELS

SEismic Design Category	Other Table R602.10.5	MINIMUM LENGTH*				CONTRIBUTING LENGTH (inches)
		1st story	2nd story	3rd story	4th story	
GB, DWB, SFB, PBS, PCP, HPS	100	100	100	100	100	
WSP, ABW, PFH, PFG	120	120	120	120	120	
CS-WSP, CS-G, CS-PF	120	120	120	120	120	

**Seismic Adjusted Length:
@ BWL 1 thru 4**

Story	GB, DWB, SFB, PBS, PCP, HPS	WSP, ABW, PFH, PFG	CS-WSP, CS-G, CS-PF
2nd	-	-	3.79
1st	12.9	9.24	7.88

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Example 2

Check the Aspect Ratio
Building Code limits h:w to 3.5:1 MAX

**Equivalent Load:
@ BWL 1 thru 4**
Using WSP, ABW, PFH...
9.24 ft. x 200 plf = 1,848 lb.

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Example 2

TABLE R602.10.5.1
BRACING REQUIREMENTS BASED ON SEISMIC DESIGN CATEGORY

Seismic Design Category	Story Location	Minimum Braced Length (inches)	MINIMUM TOTAL LENGTH (FEET) OF BRACED WALL PANELS REQUIRED ALONG EACH BRACED WALL LINE*			
			1st story	2nd story	3rd story	4th story
A	Top Story	100	100	100	100	
	Lower Story	120	120	120	120	
B	Top Story	100	100	100	100	
	Lower Story	120	120	120	120	
C	Top Story	100	100	100	100	
	Lower Story	120	120	120	120	

**Seismic Adjusted Length:
@ BWL 1 thru 4**

Story	GB, DWB, SFB, PBS, PCP, HPS	WSP, ABW, PFH, PFG	CS-WSP, CS-G, CS-PF
2nd	-	-	3.79
1st	12.9	9.24	7.88

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Example 2

Seismic Adjusted Length:
@ BWL 1 thru 4

Story	GB, DWB, SFB, PBS, PCP, HPS	WSP, ABW, PFH	CS-WSP, CS-G, CS-PF
2nd	-	-	3.79
1st	12.9	9.24	7.88

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Example 2

Seismic Adjusted Length:
@ BWL 1 thru 4

Story	GB, DWB, SFB, PBS, PCP, HPS	WSP, ABW, PFH	CS-WSP, CS-G, CS-PF
2nd	-	-	3.79
1st	12.9	9.24	7.88

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Example 2

Seismic Adjusted Length:
@ BWL 1 thru 4

Story	GB, DWB, SFB, PBS, PCP, HPS	WSP, ABW, PFH	CS-WSP, CS-G, CS-PF
2nd	-	-	3.79
1st	12.9	9.24	7.88

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Example 2

Seismic Design Category	Story Location	Braced Wall Line Length (feet)	Minimum Total Length (feet) of Braced Wall Panels Required Along Each Wall Line	
			Minimum Length (feet)	Minimum Spacing (feet)
B	Top Story	20	20	20
		30	30	30
		40	40	40
		50	50	50
		60	60	60
		70	70	70
	Lower Story	20	30	30
		30	40	40
		40	50	50
		50	60	60
		60	70	70
		70	80	80

Seismic Adjusted Length:
@ B/WL A & B

Story	GB, DWB, SFB, PBS, PCP, HPS	WSP, ABW, PFH, PFG	CS-WSP, CS-G, CS-PF
2nd	-	-	8.87
1st	30.0	21.7	18.5

c. Where the braced wall line length is greater than 50 feet, braced wall lines shall be permitted to be divided into shorter segments having lengths of 50 feet or less, and the amount of bracing within each segment shall be in accordance with this table.

