Lunch & Learn
BCBC2024 9.23.13 Roll Out

12pm April 17th, 2025

Presenter: Tim Warner

Email: twarner@boabc.org

Disclaimer

Information presented today does not directly represent the opinions of the Building Officials Association of BC (BOABC)). This presentation is conceptual and for informal educational purposes only. The presenter and Association takes no responsibility for application of any concepts or interpretations in this presentation to specific projects. The slides must not be considered complete or exhaustive. Code provisions have been generally represented and may not reflect all exceptions.

Land Acknowledgement

Welcome!

Today's Session:
Recap
Example 1
Example 2
Resources

Subsection 9.23.13 Framework **RECAP+**

Part 9:
Housing and Small Buildings

<600m2 building area
<3 storeys
Group C, D, E and F2/3 occupancies

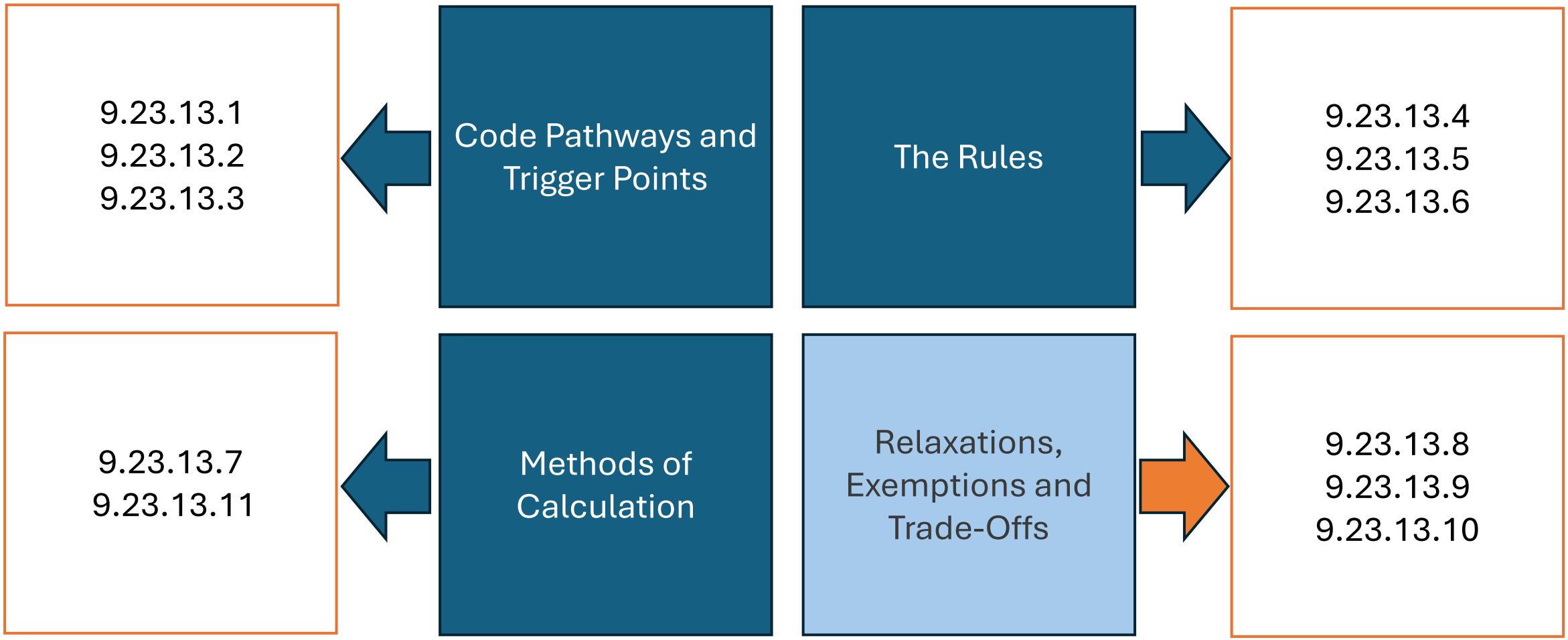
Section 9.23:
Wood-Frame Construction

Generally comprised of lumber frames of small repetitive structural members @ <2ft o.c and clad, sheathed or braced on one side

Subsection 9.23.13:
Bracing to Resist Lateral Loads due to Wind and Earthquake

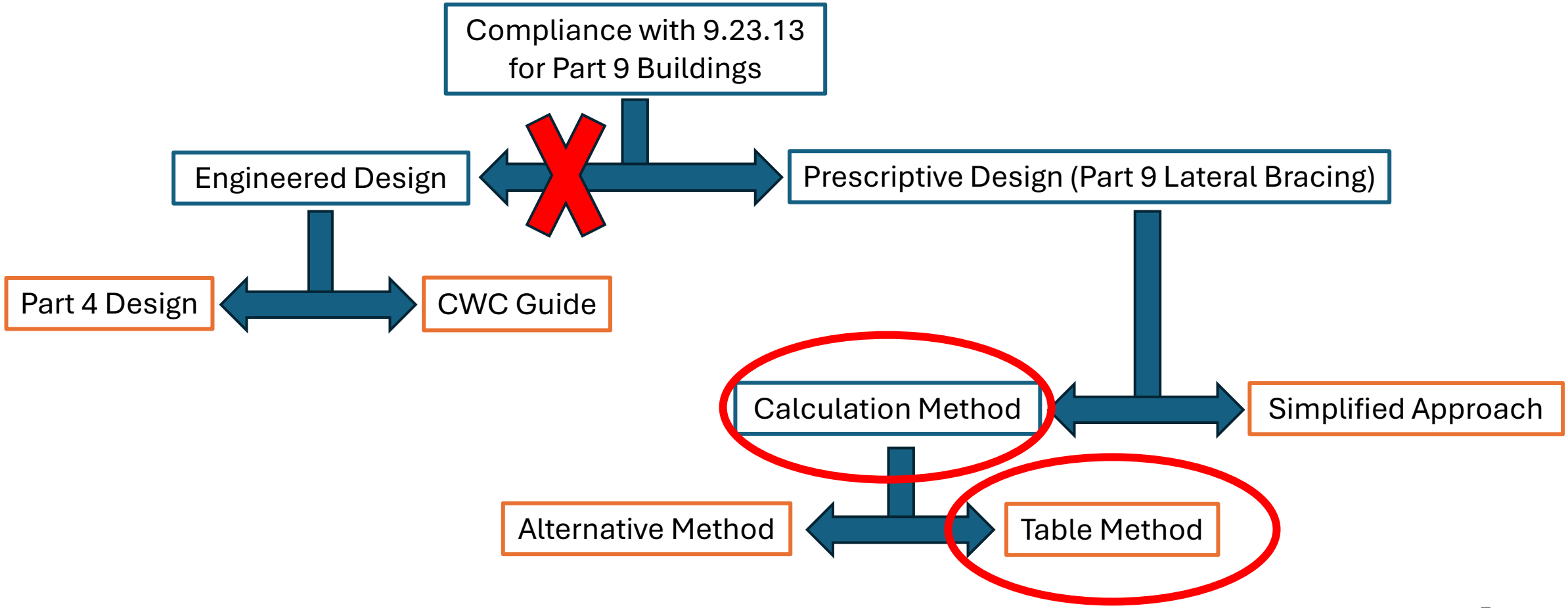
? ? ? ?

Subsection 9.23.13 Framework **RECAP+**



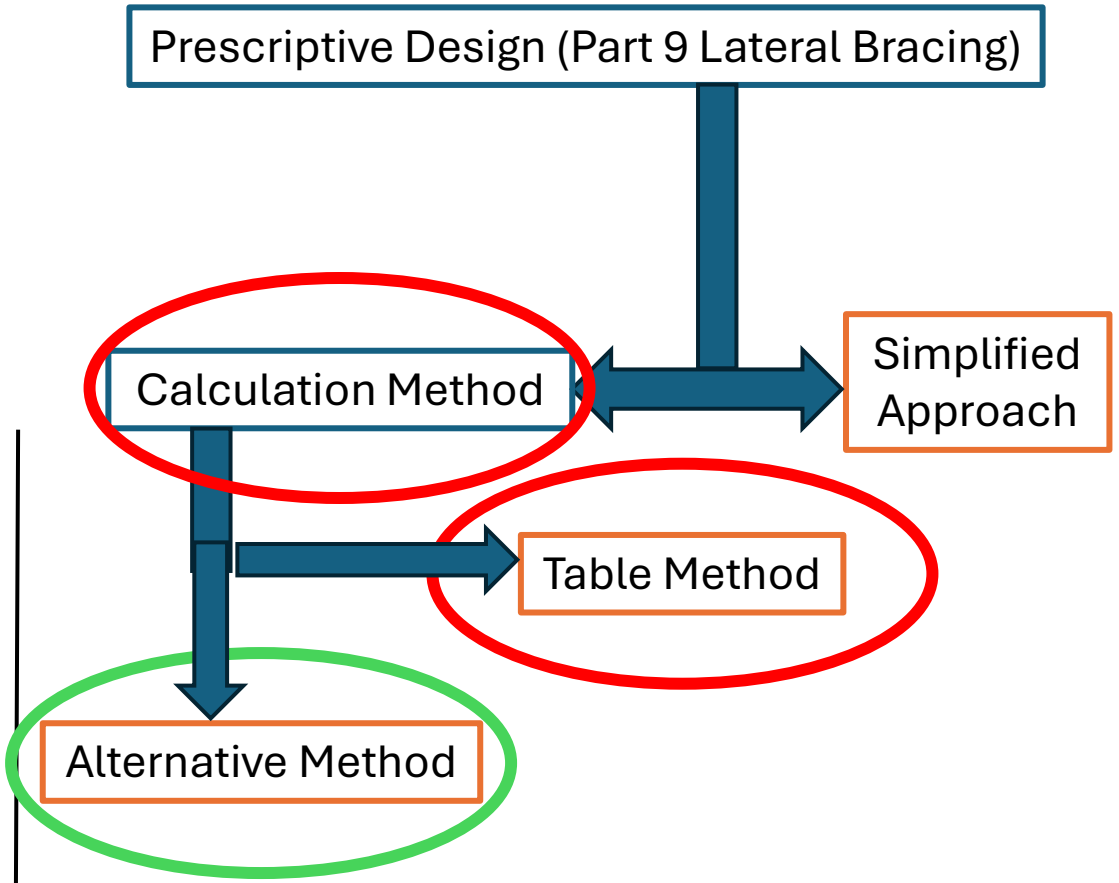
Subsection 9.23.13 Framework **RECAP+**

Box 1: Code Pathways and Trigger Points



Subsection 9.23.13 Framework **RECAP+**

Box 1: Code Pathways and Trigger Points

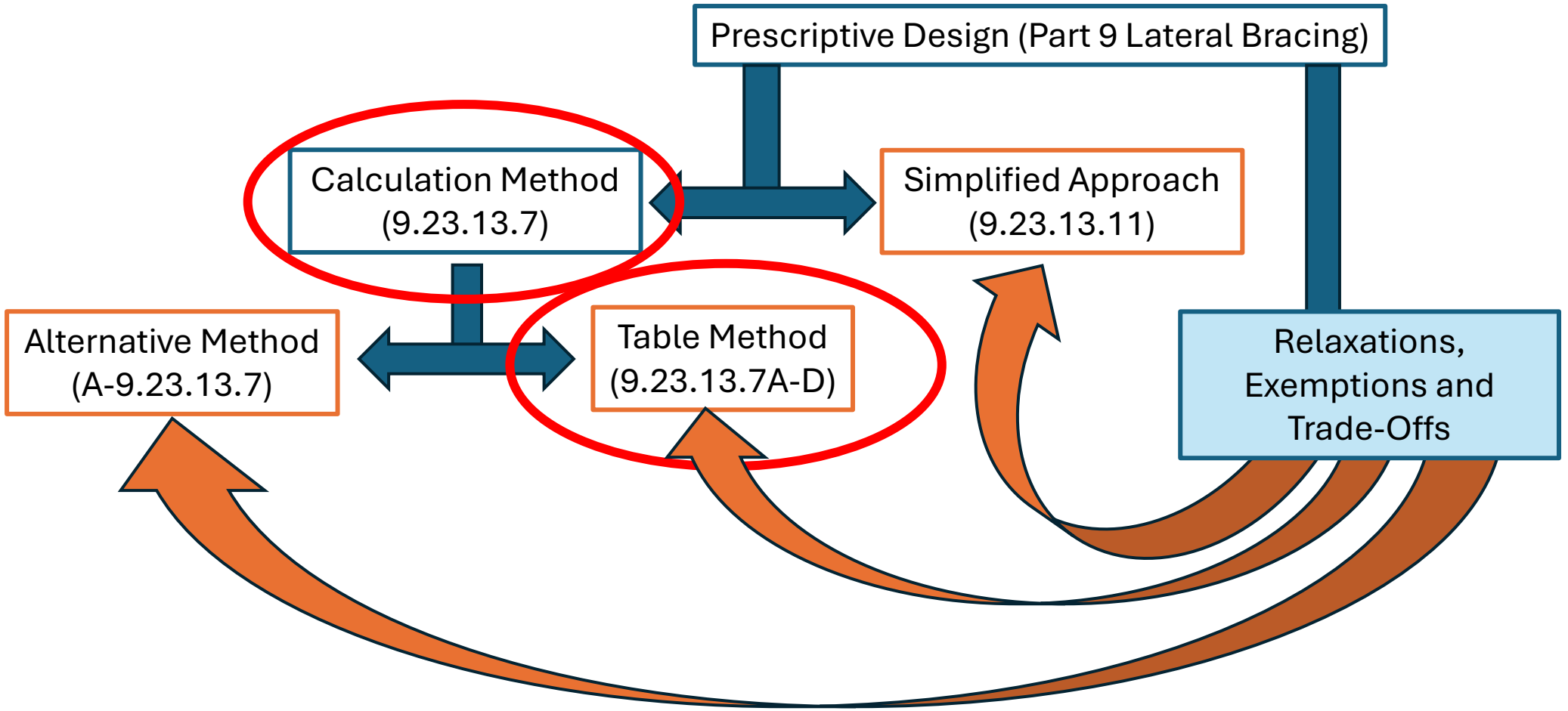


The Calculation Method (Tables)

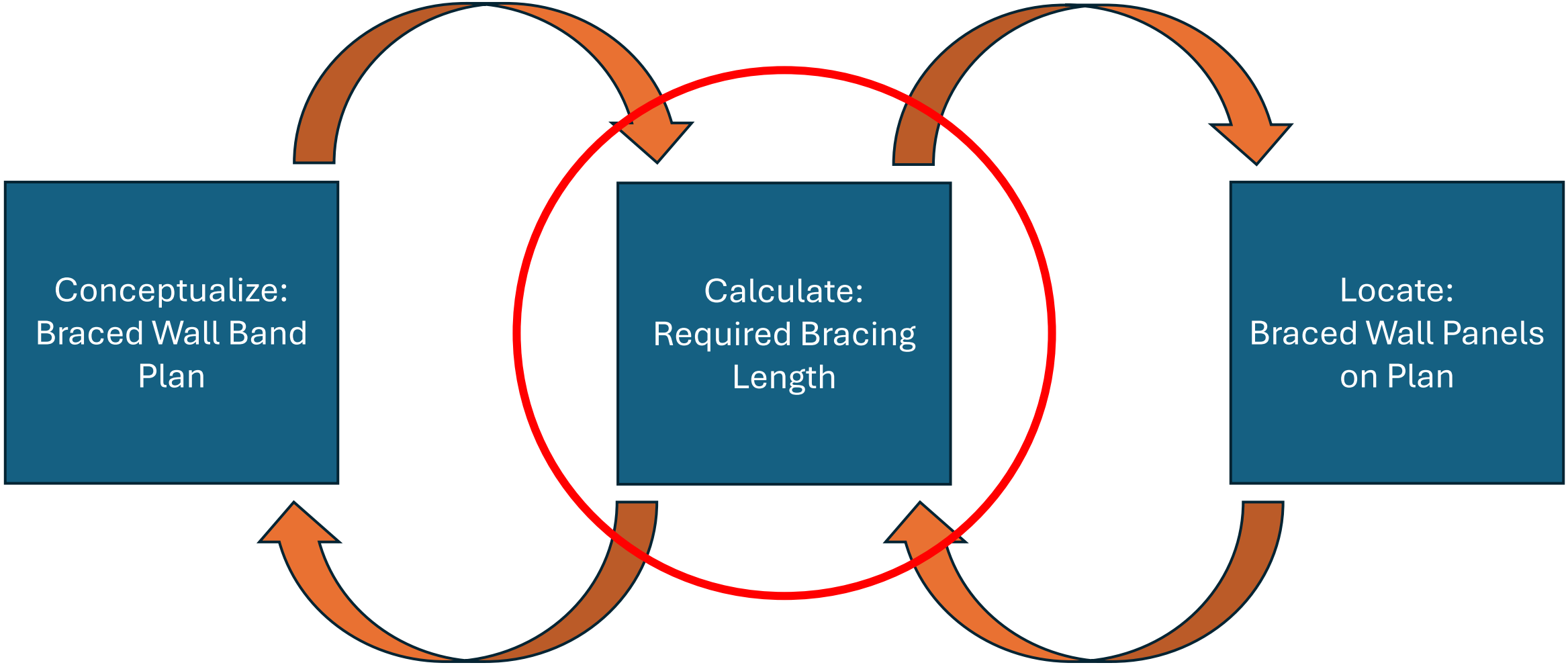
- Site Class is A, B, C, D, E or Unknown (not F)
- Smax no greater than 2.6 (2.52)
- HWP (1/50) no greater than 1.2kPa (0.72kPa)
- Roof Snow Load no greater than 6kPa (6.125kPa)
- Panel height no greater than 10' (3.1m)
- Eave-to-Ridge Roof Height no greater than 19' 8" (6m)
- Lowest exterior wood-framed walls support no more than;
  - 2 floors of normal weight construction, or
  - 1 floor of heavy weight construction