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Example 2

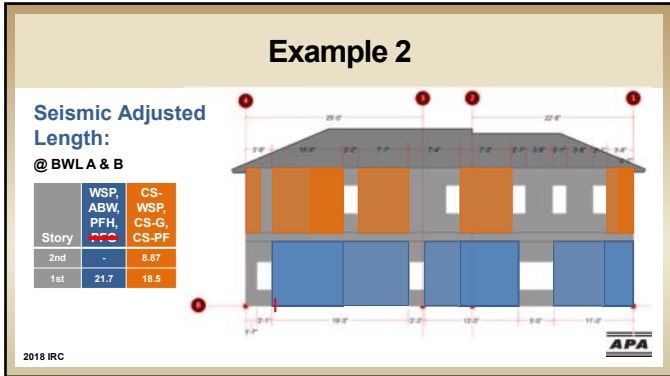
Seismic Adjusted Length:
@ B/WL A & B

Story	WSP, ABW, PFH, PFG	CS-WSP, CS-G, CS-PF
2nd	-	8.87
1st	21.7	18.5

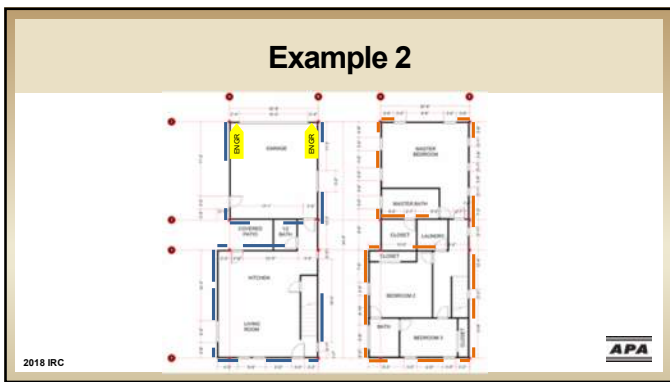
1.05(4.6+3.85) = 8.87

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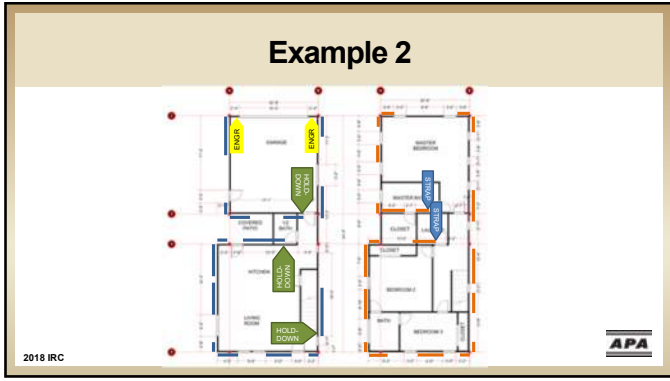
75



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Example 3 - Townhouse




Seismic Info:
SDC D₂

Geometry:
2-story
25 ft. mean roof ht.
1st story: 10.5 ft. story ht. (9 ft. wall ht.)
2nd story: 9.5 ft. story ht. (8 ft. wall ht.)
Slab-on-grade

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Example 3



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Example 3




Preliminary Check:

- Single family or townhome
- 3 stories or less, (special for SDC D₂)(R301.2.2.7)
- Story height ≤ 11'-7" (R301.3, R602.3[5])
- Seismic Design Categories D₀-D₂ (R301.2.2, R301.2.2.1.1) and maybe E (R301.2.2.1.2)
- Weight of materials (R301.2.2.2) 15 psf for roof and ceiling, 10 psf for floor system (adjustments allowed up to 25 psf roof/ceiling per Table R602.10.3[4])

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Example 3



Preliminary Check:

- Weight of materials (R301.2.2.2) 15 psf for roof and ceiling (adjustments up to 25 psf per Table R602.10.3[4]), 10 psf for floor system, 15 psf for exterior wood walls