Subsection 9.23.13 Framework **RECAP+**

Box 3: Methods of Calculation



Overview of the Design Process **RECAP+**



Overview of the Design Process **RECAP+**

Step 2: Calculate the Required Bracing Length

Combine an understanding of Design Inputs

Site Details
- Site Specific and Regional Climate Data
- Site Specific and Regional Seismic Hazard

Building Design Details
- Dimensions
- Weight of Construction
- Methods of Construction

Braced Wall Band Plan Details
- Number of Bands
- Average Spacing of Bands

Process through a Method of Calculation

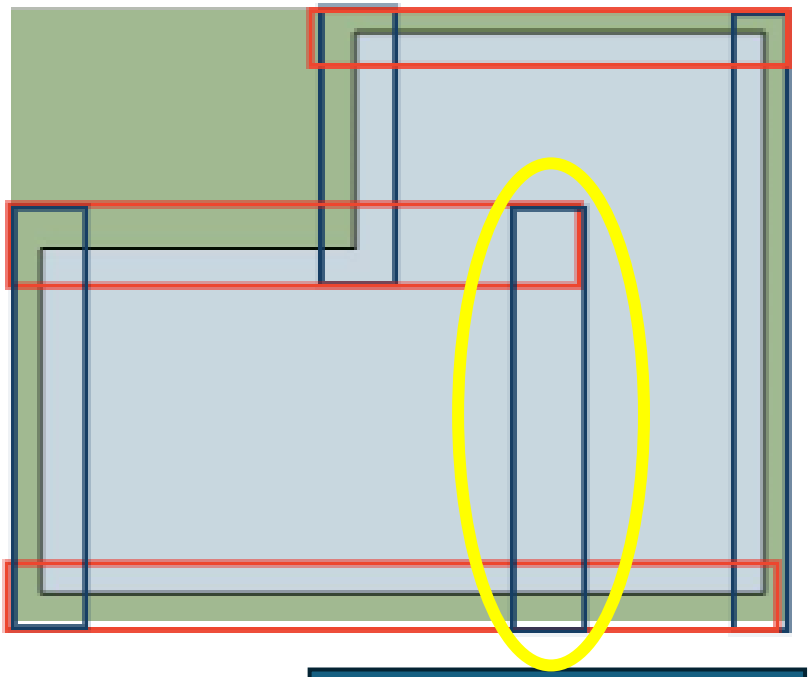
Amount of Bracing Length

Methods of Calculation: Overview

The Calculation Method (Tables and Alternative), and
The Simplified Approach

The goal with <u>any</u> method of calculation is to determine the total amount of linear bracing (ie Panel) length required;

- within a specific Band,
- on a specific Storey for Bracing,
- within a specific Building,
- built at a specific Site/Location



Understand the Site

Understand the Building

Understand the Braced Wall Band Plan

Methods of Calculation: Overview

Understand the Site

- Location
  - Regional Wind Loads
  - Regional Seismic Loads
  - Regional Snow Loads
- Site
  - Site-specific effects on Wind Loads
  - Site-specific effects on Seismic Loads
  - Site-specific effects on Snow Loads

- All of these have an affect on the amount bracing required in a Band

- All are environmental related aspects that are dependent on site and location

- Designers have no control over these aspects (or only a little)

Methods of Calculation: Overview

Understand the Building

- Size of Building
  - Number of Storeys for Bracing
  - Building Plan Dimensions for each Storey for Bracing
  - Maximum Roof Height on uppermost Storey for Bracing
- Construction of Building
  - Weight of Construction
  - Proposed Reference Framing Type (of Band being calculated)
  - Interior/Reverse Gypsum Board installation
  - Is the Band Continuously Sheathed

- All of these have an affect on the amount bracing required in a Band

- All design related aspects that are dependent on choices of the designer

- Designers have control over all these aspects

Methods of Calculation: Overview

Understand the Braced Wall Band Plan

- Location of the Band being calculated
  - Storey for Bracing
  - Orthogonal Direction
- Context to other Bands in same Storey for Bracing and Orthogonal Direction
  - Number of Bands
  - Average Spacing of Bands

Calculation Method (Tables) Overview

Calculation Summary

Adjusted Length = Unadjusted Length × Factors

Total amount of bracing length required for a Band, on a specific Storey for Bracing, for your specific building design

The Code Tables bracing length for a Band, on a specific Storey for Bracing, for based on the code reference building.

Construction and mathematical Factors that increase or decrease the Unadjusted Length. Factors change depending on your specific building type, size and location

Calculation Method (Tables) Overview

Calculation Summary for Wind

Wind

3) For resistance to wind pressure, the minimum total length of *braced wall panels* in each *braced wall band*, L_w, shall be determined by applying the adjustment factors provided in Table 9.23.13.7.-B to the unadjusted minimum total *braced wall panel* length Luw provided in Table 9.23.13.7.-A using the following equation:

$$L_w = L_{uw} K_{exp} K_{roof} K_{Wspacing} K_{Wnumber} K_{gyp} K_{sheath} \geq BWP_{min}$$

Source: BC Building Code 2024

Adjusted Length = Unadjusted Length × Factors

Calculation Method (Tables) Overview

Calculation Summary for Earthquake

Earthquake

4) For resistance to seismic forces, the minimum total length of *braced wall panels* in each *braced wall band*, Ls, shall be determined by applying the adjustment factors provided in Table 9.23.13.7.-D to the unadjusted minimum total *braced wall panel* length, Lus, provided in Table 9.23.13.7.-C using the following equation:

$$Ls = L_{us} K_{weight} K_{snow} K_{Sspacing} K_{Snumber} K_{gyp} K_{sheath} \geq BWP_{min}$$

Source: BC Building Code 2024

Adjusted Length = Unadjusted Length × Factors

Calculation Method (Tables) Overview

Calculation Summary Code Table References

Total amount of bracing length required for a Band, on a specific Storey for Bracing, for your specific building design

Wind	Table 9.23.13.7.-A
Earthquake	Table 9.23.13.7.-C

Wind	Table 9.23.13.7.-B
Earthquake	Table 9.23.13.7.-D

Calculation Method (Tables) Overview

Calculation Summary Required Inputs

	Wind	Earthquake (Seismic)
Unadjusted Length	Hourly Wind Pressure (1/50) Reference Framing Type Storey for Bracing	Smax (Location and Site Class) Reference Framing Type Storey for Bracing Building Dimension Parallel to Band
Factors	Exposure Eave-to-Ridge Height Average Spacing of Bands Number of Bands Interior/Reverse Gypsum Sheathing Continuity	Weight of Construction Roof Snow Load Average Spacing of Bands Number of Bands Interior/Reverse Gypsum Sheathing Continuity

Calculation Method (Tables) Overview

Unadjusted Length for Wind

Wind

Unadjusted Length

Table 9.23.13.7.-A

Hourly Wind Pressure (1/50)

Reference Framing Type

Storey for Bracing

Table 9.23.13.7.-A
Unadjusted Minimum Total Braced Wall Panel Lengths for Wind
Forming Part of Sentence 9.23.13.7.(3)

		Unadjusted Minimum Total *Braced Wall Panel* Length for Wind, Luw, m (1)								
		Diagonal- Lumber-Sheathed Framing Type (with gypsum board on opposite side) (2)	Gypsum-Sheathed Framing Type (with gypsum board on only one side) (2) (3)				Wood-sheathed Framing Type (with gypsum board on opposite side) (2)			
HWP	*Storey*	DWB	GWB-A	GWB-B	GWB-C	GWB-D	WSP-A	WSP-B	WSP-C	WSP-D	WSP-E
		.65	3.29	1.91	1.42	1.14	1.14	0.60	0.52	0.48	0.43
HWP ≤ 0.3		.33	6.75	3.92	2.91	2.35	2.35	1.24	1.08	0.98	0.88

Unadjusted Length (m)

Source: BC Building Code 2024

Calculation Method (Tables) Overview

Unadjusted Length for Earthquake

Earthquake (Seismic)

Unadjusted Length

Table 9.23.13.7.-C

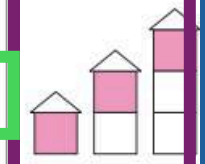
Smax (Location and Site Class)

Reference Framing Type

Storey for Bracing

Building Dimension Parallel to Band

Table 9.23.13.7.-C
Adjustment Factors for the Determination of Minimum Total Braced Wall Panel Lengths for Wind
Forming Part of Sentence 9.23.13.7.(4)

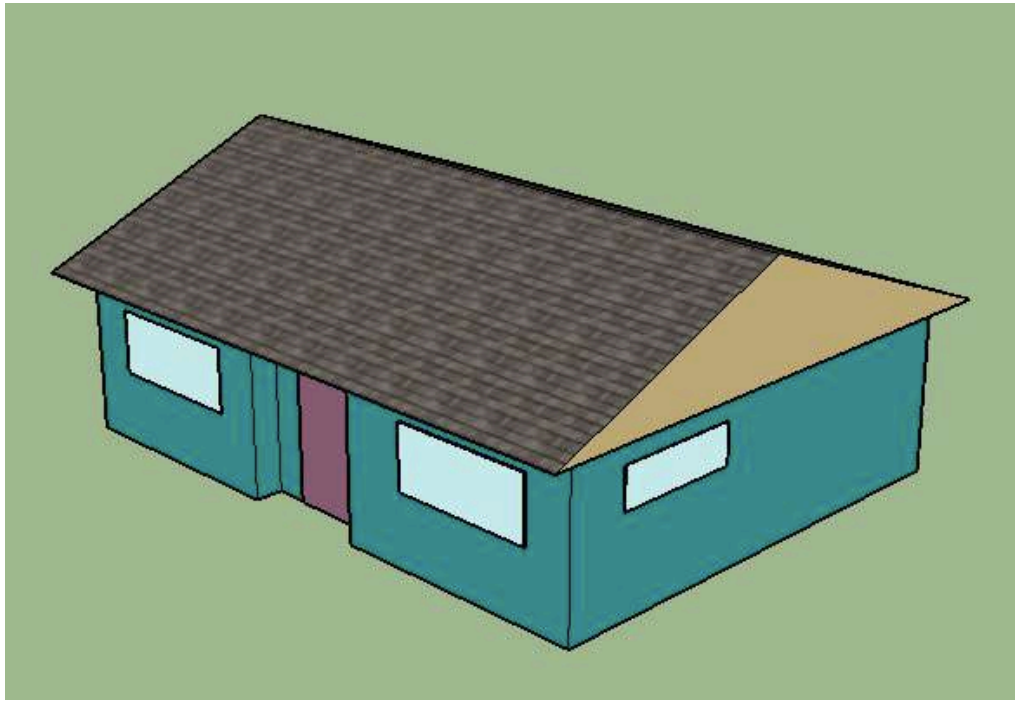
S_{max}	*Storey*	*Building* Plan Dimension Parallel to *Braced Wall Band*, Lwl, m	Unadjusted Minimum Total *Braced Wall Panel* Length for Seismic Forces, L_{us}, m (1) (2)									
			Diagonal-Lumber-Sheathed Framing Type (with gypsum board on opposite side) (3)	Gypsum-Sheathed Framing Type (with gypsum board on only one side) (3) (4)				Wood-Sheathed Framing Type (with gypsum board on opposite side) (3)				
			DWB	GWB-A	GWB-B	GWB-C	GWB-D	WSP-A	WSP-B	WSP-C	WSP-D	WSP E
$S_{max} \leq 0.2$		3.1	0.06	0.47	0.27	0.20	0.17	0.11	0.06	0.05	0.05	0.04
		6.1	0.11	0.81	0.47	0.35	0.28	0.19	0.10	0.09	0.08	0.07
		9.1	0.15	1.15	0.67	0.50	0.40	0.27	0.14	0.12	0.11	0.10
		12.2	0.20	1.5	0.87	0.65	0.53	0.35	0.18	0.16	0.15	0.13
		15.2	0.24	1.81	1.05	0.78	0.64	0.43	0.23	0.20	0.18	0.16
		18.3	0.29	2.20	1.28	0.95	0.77	0.51	0.27	0.23	0.21	0.19

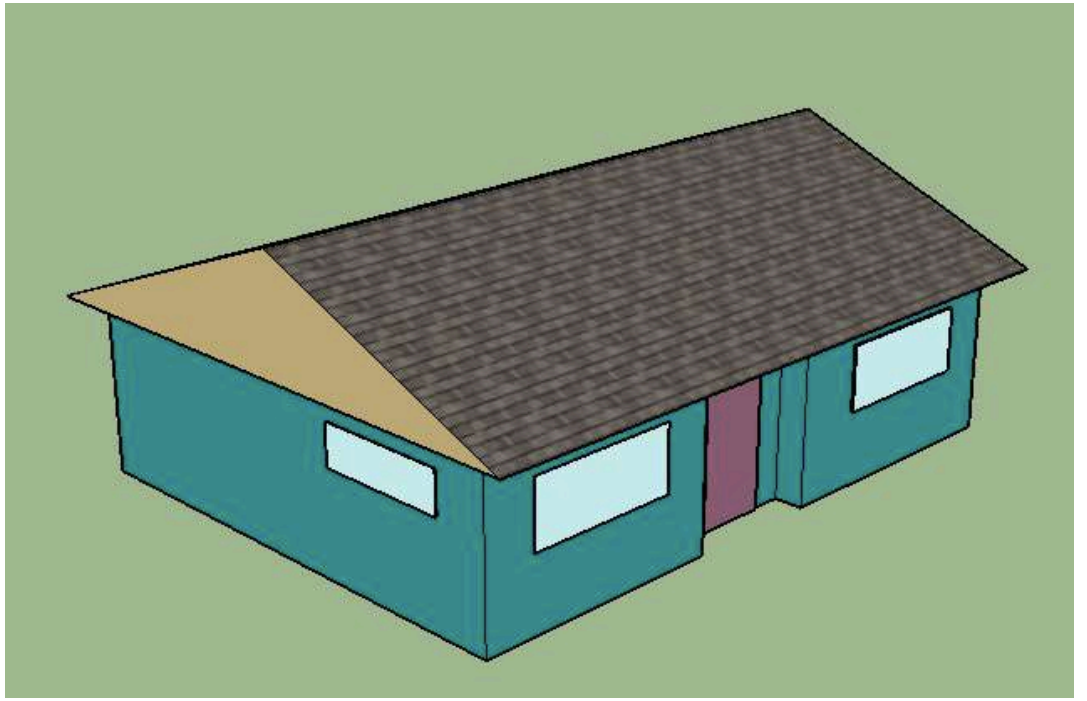
Unadjusted Length (m)

Source: BC Building Code 2024

Example House (Simple)