Roof/Ceiling Weight = 17 psf

- Concrete tile roofing (6 psf)
- Ice and water shield (0.5 psf)
- Roof trusses (4 psf)
- Roof sheathing (1.5 psf)
- Spray foam insulation (1.5 psf)
- MEP (2 psf)
- Gypsum board (1.5 psf)

Floor Weight = 10 psf

- Floor covering (2 psf)
- Floor sheathing (2 psf)
- Floor framing (2.5 psf)
- MEP (2 psf)
- Gypsum board (1.5 psf)

Wall Weight = 9 psf

- Gypsum board (1.5 psf)
- Studs & sheathing (3.5 psf)
- Siding (3 psf)
- Insulation (1 psf)

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Example 3


Roof/ceiling weight > 15 psf... means 10% extra wall required.

TABLE R602.10.3(4)
SEISMIC ADJUSTMENT FACTORS TO THE REQUIRED LENGTH OF WALL BRACING

ITEM NUMBER	ADJUSTMENT CONDITION	HEIGHT	SPACING	ADJUSTMENT FACTOR ¹ (Multiply length per Table R602.10.3(2) by the factor)	APPLICABLE METHODS
1	Story height (Section 201.3)	Any story	≤ 10 feet	1.0	All methods
			> 10 feet and ≤ 12 feet	1.2	
2	Braced wall line spacing, one-to-one = 4:1	Any story	≤ 35 feet	1.0	
			> 35 feet and ≤ 50 feet	1.43	
3	Braced wall line spacing, in SDC D _s , D _s , D _s	Any story	> 25 feet and ≤ 30 feet	1.2	
			> 30 feet and ≤ 35 feet	1.4	
4	Wall dead load	Any story	> 8 psf and ≤ 15 psf	1.0	
			> 15 psf	0.85	
5	Manufacturing dead load for wall supporting	Any story	1-2-story building ≤ 15 psf	1.0	
			2- or 3-story building > 15 psf and ≤ 25 psf	1.1	
			1-story building of top story > 15 psf and ≤ 25 psf	1.2	
All other				1.0	

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Example 3



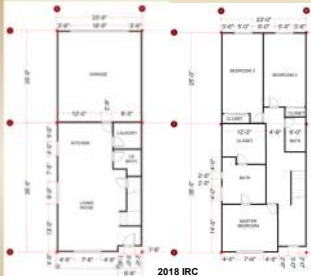
Irregularity Check (All Stories):

- No braced wall panel (BWP) offsets out of plane
- Lateral support of roofs and floors provided on all edges (exceptions up to 6 ft.)
- No BWP offsets in plane (> 1 ft. over opening, some exceptions)
- Floor or roof openings ≤ 50% least plan dimension or 12 ft.
- No vertical floor offset within a level
- All perpendicular shear wall and BWPs
- No wall stories containing masonry or concrete construction above grade (not including chimneys)

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Example 3



Wall Bracing Lines:

- ☑ Determine the braced wall line "BWL" locations (R602.10.1, offset BWL R602.10.1)
- ☑ BWL spacing ≤ 25 ft., 35 ft. for townhomes, some exceptions (Table R602.10.1.3)

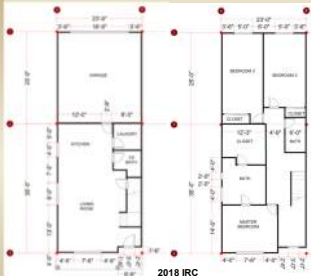
Exceptions:

- "Up to 35 feet to allow for a single room not to exceed 900 square feet."
- "Up to 35 feet when length of required bracing per Table R602.10.3(3) is adjusted in accordance with Table R602.10.3(4)."