Overview

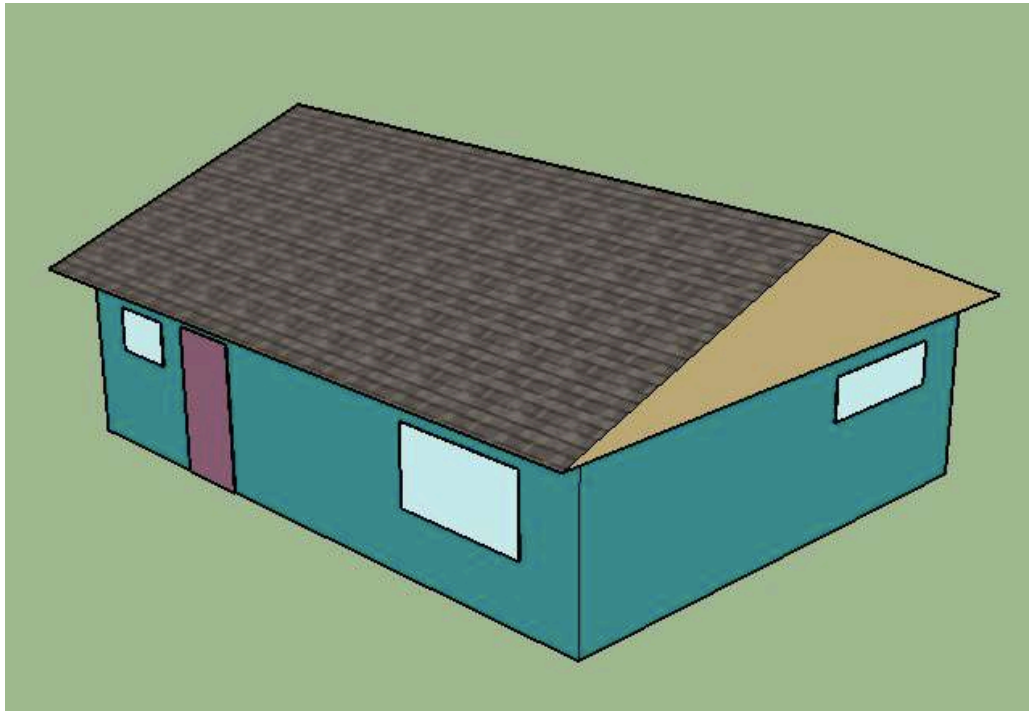


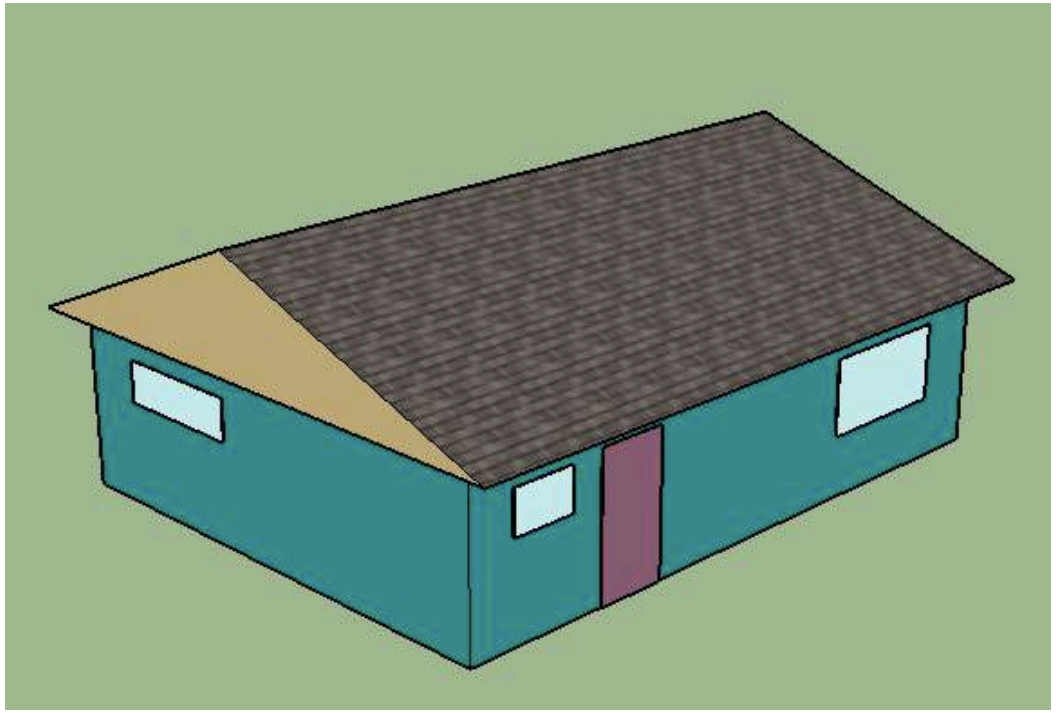


Front

Example House (Simple)

Overview





Back

Example House (Simple)

Understand the Site

- Location
- HWP (1/50)
- Terrain
- Site Class
- Smax
- Roof Snow Load

Table C-2 (continued)

Province and Location	Elev., m	Design Temperature				Degree-Days Below 18°C	15 Min. Rain, mm	One Day Rain, 1/50, mm	Ann. Rain, mm	Moist. Index	Ann. Tot. Ppn., mm	Driving Rain Wind Pressures, Pa, 1/5	Snow Load, kPa, 1/50		Hourly Wind Pressures, kPa	
		January		July 2.5%												
		2.5% °C	1% °C	Dry °C	Wet °C								S_s	S_r	1/10	1/50

Source: BC Building Code 2024

Table C-3 (continued)

Province and Location	S_{max} for Unknown Site Class	S_{max} According to Site Class				
		A	B	C	D	E

Source: BC Building Code 2024

Example House (Simple)

Understand the Site

Location	Nanaimo
HWP (1/50)	
Terrain	
Site Class	
Smax	
Roof Snow Load	

Table C-2 (continued)

Province and Location	Elev., m	Design Temperature				Degree-Days Below 18°C	15 Min. Rain, mm	One Day Rain, 1/50, mm	Ann. Rain, mm	Moist. Index	Ann. Tot. Ppn., mm	Driving Rain Wind Pressures, Pa, 1/5	Snow Load, kPa, 1/50		Hourly Wind Pressures, kPa	
		January		July 2.5%									S_s	S_r	1/10	1/50
		2.5% °C	1% °C	Dry °C	Wet °C											
Nanaimo	15	-6	-8	27	19	2920	10	91	1000	1.1	1050	200	2.1	0.4	0.38	0.48

Source: BC Building Code 2024

Table C-3 (continued)

Province and Location	S_{max} for Unknown Site Class	S_{max} According to Site Class				
		A	B	C	D	E
Nanaimo	1.55	0.571	0.7	1.15	1.5	1.55

Source: BC Building Code 2024

Example House (Simple)

Understand the Site

Location	Nanaimo
HWP (1/50)	0.48
Terrain	
Site Class	
Smax	
Roof Snow Load	

Table C-2 (continued)

Province and Location	Elev., m	Design Temperature				Degree-Days Below 18°C	15 Min. Rain, mm	One Day Rain, 1/50, mm	Ann. Rain, mm	Moist. Index	Ann. Tot. Ppn., mm	Driving Rain Wind Pressures, Pa, 1/5	Snow Load, kPa, 1/50		Hourly Wind Pressures, kPa	
		January		July 2.5%									S_s	S_r	1/10	1/50
		2.5% °C	1% °C	Dry °C	Wet °C											
Nanaimo	15	-6	-8	27	19	2920	10	91	1000	1.1	1050	200	2.1	0.4	0.38	0.48

Source: BC Building Code 2024

Table C-3 (continued)

Province and Location	S_{max} for Unknown Site Class	S_{max} According to Site Class				
		A	B	C	D	E
Nanaimo	1.55	0.571	0.7	1.15	1.5	1.55

Source: BC Building Code 2024

Example House (Simple)

Understand the Site

Location	Nanaimo
HWP (1/50)	0.48
Terrain	
Site Class	
Smax	
Roof Snow Load	1.555

Table C-2 (continued)

Province and Location	Elev., m	Design Temperature				Degree-Days Below 18°C	15 Min. Rain, mm	One Day Rain, 1/50, mm	Ann. Rain, mm	Moist. Index	Ann. Tot. Ppn., mm	Driving Rain Wind Pressures, Pa, 1/5	Snow Load, kPa, 1/50		Hourly Wind Pressures, kPa	
		January		July 2.5%									S_s	S_r	1/10	1/50
		2.5% °C	1% °C	Dry °C	Wet °C											
Nanaimo	15	-6	-8	27	19	2920	10	91	1000	1.1	1050	200	2.1	0.4	0.38	0.48

Source: BC Building Code 2024

Table C-3 (continued)

Province and Location	S_{max} for Unknown Site Class	S_{max} According to Site Class				
		A	B	C	D	E
Nanaimo	1.55	0.571	0.7	1.15	1.5	1.55

Source: BC Building Code 2024

Example House (Simple)

Understand the Site

Location	Nanaimo
HWP (1/50)	0.48
Terrain	
Site Class	Unknown
Smax	
Roof Snow Load	1.55

Table C-2 (continued)

Province and Location	Elev., m	Design Temperature				Degree-Days Below 18°C	15 Min. Rain, mm	One Day Rain, 1/50, mm	Ann. Rain, mm	Moist. Index	Ann. Tot. Ppn., mm	Driving Rain Wind Pressures, Pa, 1/5	Snow Load, kPa, 1/50		Hourly Wind Pressures, kPa	
		January		July 2.5%									S_s	S_r	1/10	1/50
		2.5% °C	1% °C	Dry °C	Wet °C											
Nanaimo	15	-6	-8	27	19	2920	10	91	1000	1.1	1050	200	2.1	0.4	0.38	0.48

Source: BC Building Code 2024

Table C-3 (continued)

Province and Location	S_{max} for Unknown Site Class	S_{max} According to Site Class				
		A	B	C	D	E
Nanaimo	1.55	0.571	0.7	1.15	1.5	1.55

Source: BC Building Code 2024

Example House (Simple)

Understand the Site

Location	Nanaimo
HWP (1/50)	0.48
Terrain	
Site Class	Unknown
Smax	1.55
Roof Snow Load	1.555

Table C-2 (continued)

Province and Location	Elev., m	Design Temperature				Degree-Days Below 18°C	15 Min. Rain, mm	One Day Rain, 1/50, mm	Ann. Rain, mm	Moist. Index	Ann. Tot. Ppn., mm	Driving Rain Wind Pressures, Pa, 1/5	Snow Load, kPa, 1/50		Hourly Wind Pressures, kPa	
		January		July 2.5%									S_s	S_r	1/10	1/50
		2.5% °C	1% °C	Dry °C	Wet °C											
Nanaimo	15	-6	-8	27	19	2920	10	91	1000	1.1	1050	200	2.1	0.4	0.38	0.48

Source: BC Building Code 2024

Table C-3 (continued)

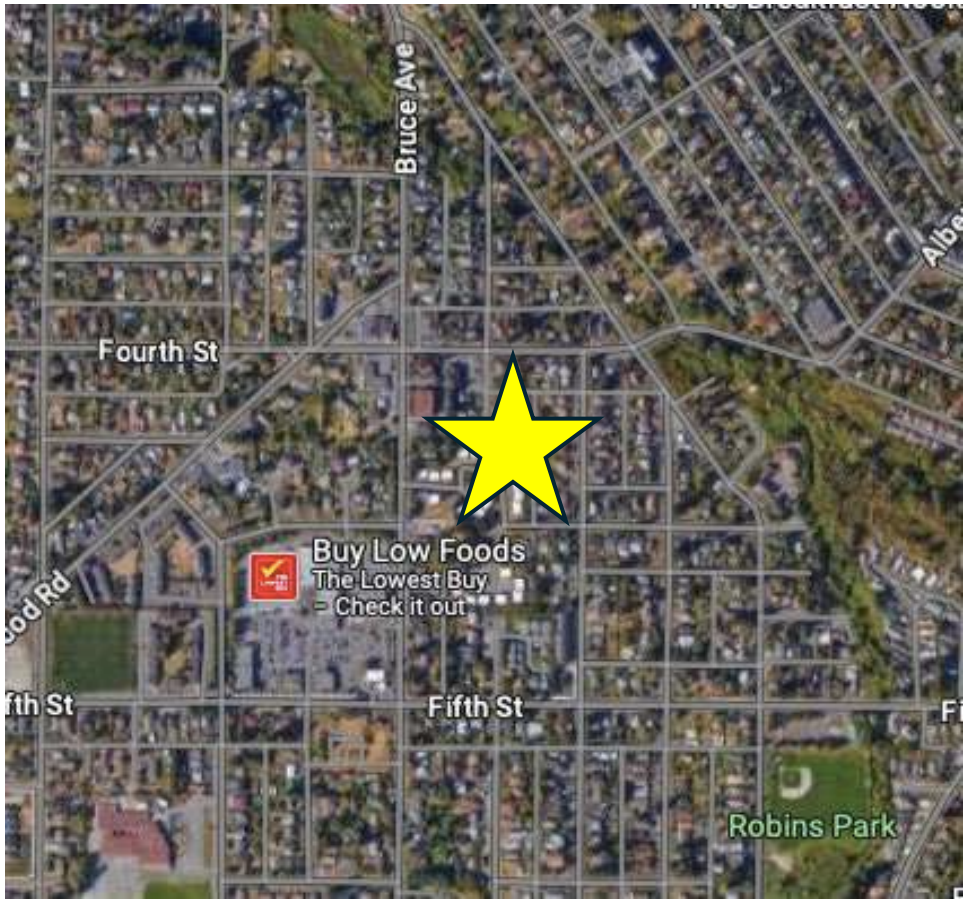
Province and Location	S_{max} for Unknown Site Class	S_{max} According to Site Class				
		A	B	C	D	E
Nanaimo	1.55	0.571	0.7	1.15	1.5	1.55

Source: BC Building Code 2024

Example House (Simple)

Understand the Site

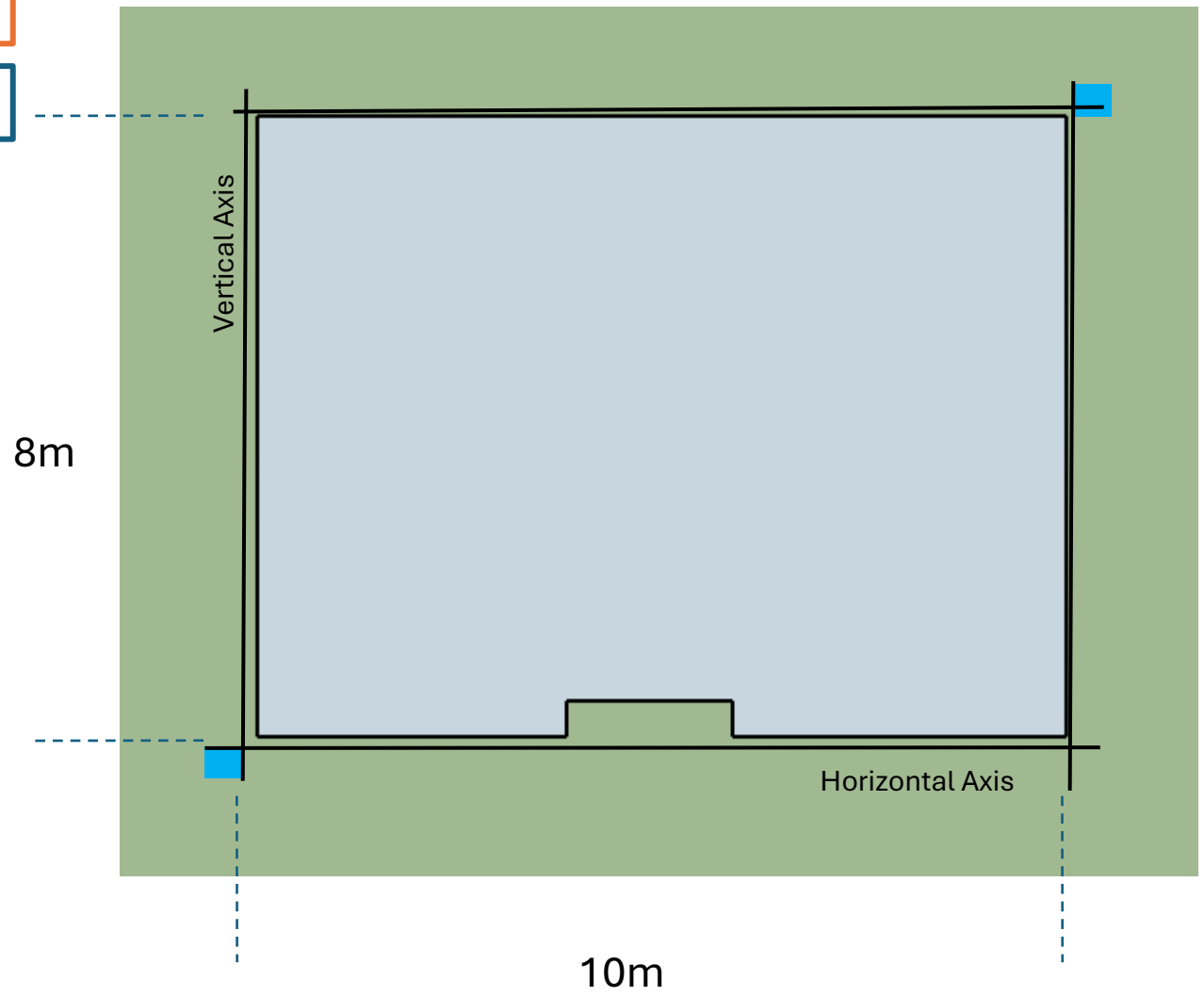
Location	Nanaimo
HWP (1/50)	0.48
Terrain	Rough
Site Class	Unknown
Smax	1.55
Roof Snow Load	1.555