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Example 3



BWL Length:



1, 2 & 3 ⇒ 23'-0"

A & B ⇒ 60'-0"

APA

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TABLE R602.10.3(3)—continued
BRACING REQUIREMENTS BASED ON SEISMIC DESIGN CATEGORY

Seismic Design Category	Story Location	Braced Wall Line Length (feet) ¹	Method LIB ²	Method GB	MINIMUM TOTAL LENGTH (FEET) OF BRACED WALL PANELS REQUIRED ALONG EACH BRACED WALL LINE ³		
					Methods DWB, SFB, PDS, PSP, HPS, CS-SFB ⁴	Methods WSP, ABW, PFI and PFG ⁴	Methods CS-WSP, CS-G, CS-PF
		10	NP	3.0	3.0	2.0	1.7
		50	NP	42.5	42.5	30.0	25.5
		10	NP	4.0	4.0	3.5	2.1
		20	NP	8.0	8.0	5.0	4.3
		30	NP	12.0	12.0	7.5	6.4
		40	NP	16.0	16.0	10.0	8.5
		50	NP	20.0	20.0	12.5	10.6
		10	NP	7.5	7.5	5.5	4.7
		23 (BWL 1/2/3)	NP	9.20	9.20	5.75	4.93
		2x30 (BWL A/B)	NP	24.0	24.0	15.0	12.8
		50	NP	32.6	32.6	22.4	19.4
		20	NP	10.0	10.0	7.0	6.0

¹ Where the braced wall line length is greater than 50 feet, braced wall lines shall be permitted to be divided into shorter segments having lengths of 50 feet or less, and the amount of bracing within each segment shall be in accordance with this table.

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Example 3



Adjusted Length per Table R602.10.3(3) & (4)

BWL Length	GB, DWB, SFB, PBS, PCP, HPS	WSP, ABW, PFH	CS-WSP, CS-G, CS-PF
23 ft. (BWL 1)	11.04	6.91	5.91
23 ft. (BWL 2/3)	15.5	9.67	8.29
60 ft. (BWL A/B)	28.8	18.0	15.4

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TABLE R602.10.3(3)—continued
BRACING REQUIREMENTS BASED ON SEISMIC DESIGN CATEGORY

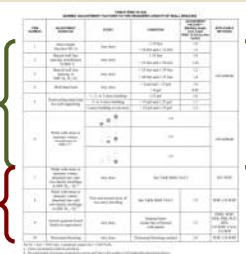
Seismic Design Category	Story Location	Braced Wall Line Length (feet) ¹	MINIMUM TOTAL LENGTH (FEET) OF BRACED WALL PANELS REQUIRED ALONG EACH BRACED WALL LINE ¹				
			Method LFB ^a	Method GB	Methods DWB, SFB, PDS, PCP, HPS, CS-SFB ^a	Methods WSP, ABW, PFH and PFG ^a	Methods CS-WSP, CS-G, CS-PF
A	10	10	NP	3.0	3.0	2.0	1.7
		50	NP	42.5	42.5	30.0	25.5
	23 (BWL 1/2/3)	10	NP	4.0	4.0	3.4	3.1
		23 (BWL 1/2/3)	NP	17.3	17.3	12.7	10.8
	60 (BWL A/B)	10	NP	45.0	45.0	33.0	28.0
		50	NP	20.0	20.0	12.5	10.6
	10	20	NP	7.5	7.5	5.5	4.7
		30	NP	15.0	15.0	11.0	9.4
	40	30	NP	22.5	22.5	16.5	14.0
		40	NP	30.0	30.0	22.0	18.7
50	50	NP	32.4	32.4	23.4	20.4	
	50	NP	32.4	32.4	23.4	20.4	

1. Where the braced wall line length is greater than 50 feet, braced wall lines shall be permitted to be divided into shorter segments having lengths of 50 feet or less, and the amount of bracing within each segment shall be in accordance with this table.