Example House (Simple)

Understand the Building

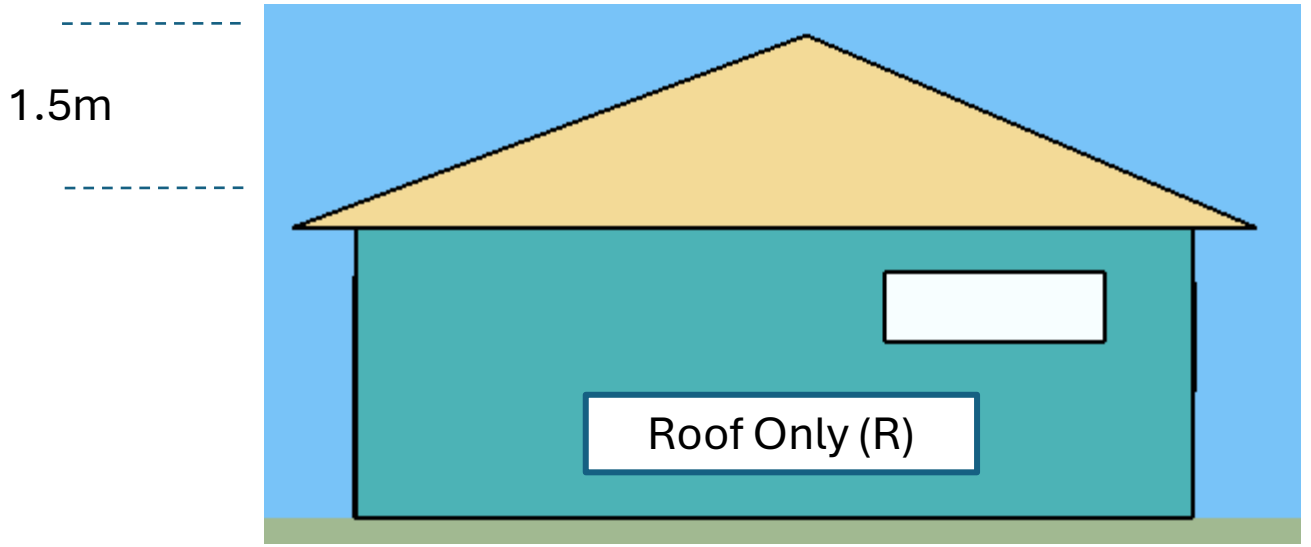
Building Plan Dimensions



Example House (Simple)

Understand the Building

Storeys for Bracing and Eave-to-Ridge Height



Example House (Simple)

Understand the Building

Building Dimensions:

- 10m (Horizontal Axis)
- 8m (Vertical Axis)

- 1.5m (Eave-to-Ridge)

Normal weight Construction

Slab on Grade

1 Storey for Bracing

Lowest wood-framed walls support no floors

Continuously Sheathed

All Bands are WSP-A with interior gypsum board installed

Example House (Simple)

Understand the Braced Wall Band Plan

Band ID and Average Band Spacing

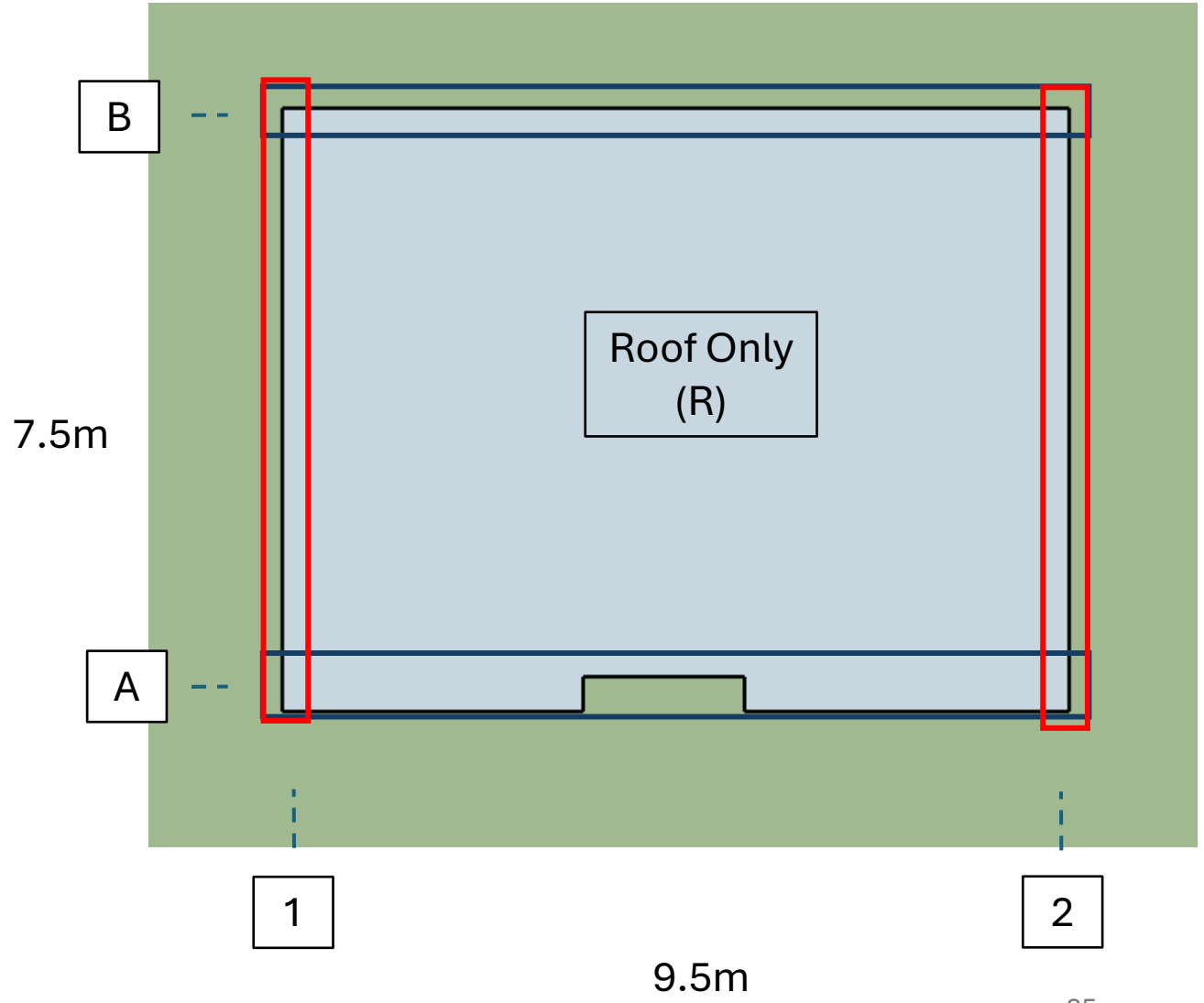
Storey supporting Roof Only (R)

Along Vertical Axis (Bands labelled A, B C…)

Distance between c/l furthest Bands: 7.5m
Number of Bands: 2
Number of Spacings: 1
Average Spacing: 7.5m

Along Horizontal Axis (Bands labelled 1, 2, 3…)

Distance between c/l furthest Bands: 9.5m
Number of Bands: 2
Number of Spacings: 1
Average Spacing: 9.5m

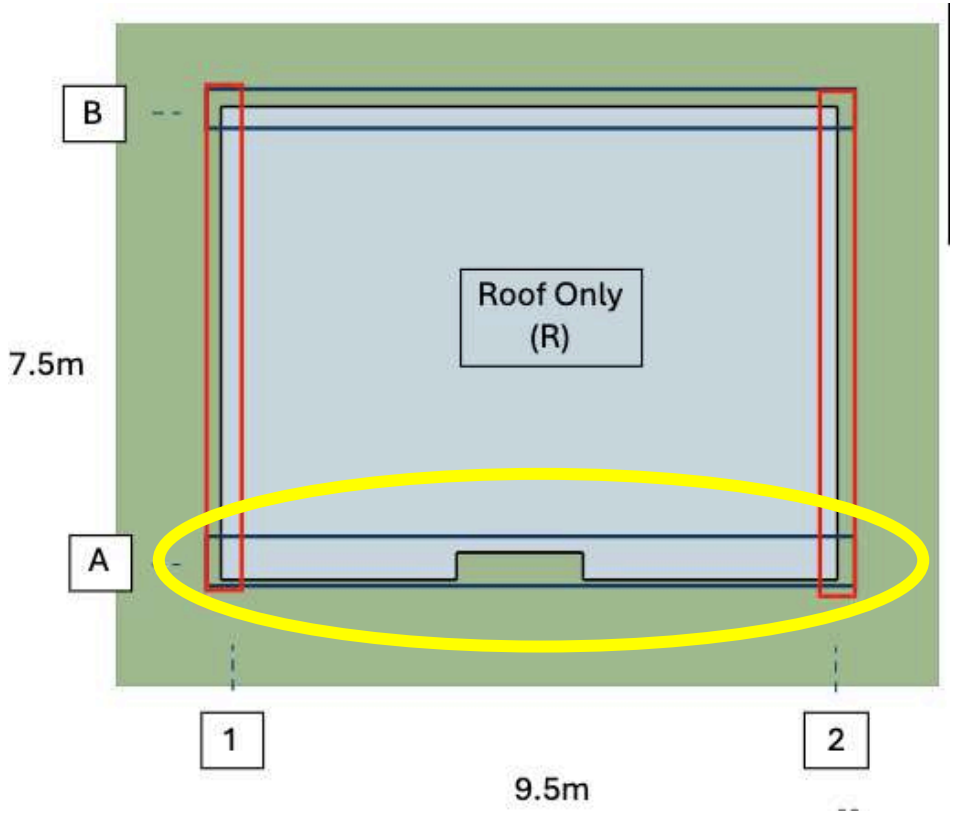


Example House (Simple)

Calculate for Wind

Band ID	Unadjusted Length	Factors						Adjusted Length
		K(W)exp	K(W)roof	K(W)spac	K(W)num	Kgyp	Ksheath	
R-A								

- Identify Band for specific Storey for Bracing, Orthogonal Direction and relationship to other Bands



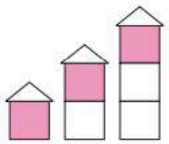
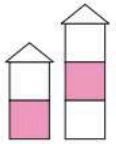
Example House (Simple)

Calculate for Wind

Band ID	Unadjusted Length	Factors						Adjusted Length
		K(W)exp	K(W)roof	K(W)spac	K(W)num	Kgyp	Ksheath	
R-A	1.90							

- HWP (1/50): 0.48
- Band is on Storey for Bracing with walls supporting Roof Only (R)
- Reference Framing Type is WSP-A

Table 9.23.13.7.-A (continued)

		Unadjusted Minimum Total *Braced Wall Panel* Length for Wind, Luw, m (1)									
		Diagonal- Lumber-Sheathed Framing Type (with gypsum board on opposite side) (2)	Gypsum-Sheathed Framing Type (with gypsum board on only one side) (2) (3)				Wood-sheathed Framing Type (with gypsum board on opposite side) (2)				
HWP	*Storey*	DWB	GWB-A	GWB-B	GWB-C	GWB-D	WSP-A	WSP-B	WSP-C	WSP-D	WSP-E
		1.08	5.84	3.18	2.36	1.90	1.90	1.00	0.87	0.79	0.72
0.4 < HWP ≤ 0.5		2.22	11.25	6.54	4.85	3.92	3.92	2.06	1.79	1.63	1.47

Source: BC Building Code 2024

Example House (Simple)

Calculate for Wind

Band ID	Unadjusted Length	Factors						Adjusted Length
		K(W)exp	K(W)roof	K(W)spac	K(W)num	Kgyp	Ksheath	
R-A	1.90	1						

- Terrain is rough

Table 9.23.13.7-B
Adjustment Factors for the Determination of Minimum Total Braced Wall Panel Lengths for Wind
Forming Part of Sentence 9.23.13.7.(3)

Symbol	Description	*Storey*	Condition	Adjustment Factor
K_{exp} (1)	Wind exposure: apply factor to all *storeys* in both directions	All *storeys* All *storeys* in 1 – *storey building* All *storeys* in 2 – *storey building* All *storeys* in 3 – *storey building*	Rough terrain Open terrain	1.00 1.29 1.40 1.48

Source: BC Building Code 2024

Example House (Simple)

Calculate for Wind

Band ID	Unadjusted Length	Factors						Adjusted Length
		K(W)exp	K(W)roof	K(W)spac	K(W)num	Kgyp	Ksheath	
R-A	1.90	1	0.52					

- Eave-to-Ridge height is 1.5m

Table 9.23.13.7.-B
Adjustment Factors for the Determination of Minimum Total Braced Wall Panel Lengths for Wind
Forming Part of Sentence 9.23.13.7.(3)

Symbol	Description	*Storey*	Condition	Adjustment Factor
K_{roof} (2)	Roof eave-to-ridge height: apply factor separately to each *storey*	*Storey* supporting roof only	≤ 1.5 m 3.0 m 4.5 m 6.0 m	0.52 1.00 1.58 1.99
		Storey supporting roof and 1 floor	≤ 1.5 m 3.0 m 4.5 m 6.0 m	0.79 1.00 1.26 1.47
		Storey supporting roof and 2 floors	≤ 1.5 m 3.0 m 4.5 m 6.0 m	0.87 1.00 1.16 1.31

Source: BC Building Code 2024

Example House (Simple)

Calculate for Wind

Band ID	Unadjusted Length	Factors						Adjusted Length
		K(W)exp	K(W)roof	K(W)spac	K(W)num	Kgyp	Ksheath	
R-A	1.90	1	0.52	0.99	1.00			

For this Orthogonal Direction
- Average Spacing is 7.5m
- Number of Bands is 2

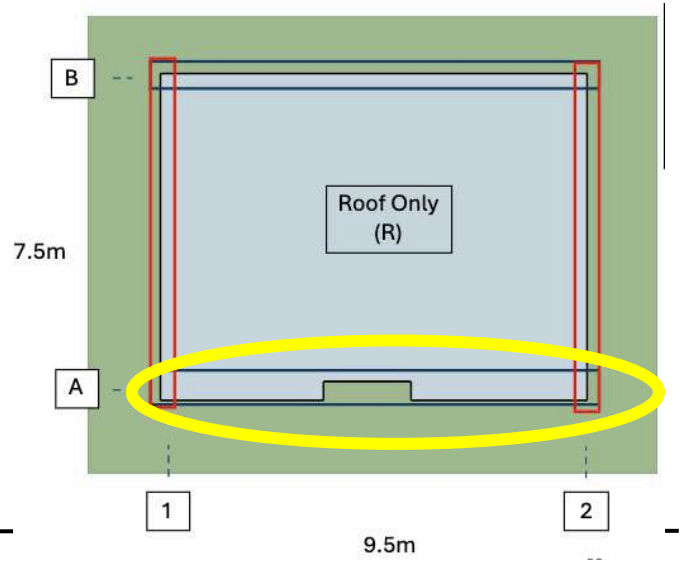


Table 9.23.13.7.-B
Adjustment Factors for the Determination of Minimum Total Braced Wall Panel Lengths for Wind
Forming Part of Sentence 9.23.13.7.(3)

Symbol	Description	*Storey*	Condition	Adjustment Factor
$K_{Wspacing}$ (2) (3) (4)	*Braced wall band* spacing: apply factor to all *braced wall panels* per *building* plan direction	Any *storey*	3.8 m 7.6 m 10.6 m 15 m (5)	0.51 1.00 1.35 1.86
$K_{Wnumber}$	Number of parallel *braced wall bands*: apply factor to all *braced wall panels* per *building* plan direction	Any *storey*	2 3 4 ≥ 5	1.00 1.28 1.38 1.43

Source: BC Building Code 2024

Example House (Simple)

Calculate for Wind

Band ID	Unadjusted Length	Factors						Adjusted Length
		K(W)exp	K(W)roof	K(W)spac	K(W)num	Kgyp	Ksheath	
R-A	1.90	1	0.52	0.99	1	1	1	

- Interior/Reverse Gypsum board installed
- Continuously sheathed

Table 9.23.13.7.-B
Adjustment Factors for the Determination of Minimum Total Braced Wall Panel Lengths for Wind
Forming Part of Sentence 9.23.13.7.(3)

Symbol	Description	*Storey*	Condition	Adjustment Factor
K_{gyp}	Interior gypsum board: apply factor in accordance with whether gypsum board is installed or ommited on interior side of *braced wall panels*	Any *storey*	Installed Omitted, blocked wall Omiitted, unblocked wall	1.00 1.20 1.40
K_{sheath}	Intermittent *braced wall panels*: apply factor in accordance with continuity of sheathing within *braced wall band*	Any *storey*	Continuously sheathed Intermittently sheathed	1.00 1.15

Source: BC Building Code 2024

Example House (Simple)

Calculate for Wind

Band ID	Unadjusted Length	Factors						Adjusted Length
		K(W)exp	K(W)roof	K(W)spac	K(W)num	Kgyp	Ksheath	
R-A	1.90	1	0.52	0.99	1	1	1	0.978

3) For resistance to wind pressure, the minimum total length of *braced wall panels* in each *braced wall band*, L_w, shall be determined by applying the adjustment factors provided in Table 9.23.13.7.-B to the unadjusted minimum total *braced wall panel* length Luw provided in Table 9.23.13.7.-A using the following equation:

$$L_w = L_{uw}\, K_{exp}\, K_{roof}\, K_{Wspacing}\, K_{Wnumber}\, K_{gyp}\, K_{sheath} \geq BWP_{min}$$

Source: BC Building Code 2024

Example House (Simple)

Calculate for Wind

Band ID	Unadjusted Length	Factors						Adjusted Length
		K(W)exp	K(W)roof	K(W)spac	K(W)num	Kgyp	Ksheath	
R-A	1.90	1	0.52	0.99	1	1	1	0.978
R-B	1.90	1	0.52	0.99	1	1	1	0.978
R-1	1.90	1	0.52	1.22	1	1	1	1.205
R-2	1.90	1	0.52	1.22	1	1	1	1.205

For this Orthogonal Direction
- Average Spacing is 9.5m
- Number of Bands is 2

$K_{Wspacing}$ (2) (3) (4)	*Braced wall band* spacing: apply factor to all *braced wall panels* per *building* plan direction	Any *storey*	3.8 m 7.6 m 10.6 m 15 m (5)	0.51 1.00 1.35 1.86

Source: BC Building Code 2024

Example House (Simple)

Calculate for Earthquake

Band ID	Unadjusted Length	K(S)weight	K(S)snow	K(S)
R-A	2.349			

- Smax is 1.55
- Band is on Storey for Bracing supporting Roof Only (R)
- Building Plan Dimension Parallel to Band is 10m
- Reference Framing Type is WSP-A

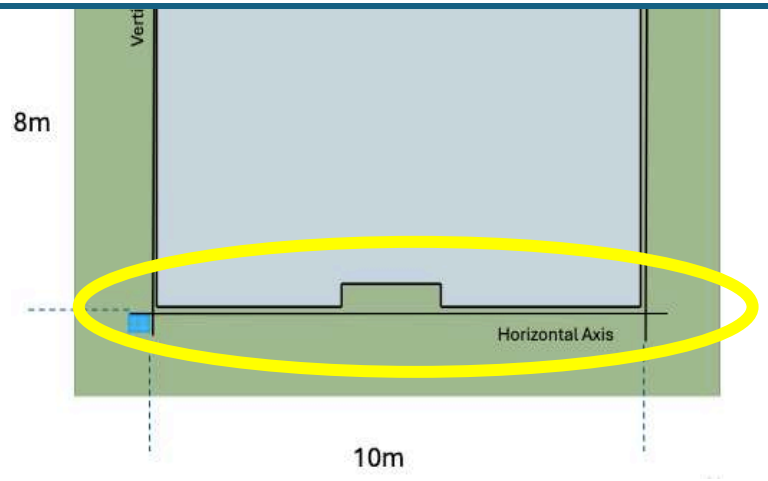
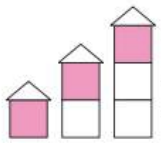


Table 9.23.13.7.-C
Adjustment Factors for the Determination of Minimum Total Braced Wall Panel Lengths for Wind
Forming Part of Sentence 9.23.13.7.(4)

S_{max}	*Storey*	*Building* Plan Dimension Parallel to *Braced Wall Band*, Lwl, m	Unadjusted Minimum Total *Braced Wall Panel* Length for Seismic Forces, L_{us}, m (1) (2)									
			Diagonal-Lumber-Sheathed Framing Type (with gypsum board on opposite side) (3)	Gypsum-Sheathed Framing Type (with gypsum board on only one side) (3) (4)				Wood-Sheathed Framing Type (with gypsum board on opposite side) (3)				
			DWB	GWB-A	GWB-B	GWB-C	GWB-D	WSP-A	WSP-B	WSP-C	WSP-D	WSP-E
1.2 < Smax ≤ 1.6		3.1	0.50	DR(1.89)	2.19	1.63	1.32	0.88	0.46	0.40	0.37	0.33
		6.1	0.86	DR(3.25)	3.78	2.80	2.28	1.52	0.80	0.69	0.63	0.57
		9.1	1.22	DR(4.61)	5.36	3.67	3.23	2.16	1.13	0.99	0.90	0.81
		12.2	1.59	12.03	6.99	5.18	4.22	2.81	1.48	1.29	1.17	1.06
		15.2	1.95	14.51	8.43	6.25	5.09	3.45	1.81	1.58	1.44	1.30
		18.3	2.33	17.57	10.20	7.57	6.16	4.11	2.16	1.88	1.71	1.54

Source: BC Building Code 2024

Example House (Simple)

Calculate for Earthquake

Band ID	Unadjusted Length	Factors						Adjusted Length
		K(S)weight	K(S)snow	K(S)spac	K(S)num	Kgyp	Ksheath	
R-A	2.349	1						

- Normal weight Construction

Table 9.23.13.7-D
Adjustment Factors for the Determination of Minimum Total Braced Wall Panel Lengths for Seismic Forces
Forming Part of Sentence 9.23.13.7.(4)

Symbol	Description	*Storey*	Condition	Adjustment Factor
	Normal-weight construction	Any *storey*	Any L_{wl}	1.0

Source: BC Building Code 2024

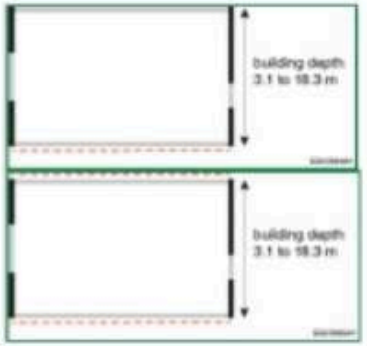
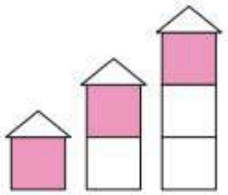
Example House (Simple)

Calculate for Earthquake

Band ID	Unadjusted Length	Factors						Adjusted Length
		K(S)weight	K(S)snow	K(S)spac	K(S)num	Kgyp	Ksheath	
R-A	2.349	1	1					

- Roof Snow Load is 1.55kPa
- Band is on Storey for Bracing with walls supporting Roof Only (R)

Table 9.23.13.7.-D (continued)

Symbol	Description	*Storey*	Condition	Adjustment Factor
K_{snow} (4)	Stone veneer cladding perpendicular to the *braced wall band*, 2 *storey* height, fully clad: Apply factor corresonding to depth Lwl in the direction of the *braced wall band* for  one or two *building* face(s).	 *Storey* supporting roof only	≤ 2kPa	1.00
			3 kPa	1.20
			4 kPa	1.40
			5 kPa	1.60
			6 kPa	1.80

Source: BC Building Code 2024

Example House (Simple)

Calculate for Earthquake

Band ID	Unadjusted Length	Factors						Adjusted Length
		K(S)weight	K(S)snow	K(S)spac	K(S)num	Kgyp	Ksheath	
R-A	2.349	1	1	0.99	1			

For this Orthogonal Direction
- Average Spacing is 7.5m
- Number of Bands is 2

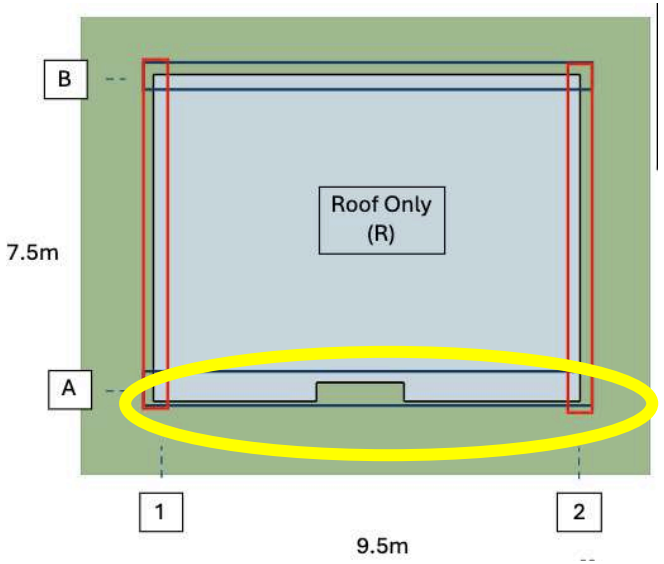


Table 9.23.13.7.-D (continued)

Symbol	Description	*Storey*	Condition	Adjustment Factor
$K_{Sspacing}$ (5) (6)	*Braced wall band* spacing: apply factor to all *braced wall panels* per *building* plan direction	Any *storey*	3.8 m	0.60
			7.6 m	1.00
			10.6 m	1.35
			15 m (7)	1.90
$K_{Snumber}$	Number of parallel *braced wall bands*: apply factor to all *braced wall panels* per *building* plan direction	Any *storey*	2	1.00
			3	1.33
			4	1.50
			≥ 5	1.60

Source: BC Building Code 2024

Example House (Simple)

Calculate for Earthquake

Band ID	Unadjusted Length	Factors						Adjusted Length
		K(S)weight	K(S)snow	K(S)spac	K(S)num	Kgyp	Ksheath	
R-A	2.349	1	1	0.99	1	1	1	

- Interior/Reverse Gypsum board installed
- Continuously sheathed

Table 9.23.13.7.-D (continued)

Symbol	Description	*Storey*	Condition	Adjustment Factor
K_{gyp}	Interior gypsum board: apply factor in accordance with whether gypsum board is installed or ommitted on interior side of *braced wall panels*	Any *storey*	Installed	1.00
			Omitted, blocked wall	1.20
			Omitted, unblocked wall	1.40
K_{sheath}	Intermittent *braced wall panels*: apply factor in accordance with continuity of sheathing within *braced wall band*	Any *storey*	Continuously wood-sheathed	1.00
			Intermittently sheathed	1.15

Source: BC Building Code 2024

Example House (Simple)

Calculate for Earthquake

Band ID	Unadjusted Length	Factors						Adjusted Length
		K(S)weight	K(S)snow	K(S)spac	K(S)num	Kgyp	Ksheath	
R-A	2.349	1	1	0.99	1	1	1	2.326

4) For resistance to seismic forces, the minimum total length of *braced wall panels* in each *braced wall band*, Ls, shall be determined by applying the adjustment factors provided in Table 9.23.13.7.-D to the unadjusted minimum total *braced wall panel* length, Lus, provided in Table 9.23.13.7.-C using the following equation:

$$Ls = L_{us}\ K_{weight}\ K_{snow}\ K_{Sspacing}\ K_{Snumber}\ K_{gyp}\ K_{sheath} \geq BWP_{min}$$

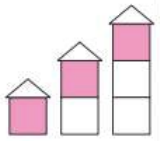
Source: BC Building Code 2024

Example House (Simple)

Calculate for Earthquake

Band ID	Unadjusted Length	Factors						Adjusted Length
		K(S)weight	K(S)snow	K(S)spac	K(S)num	Kgyp	Ksheath	
R-A	2.349	1	1	0.99	1	1	1	2.326
R-B	2.349	1	1	0.99	1	1	1	2.326
R-1	1.925	1	1	1.22	1	1	1	2.349
R-2	1.925	1	1	1.22	1	1	1	2.349

For this Orthogonal Direction
- Building Dimension || to Band is 8m
- Average Spacing is 9.5m

1.2 < S_{max} ≤ 1.6		3.1	0.50	DR(1.89)	2.19	1.63	1.32	0.88	0.46	0.40	0.37	0.33
		6.1	0.86	DR(3.25)	3.78	2.80	2.28	1.52	0.80	0.69	0.63	0.57
		9.1	1.22	DR(4.61)	5.36	3.67	3.23	2.16	1.13	0.99	0.90	0.81
		12.2	1.59	12.03	6.99	5.18	4.22	2.81	1.48	1.29	1.17	1.06
		15.2	1.95	14.51	8.43	6.25	5.09	3.45	1.81	1.58	1.44	1.30
		18.3	2.33	17.57	10.20	7.57	6.16	4.11	2.16	1.88	1.71	1.54

$K_{Sspacing}$ (5) (6)	*Braced wall band* spacing: apply factor to all *braced wall panels* per *building* plan direction	Any *storey*	3.8 m	0.60
			7.6 m	1.00
			10.6 m	1.35
			15 m (7)	1.90

Source: BC Building Code 2024

Example House (Simple)

Wind/Earthquake Calculation Comparison

		Adjusted Length (m)		
Band ID	RFT	Wind	Earthquake	Design Driver
R-A	WSP-A	0.978	2.326	Earthquake
R-B	WSP-A	0.978	2.326	Earthquake
R-1	WSP-A	1.205	2.349	Earthquake
R-2	WSP-A	1.205	2.349	Earthquake

- The BCBC requires the most restrictive design driver be selected for total minimum bracing requirements for each Band

Example House (Simple)

Confirm Minimum Panel Length Requirement

Band ID	RFT	Bracing (m)
R-A	WSP-A	2.326
R-B	WSP-A	2.326
R-1	WSP-A	2.349
R-2	WSP-A	2.349

3) For resistance to wind pressure, the minimum total length of *braced wall panels* in each *braced wall band*, L_w, shall be determined by applying the adjustment factors provided in Table 9.23.13.7.-B to the unadjusted minimum total *braced wall panel* length Luw provided in Table 9.23.13.7.-A using the following equation:

$$L_w = L_{uw}\, K_{exp}\, K_{roof}\, K_{Wspacing}\, K_{Wnumber}\, K_{gyp}\, K_{sheath} \geq BWP_{min}$$

4) For resistance to seismic forces, the minimum total length of *braced wall panels* in each *braced wall band*, Ls, shall be determined by applying the adjustment factors provided in Table 9.23.13.7.-D to the unadjusted minimum total *braced wall panel* length, Lus, provided in Table 9.23.13.7.-C using the following equation:

$$Ls = L_{us}\, K_{weight}\, K_{snow}\, K_{Sspacing}\, K_{Snumber}\, K_{gyp}\, K_{sheath} \geq BWP_{min}$$