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Example 3



Adjustments per Table R602.10.3(4):

- 1.05 Story Ht. > 10 ft.
- 1.40 BWL spacing > 25 ft.
- 1.00 Wall dead load < 15 psf
- 1.10 Roof/ceiling dead load > 15 psf
- 1.00 Stone/masonry veneer
- 1.00 No Gypsum Board
- 1.00 No Horizontal Blocking

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Example 3

Adjusted Length per Table R602.10.3(3) & (4)

BWL Length	GB, DWB, SFB, PBS, PCP, HPS	WSP, ABW, PFH	CS-WSP, CS-G, CS-PF
23 ft. (BWL 1)	20.0	14.7	12.5
23 ft. (BWL 2/3)	28.0	20.6	17.5
60 ft. (BWL A/B)	52.0	38.1	32.3

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Example 3

BWP Length Required:

@ BWL 1

Story	GB, DWB, SFB, PBS, PCP, HPS	WSP, ABW, PFH	CS-WSP, CS-G, CS-PF
2nd	11.04	6.91	5.91
1st	20.0	14.7	12.5

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**TABLE R602.10.5
MINIMUM LENGTH OF BRACED WALL PANELS**

METHOD (See Table R602.10.4)	Adjacent clear opening height (inches)	MINIMUM LENGTH* (inches)					CONTRIBUTING LENGTH (inches)
		Wall Height					
		8 feet	9 feet	10 feet	11 feet	12 feet	
CS-WSP, CS-SFB	≤ 64	24	27	30	33	36	Actual*
	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	38	35	36	36	
	100	—	44	40	38	38	
	104	—	49	43	40	39	
	108	—	54	45	41	41	
	112	—	—	50	45	43	
	116	—	—	55	48	45	
120	—	—	60	52	48		

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Example 3

BWP Length Required:
@ BWL 1

Story	GB, DWB, SFB, PBS, PCP, HPS	WSP, ABW, PFH	CS-WSP, CS-G, CS-PF
2nd	11.04	6.91	5.92
1st	20.0	14.7	12.5

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Example 3

BWP Length Required:
@ BWL 1

Story	GB, DWB, SFB, PBS, PCP, HPS	WSP, ABW, PFH	CS-WSP, CS-G, CS-PF
2nd	11.04	6.91	5.92
1st	20.0	14.7	12.5

Equivalent Load:
Using WSP, ABW, PFH...
14.7 ft. x 200 plf = 2,940 lb.

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Example 3

BWP Length Required:
@ BWL 2

Story	GB, DWB, SFB, PBS, PCP, HPS	WSP, ABW, PFH	CS-WSP, CS-G, CS-PF
2nd	11.5	8.29	8.29
1st	20.6	17.5	17.5

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Example 3

BWP Length Required:
@ BWL 2

Story	GB, DWB, SFB, PBS, PCP, HPS	WSP, ABW, PFH	CS-WSP, CS-G, CS-PF
2nd	-	-	8.29
1st	-	20.6	17.5

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Example 3

BWP Length Required:
@ BWL A & B

Story	CS-WSP, CS-G, CS-PF
2nd	15.4
1st	32.3

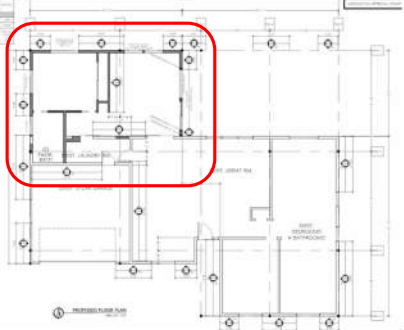
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Example 3


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Additions

How do you tackle home additions using prescriptive wall bracing methods?




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Additions

The first step is to determine if the addition meets Residential Code prescriptive methods?


Initial thought process:

- Does the basic overall design qualify for prescriptive design?
- Can any of the walls meet prescriptive design?
- If some walls won't meet prescriptive, can you use a hybrid approach to design wall bracing for the addition (use both prescriptive and engineering)?
- If the addition doesn't conform to prescriptive, then use engineering (R301.1.3).




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Additions



Preliminary Checklist:

- Single family or townhome
- 3 stories or less, (special for SDC D₂) (R301.2.2.7)
- Story height ≤ 11'-7" (R301.3, R602.3(5))
- Seismic Design Categories D₀-D₂ (R301.2.2, R301.2.2.1.1) and maybe SDC E (R301.2.2.1.2)
- Weight of materials (R301.2.2.2) 15 psf for roof and ceiling, 10 psf for floor system (adjustments allowed up to 25 psf roof/ceiling per Table R602.10.3(4))




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Additions

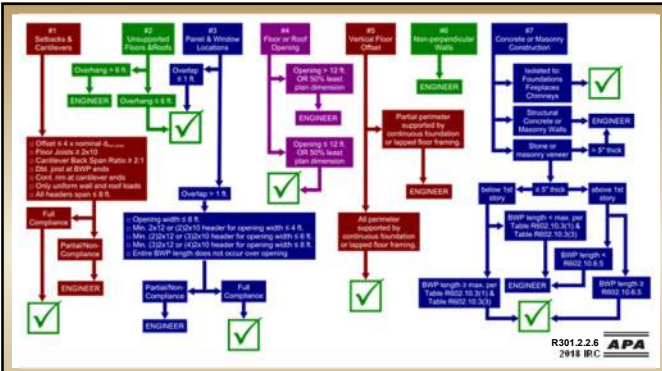
Irregularity Check:

- No exterior braced wall panel (BWP) offsets out of plane
- Lateral support of roofs and floors provided on all edges (exceptions up to 6 ft.)
- No BWP offsets in plane (> 1 ft. over opening, some exceptions)
- Floor or roof opening ≤ 50% least plan dimension or 12 ft.
- No vertical floor offset within a level
- All perpendicular shear wall and BWPs
- No wall stories containing masonry or concrete construction above grade (not including chimneys)



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R301.2.2.6
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Additions




Additional Checks:

- Cannot mix intermittent and continuous sheathed methods BWL to BWL within the same story (R602.10.4.1 Item 2b)
- Check if end conditions will be met (R602.10.7 and R602.10.2.2.1)
- Stone or masonry? (R602.10.6.5 and Figure R602.10.6.5)
- Would BWL spacing exceed 25 ft.? 35 ft.? (Table R602.10.1.3 & exceptions)
- Are existing and new foundations continuous? Do they meet high seismic requirements? (R403.1.2, R403.1.3.4 and R403.1.6.1)
- Check existing braced wall panel connections (R602.10.8.1)

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Additions



Congratulations!

You passed the preliminary checklist and some or all of the addition will meet prescriptive requirements!

Now what?

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Additions

Some possible ideas on using the Residential Code:

1. One could check/design the wall bracing for the entire home (existing and addition) to account for the capacity of the shared walls. This should be a story-by-story check/design.

The challenge of this method is knowing the existing home construction and wall bracing design.

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Additions

Some possible ideas on using the Residential Code:

2. The shared wall(s) may need to be engineered and the remaining addition walls may be designed using the Residential Code

The challenge of this method is knowing the existing shared wall construction and bracing design.

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Additions

Some possible ideas on using the Residential Code :

3. Prescriptively design the addition and add the required wall bracing to the shared wall(s) of the existing building.

The challenge of this method is knowing the existing shared wall construction and bracing design and having the ability to add additional bracing wall capacity per the prescriptive design.


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Additions

Some possible ideas of using the Residential Code :

4. Can you design the addition in the way that you would design the wall bracing for T and L shaped buildings?

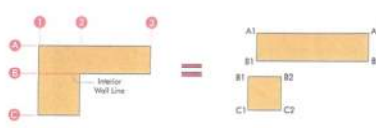
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Additions

Bracing T- and L- Shaped Buildings (may apply to additions)

STEP 1 – Divide the structure into rectangular elements



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Additions

Bracing T and L Shaped Buildings (may apply to additions)

STEP 2 – Determine bracing requirements for each rectangular element using the Residential Code bracing provisions.