Source: BC Building Code 2024

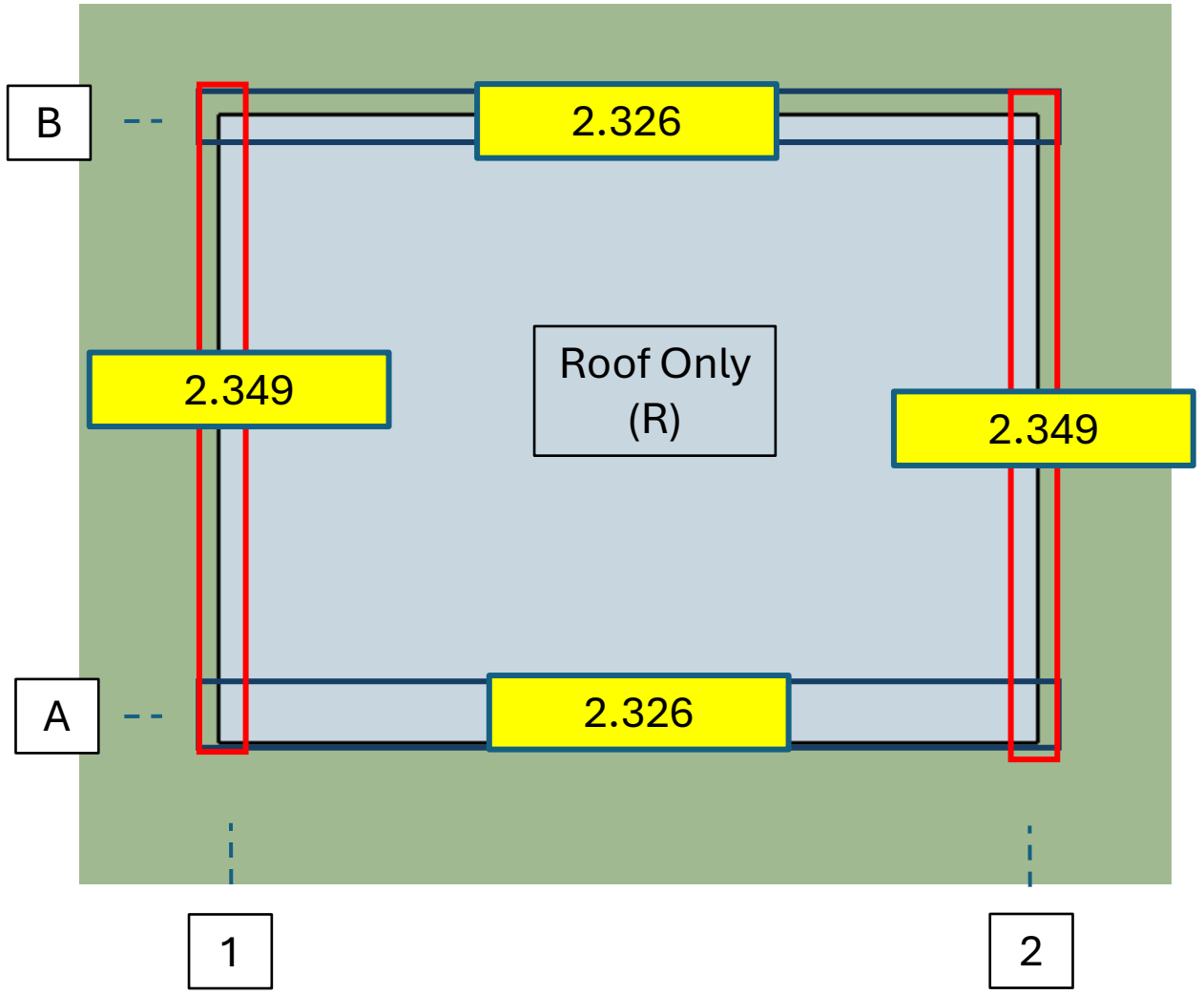
- Final check - the minimum total bracing length is the greater of the calculated adjusted length or the minimum Panel length according to the Rules

Example House (Simple)

Total Length Allocation to Braced Wall Band Plan

Band ID	RFT	Bracing (m)
R-A	WSP-A	2.326
R-B	WSP-A	2.326
R-1	WSP-A	2.349
R-2	WSP-A	2.349

- Minimum total bracing length is allocated back onto Braced Wall Band Plan

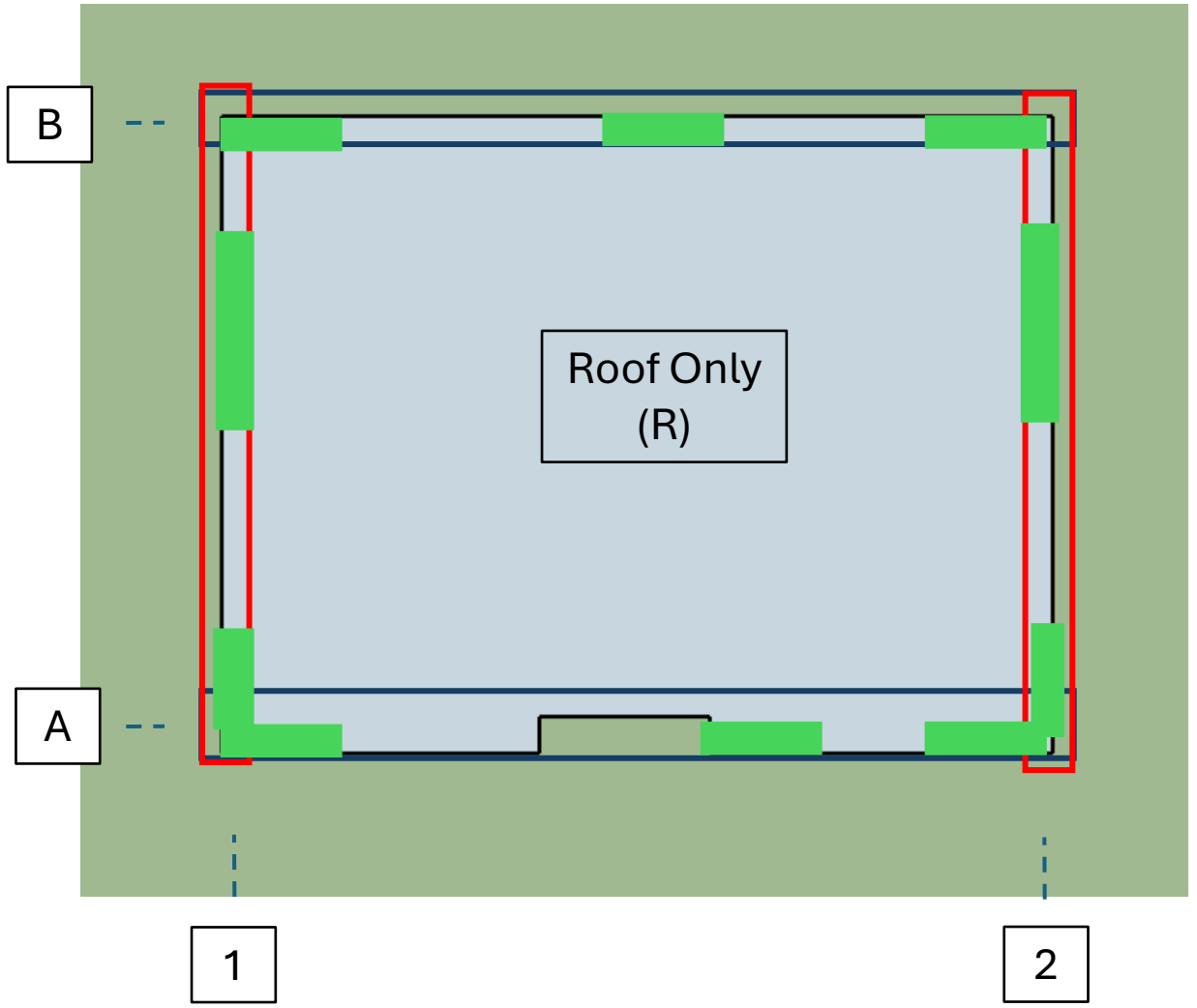


Example House (Simple)

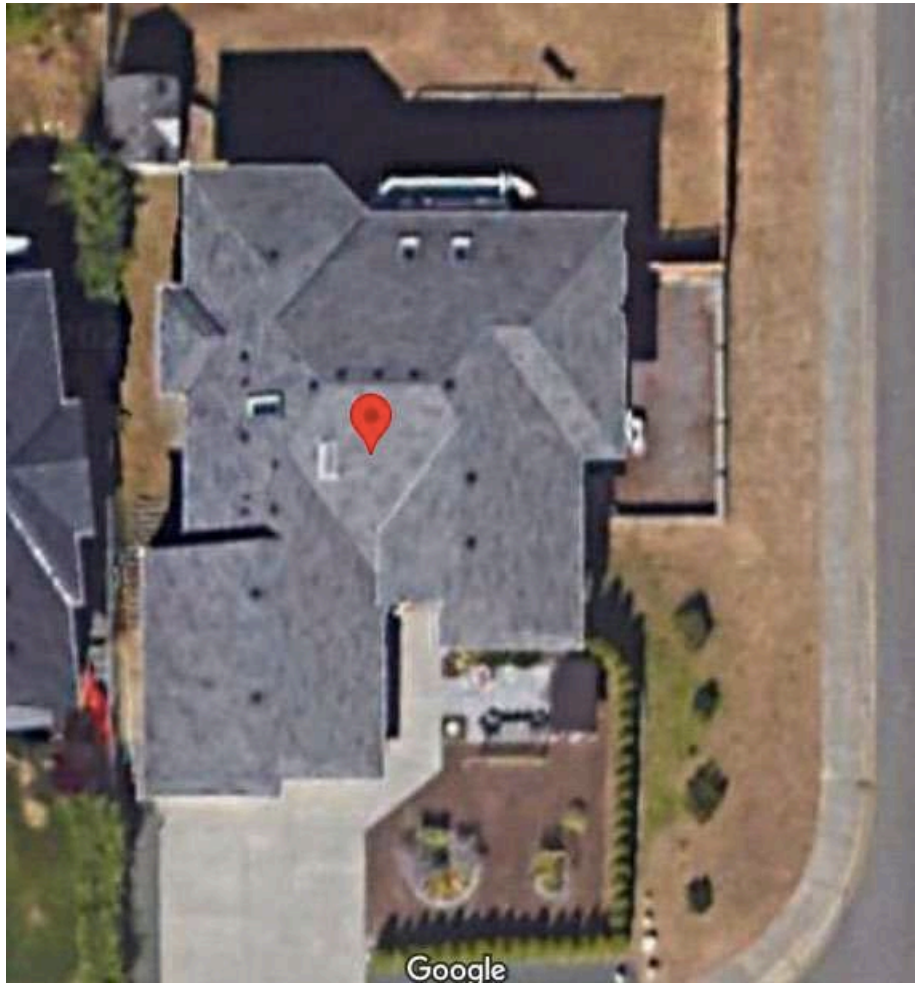
Distribute Panels

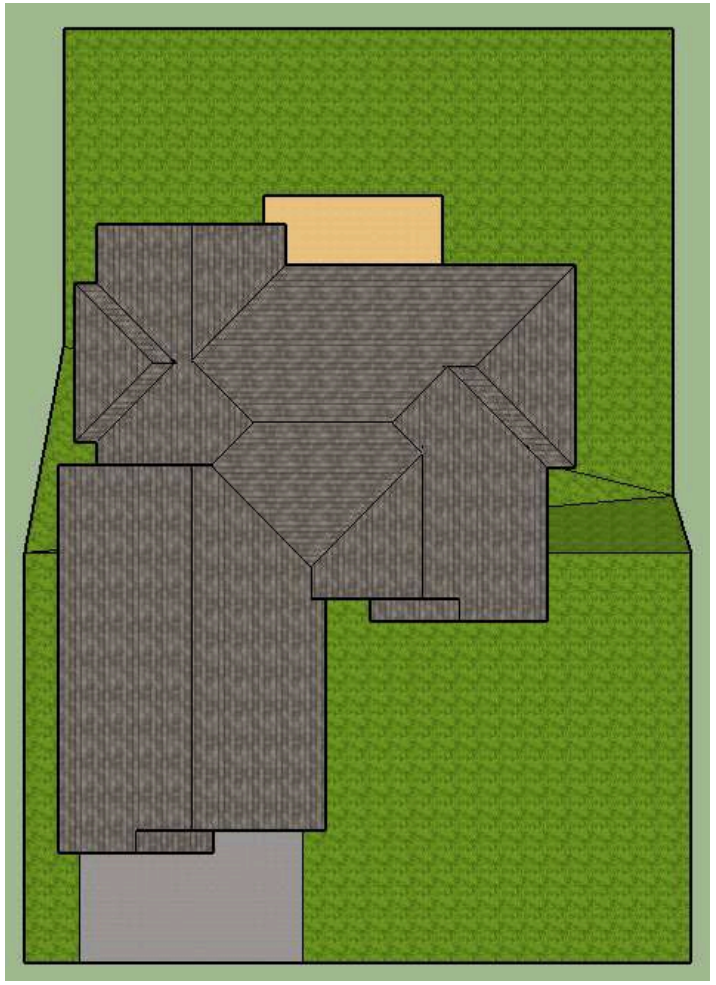
Band ID	RFT	Bracing (m)
R-A	WSP-A	2.326
R-B	WSP-A	2.326
R-1	WSP-A	2.349
R-2	WSP-A	2.349

- Total bracing length is allocated through the sum of Panel lengths in each Band. Panels are placed subject to Rules on minimum lengths, spacing etc
- Panels cannot be placed over openings for windows/doors



Example House (Not as Simple)

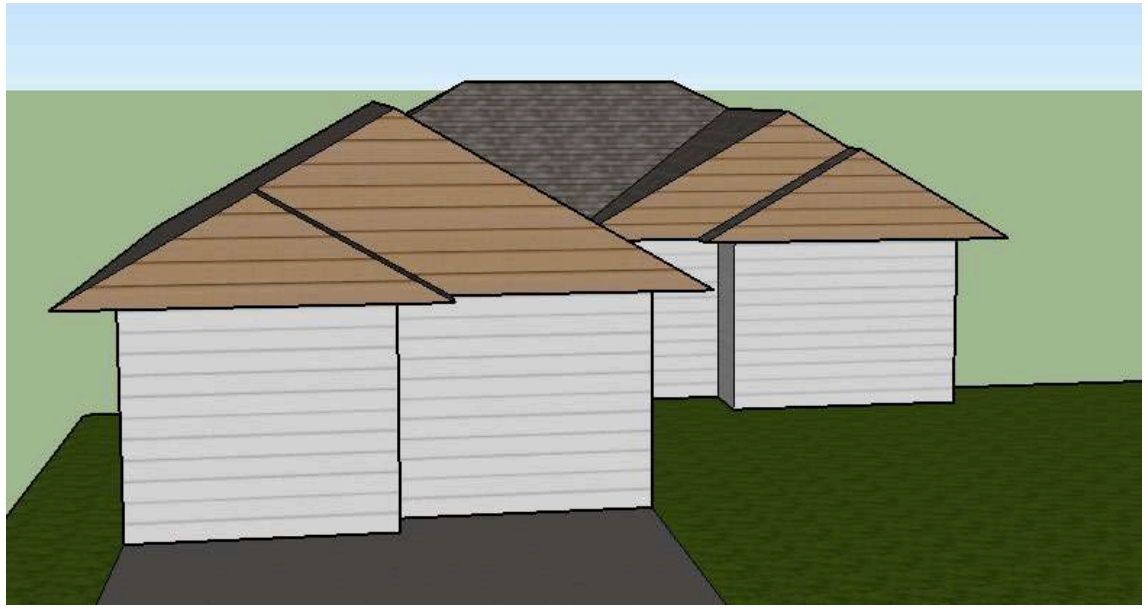




*Google Maps

Example House (Not as Simple)

*Google Maps



Example House (Not as Simple)

*Google Maps

Example House (Not as Simple)

*Google Maps

Example House (Not as Simple)

Understand the Site

- Location
- HWP (1/50)
- Terrain
- Site Class
- Smax
- Roof Snow Load

Table C-2 (continued)

Province and Location	Elev., m	Design Temperature				Degree-Days Below 18°C	15 Min. Rain, mm	One Day Rain, 1/50, mm	Ann. Rain, mm	Moist. Index	Ann. Tot. Ppn., mm	Driving Rain Wind Pressures, Pa, 1/5	Snow Load, kPa, 1/50		Hourly Wind Pressures, kPa	
		January		July 2.5%												
		2.5% °C	1% °C	Dry °C	Wet °C								S_s	S_r	1/10	1/50

Table C-3 (continued)

Province and Location	S_{max} for Unknown Site Class	S_{max} According to Site Class				
		A	B	C	D	E

Source: BC Building Code 2024

Example House (Not as Simple)

Understand the Site

Location	Kelowna
HWP (1/50)	
Terrain	
Site Class	
Smax	
Roof Snow Load	

Table C-2 (continued)

Province and Location	Elev., m	Design Temperature				Degree-Days Below 18°C	15 Min. Rain, mm	One Day Rain, 1/50, mm	Ann. Rain, mm	Moist. Index	Ann. Tot. Ppn., mm	Driving Rain Wind Pressures, Pa, 1/5	Snow Load, kPa, 1/50		Hourly Wind Pressures, kPa	
		January		July 2.5%									S_s	S_r	1/10	1/50
		2.5% °C	1% °C	Dry °C	Wet °C											
Kelowna	350	-17	-20	33	20	3400	12	43	260	0.3	325	80	1.7	0.1	0.30	0.40

Table C-3 (continued)

Province and Location	S_{max} for Unknown Site Class	S_{max} According to Site Class				
		A	B	C	D	E
Kelowna	0.302	0.07	0.088	0.155	0.255	0.302

Source: BC Building Code 2024

Example House (Not as Simple)

Understand the Site

Location	Kelowna
HWP (1/50)	0.40
Terrain	
Site Class	
Smax	
Roof Snow Load	

Table C-2 (continued)

Province and Location	Elev., m	Design Temperature				Degree-Days Below 18°C	15 Min. Rain, mm	One Day Rain, 1/50, mm	Ann. Rain, mm	Moist. Index	Ann. Tot. Ppn., mm	Driving Rain Wind Pressures, Pa, 1/5	Snow Load, kPa, 1/50		Hourly Wind Pressures, kPa	
		January		July 2.5%												
		2.5% °C	1% °C	Dry °C	Wet °C								S_s	S_r	1/10	1/50
Kelowna	350	-17	-20	33	20	3400	12	43	260	0.3	325	80	1.7	0.1	0.30	0.40

Table C-3 (continued)

Province and Location	S_{max} for Unknown Site Class	S_{max} According to Site Class				
		A	B	C	D	E
Kelowna	0.302	0.07	0.088	0.155	0.255	0.302

Source: BC Building Code 2024

Example House (Not as Simple)

Understand the Site

Location	Kelowna
HWP (1/50)	0.40
Terrain	
Site Class	
Smax	
Roof Snow Load	1.035

Table C-2 (continued)

Province and Location	Elev., m	Design Temperature				Degree-Days Below 18°C	15 Min. Rain, mm	One Day Rain, 1/50, mm	Ann. Rain, mm	Moist. Index	Ann. Tot. Ppn., mm	Driving Rain Wind Pressures, Pa, 1/5	Snow Load, kPa, 1/50		Hourly Wind Pressures, kPa	
		January		July 2.5%												
		2.5% °C	1% °C	Dry °C	Wet °C								S_s	S_r	1/10	1/50
Kelowna	350	-17	-20	33	20	3400	12	43	260	0.3	325	80	1.7	0.1	0.30	0.40

Table C-3 (continued)

Province and Location	S_{max} for Unknown Site Class	S_{max} According to Site Class				
		A	B	C	D	E
Kelowna	0.302	0.07	0.088	0.155	0.255	0.302

Source: BC Building Code 2024

Example House (Not as Simple)

Understand the Site

Location	Kelowna
HWP (1/50)	0.40
Terrain	
Site Class	C
Smax	
Roof Snow Load	1.035

Table C-2 (continued)

Province and Location	Elev., m	Design Temperature				Degree-Days Below 18°C	15 Min. Rain, mm	One Day Rain, 1/50, mm	Ann. Rain, mm	Moist. Index	Ann. Tot. Ppn., mm	Driving Rain Wind Pressures, Pa, 1/5	Snow Load, kPa, 1/50		Hourly Wind Pressures, kPa	
		January		July 2.5%									S_s	S_r	1/10	1/50
		2.5% °C	1% °C	Dry °C	Wet °C											
Kelowna	350	-17	-20	33	20	3400	12	43	260	0.3	325	80	1.7	0.1	0.30	0.40

Table C-3 (continued)

Province and Location	S_{max} for Unknown Site Class	S_{max} According to Site Class				
		A	B	C	D	E
Kelowna	0.302	0.07	0.088	0.155	0.255	0.302

Source: BC Building Code 2024

Example House (Not as Simple)

Understand the Site

Location	Kelowna
HWP (1/50)	0.40
Terrain	
Site Class	C
Smax	0.155
Roof Snow Load	1.035

Table C-2 (continued)

Province and Location	Elev., m	Design Temperature				Degree-Days Below 18°C	15 Min. Rain, mm	One Day Rain, 1/50, mm	Ann. Rain, mm	Moist. Index	Ann. Tot. Ppn., mm	Driving Rain Wind Pressures, Pa, 1/5	Snow Load, kPa, 1/50		Hourly Wind Pressures, kPa	
		January		July 2.5%												
		2.5% °C	1% °C	Dry °C	Wet °C								S_s	S_r	1/10	1/50
Kelowna	350	-17	-20	33	20	3400	12	43	260	0.3	325	80	1.7	0.1	0.30	0.40

Table C-3 (continued)

Province and Location	S_{max} for Unknown Site Class	S_{max} According to Site Class				
		A	B	C	D	E
Kelowna	0.302	0.07	0.088	0.155	0.255	0.302

Source: BC Building Code 2024

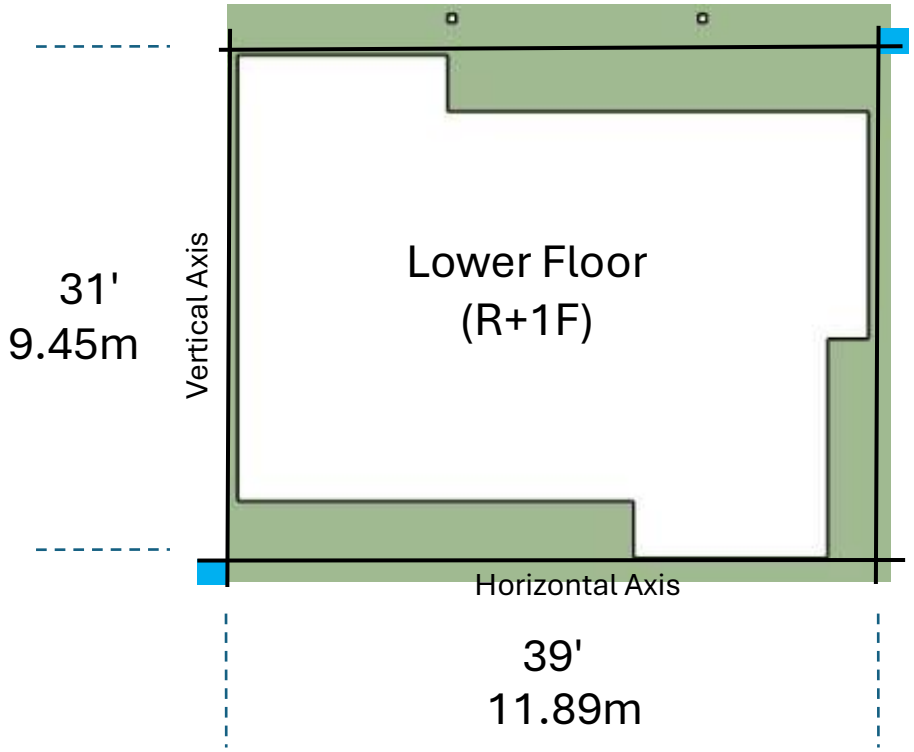
Example House (Not as Simple)

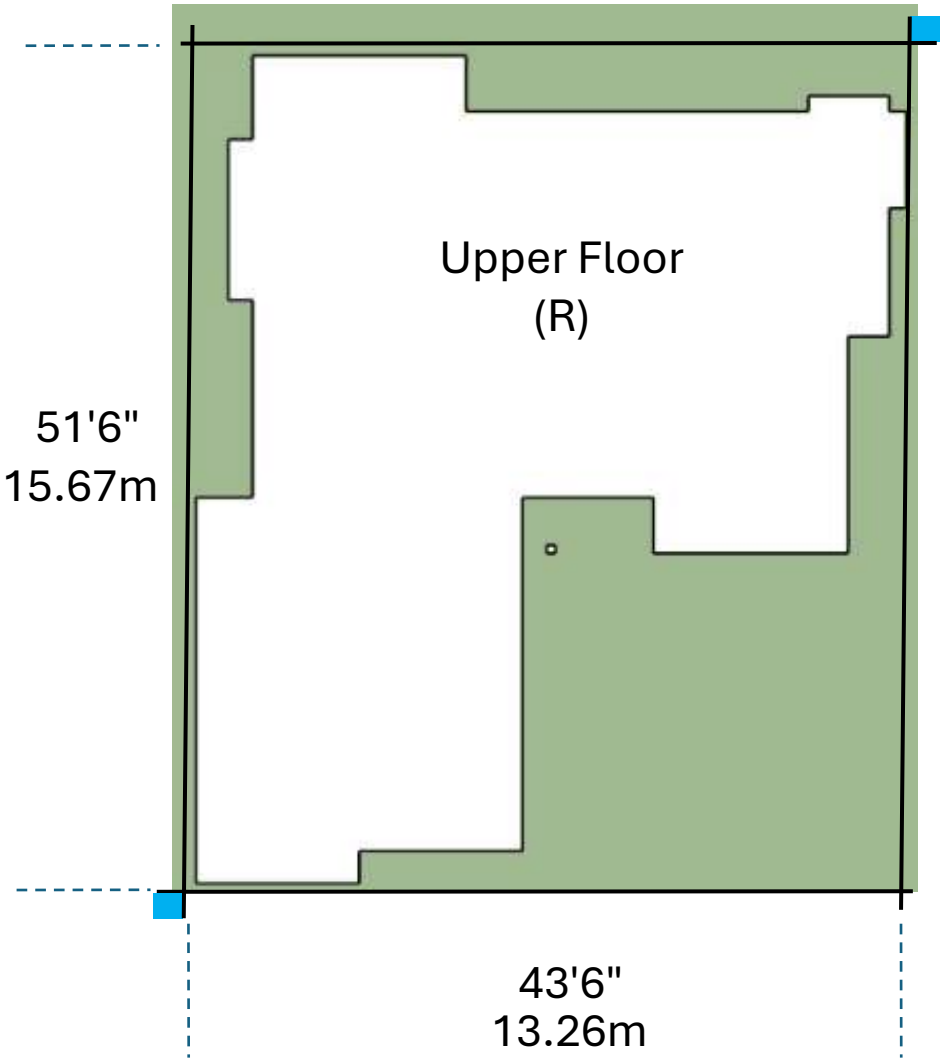
Understand the Site

Location	Kelowna
HWP (1/50)	0.40
Terrain	Open
Site Class	C
Smax	0.155
Roof Snow Load	1.035

Example House (Not as Simple)

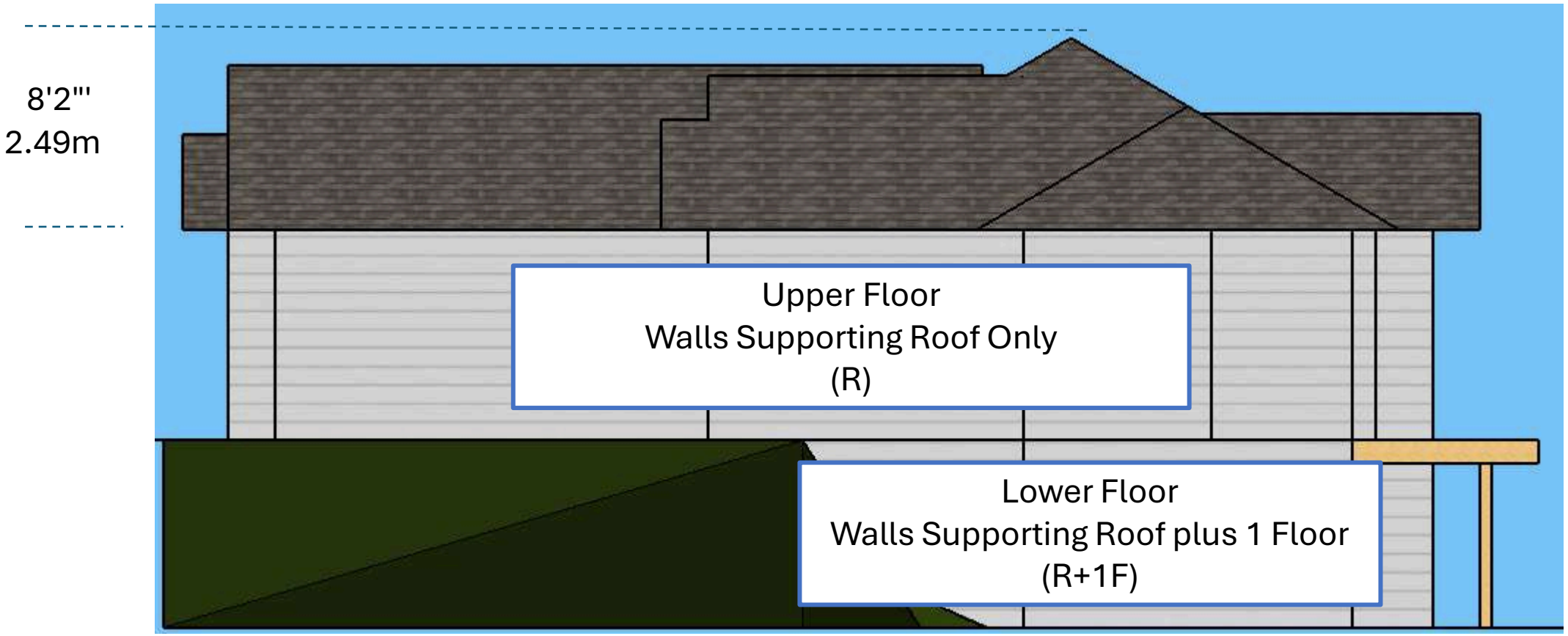
Understand the Building – Building Plan Dimensions





Example House (Not as Simple)

Understand the Building – Roof Height



Example House (Not as Simple)

Understand the Building

Building Dimensions:

Roof Only
- 11.89m (Horizontal Axis)
- 9.45m (Vertical Axis)

Roof plus 1 Floor
- 15.67m (Horizontal Axis)
- 13.26m (Vertical Axis)

- 2.49m (Eave-to-Ridge)

Heavy weight Construction

Walk out Basement (Storey for Bracing)

2 Storeys for Bracing

Lowest wood-framed walls support 1 floors

Intermittently Sheathed

All Bands are WSP-D with interior gypsum board installed

Example House (Not as Simple)