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Additions

Bracing T- and L- Shaped Buildings (may apply to additions)

STEP 3 – Rejoin the rectangles wall bracing as determined from step 2 and follow 6 rules (next slides):

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Additions

Rules for rejoining the rectangles:

1. The total bracing from both rectangles along the common side must be provided in total on the common side.
2. You may utilize the entire shared wall line (not necessarily where they intersect) to disperse the required total bracing.
3. The wall bracing location provisions of Section R602.10.2.2 and R602.10.2.2.1 (if applicable) must be met along the common side as well as the extended wall line.

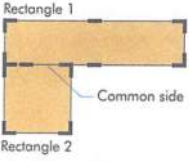
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Additions

Rules for rejoining the rectangles:

4. Watch that you are not mixing methods (that are not allowed in high seismic) on the common wall if intermittent bracing methods are used.
5. The length of the required bracing shall be the highest value of calculated results from wind and seismic in accordance with Table R602.10.3(1) or R602.10.3(3) as adjusted by Tables R602.10.3(2) and R602.10.3 (4) respectively.



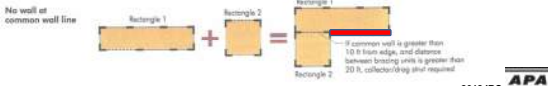
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Additions

Rules for rejoining the rectangles:

6. If a physical wall is not available at the common wall location, then all the bracing for both rectangles must be placed at the exterior extension of the common wall. If the non-existent common wall or an opening in that common wall exceeds 10 ft. in length, an engineered collector/drag strut must be used to transfer the wall bracing from both walls to the extension.



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Additions

Additional thoughts:


- The aforementioned ideas are **not the inclusive list of possible solutions.**
- **Check both wind and seismic** to see which criteria requires the most amount of wall bracing.
- The **APA Wall Bracing Calculator** might be an excellent resource. It can be used on a wall-by-wall basis.
- Checking for code compliance and capacity of **existing foundations.**

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Learning Objectives

- ❑ Understand the basic procedure for designing wall bracing using the residential building code.
- ❑ Appreciate the effect various design choices have on the applicability of the residential building code.
- ❑ Explore various approaches to designing portions of a structure that do not meet the residential building code limitations.
- ❑ Discuss how the residential building code may be applied to small additions.


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APA Wall Bracing Calculator

www.apawood.org/wall-bracing-calculator

Download the APA Wall Bracing Calculator Quick Start Guide for a tutorial.



This video walks new users through the basics of the APA Wall Bracing Calculator, a free tool that creates printable reports showing 2009, 2012, 2015, or 2018 IRC wall bracing compliance. The reports are accepted by most local jurisdictions. Running time 1:43.




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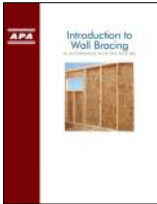
Resources


www.apawood.org/wall-bracing

Item no. 7102S18



Form F430





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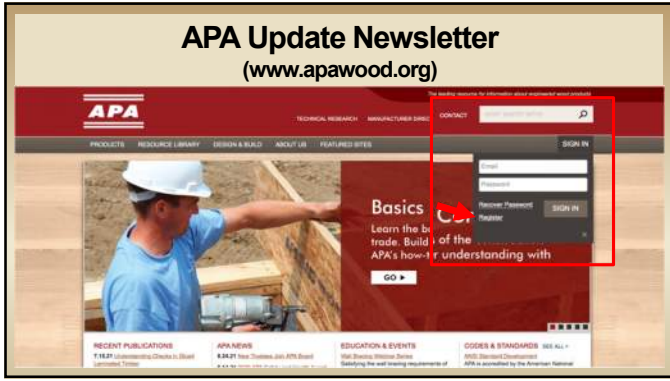
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