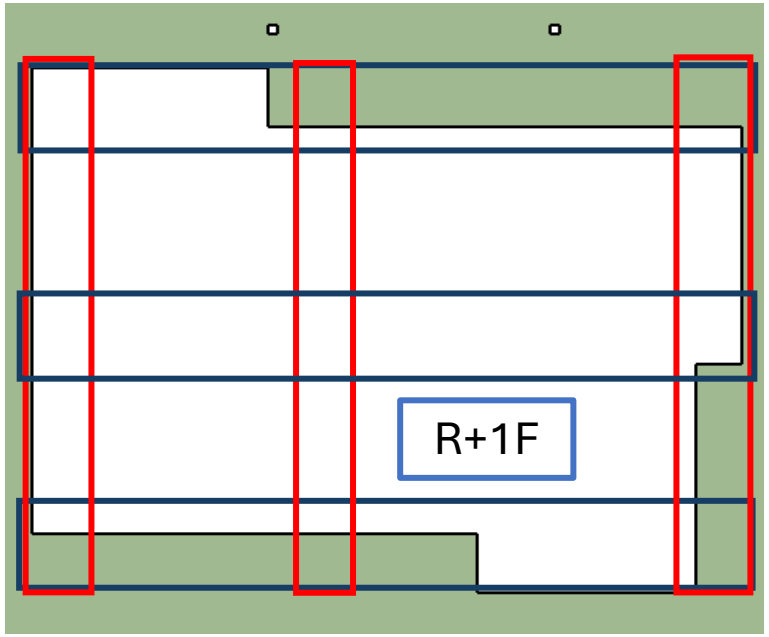
Understand the Braced Wall Band Plan

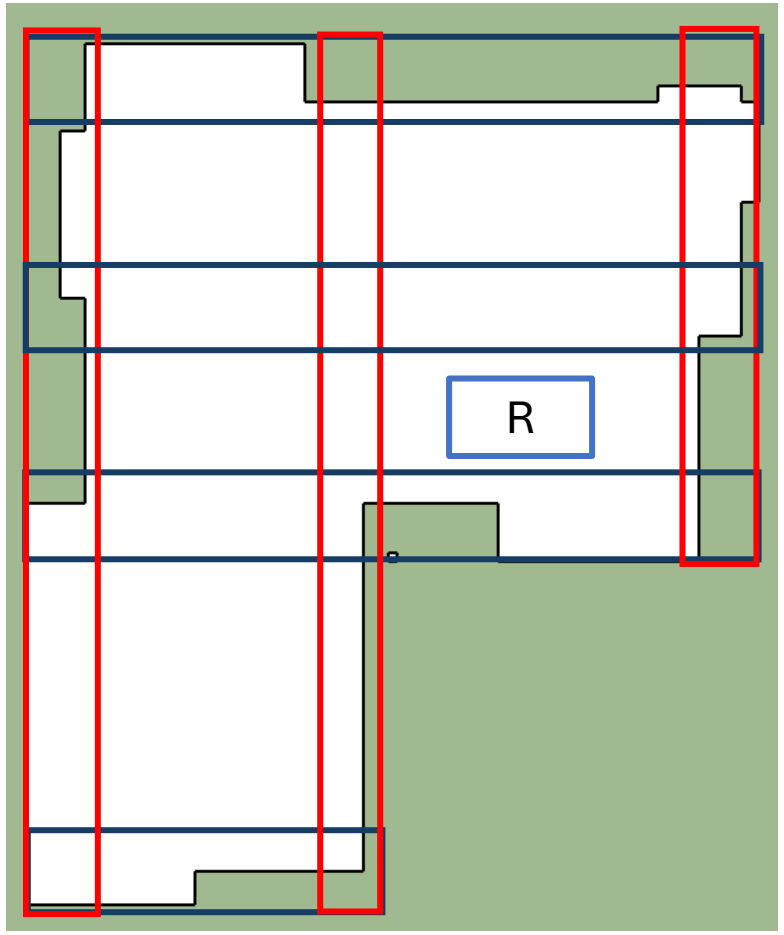
Band ID and Average Band Spacing

Example House (Not as Simple)

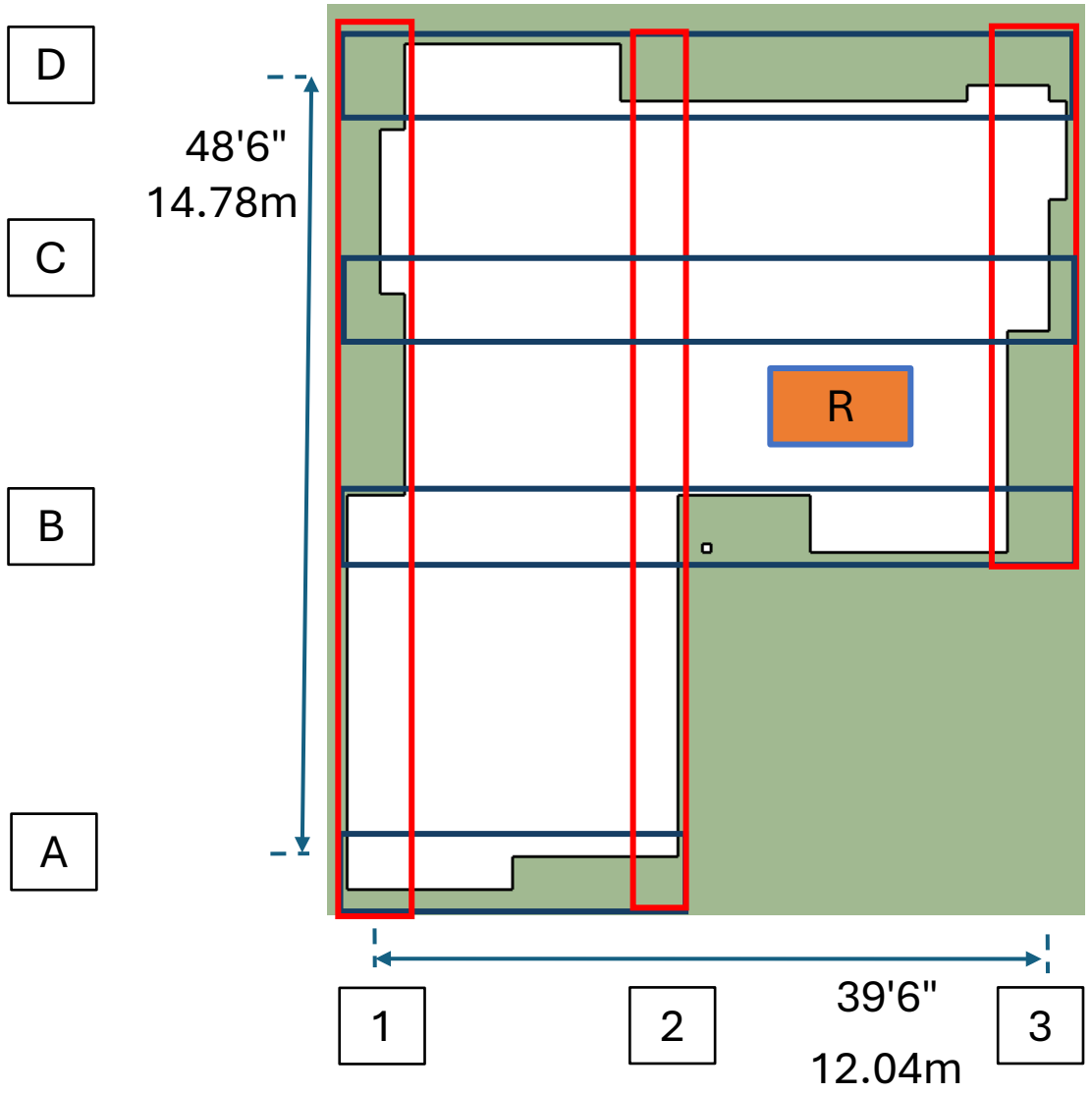
Understand the Braced Wall Band Plan

Band ID and Average Band Spacing





Band ID and Average Spacing



Storey supporting Roof Only (R)

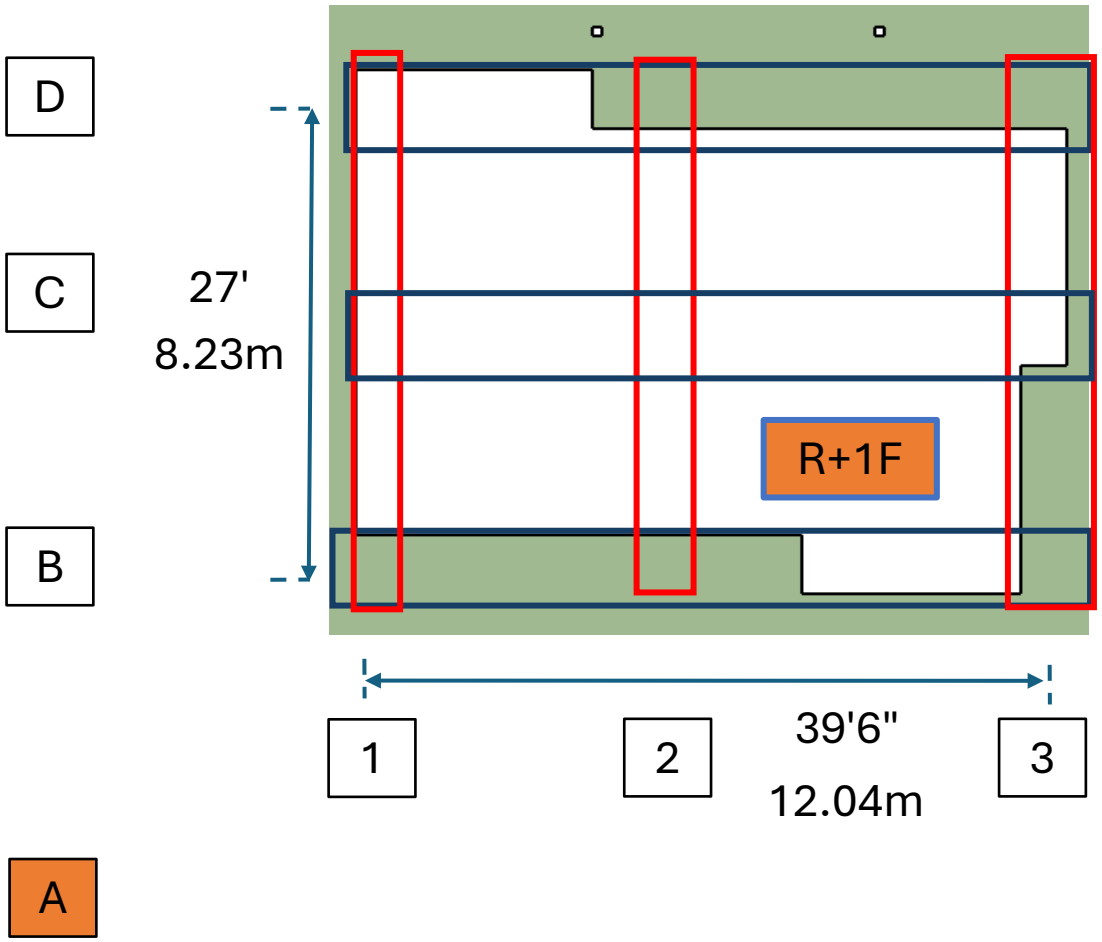
Along Vertical Axis (Bands labelled A, B C...)

Distance between c/l furthest Bands: 14.78m
Number of Bands: 4
Number of Spacings: 3
Average Spacing: 4.93m

Along Horizontal Axis (Bands labelled 1, 2, 3...)

Distance between c/l furthest Bands: 12.04m
Number of Bands: 3
Number of Spacings: 2
Average Spacing: 6.02m

Band ID and Average Spacing



Storey supporting Roof plus 1 Floor (R+1F)

Along Vertical Axis (Bands labelled A, B C...)

Distance between c/l furthest Bands: 8.23m
Number of Bands: 3
Number of Spacings: 2
Average Spacing: 4.12m

Along Horizontal Axis (Bands labelled 1, 2, 3...)

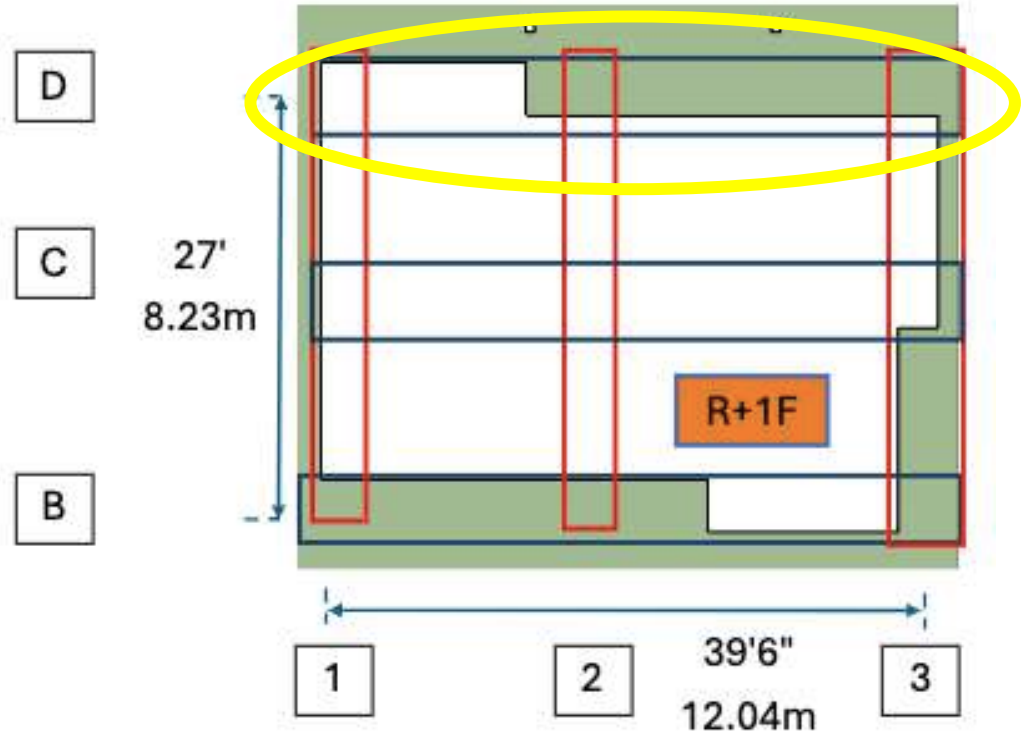
Distance between c/l furthest Bands: 12.04m
Number of Bands: 3
Number of Spacings: 2
Average Spacing: 6.02m

Example House (Not as Simple)

Calculate for Wind

Band ID	Unadjusted Length	Factors						Adjusted Length
		K(W)exp	K(W)roof	K(W)spac	K(W)num	Kgyp	Ksheath	
R+1F-D								

- Identify Band for specific Storey for Bracing, Orthogonal Direction and relationship to other Bands



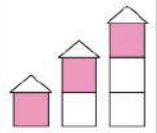
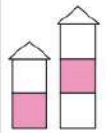
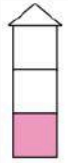
Example House (Not as Simple)

Calculate for Wind

Band ID	Unadjusted Length	Factors						Adjusted Length
		K(W)exp	K(W)roof	K(W)spac	K(W)num	Kgyp	Ksheath	
R+1F-D	1.31							

- HWP (1/50): 0.40
- Band is on Storey for Bracing with walls supporting R+1F
- Reference Framing Type is WSP-D

Table 9.23.13.7.-A
Unadjusted Minimum Total Braced Wall Panel Lengths for Wind
Forming Part of Sentence 9.23.13.7.(3)

		Unadjusted Minimum Total *Braced Wall Panel* Length for Wind, Luw, m (1)									
		Diagonal- Lumber-Sheathed Framing Type (with gypsum board on opposite side) (2)	Gypsum-Sheathed Framing Type (with gypsum board on only one side) (2) (3)				Wood-sheathed Framing Type (with gypsum board on opposite side) (2)				
HWP	*Storey*	DWB	GWB-A	GWB-B	GWB-C	GWB-D	WSP-A	WSP-B	WSP-C	WSP-D	WSP-E
0.3 < HWP ≤ 0.4		0.86	4.38	2.54	1.89	1.52	1.52	0.80	0.70	0.64	0.57
		1.78	9.00	5.23	3.88	3.14	3.14	1.65	1.43	1.31	1.18
		2.69	13.61	7.91	5.86	4.75	4.75	2.50	2.17	1.98	1.79

Source: BC Building Code 2024

Example House (Not as Simple)

Calculate for Wind

Band ID	Unadjusted Length	Factors						Adjusted Length
		K(W)exp	K(W)roof	K(W)spac	K(W)num	Kgyp	Ksheath	
R+1F-D	1.31	1.40						

- Terrain is Open

Table 9.23.13.7-B
Adjustment Factors for the Determination of Minimum Total Braced Wall Panel Lengths for Wind
Forming Part of Sentence 9.23.13.7.(3)

Symbol	Description	*Storey*	Condition	Adjustment Factor
K_{exp} (1)	Wind exposure: apply factor to all *storeys* in both directions	All *storeys* All *storeys* in 1 – *storey building* All *storeys* in 2 – *storey building* All *storeys* in 3 – *storey building*	Rough terrain Open terrain	1.00 1.29 1.40 1.48

Source: BC Building Code 2024

Example House (Not as Simple)

Calculate for Wind

Band ID	Unadjusted Length	Factors						Adjusted Length
		K(W)exp	K(W)roof	K(W)spac	K(W)num	Kgyp	Ksheath	
R+1F-D	1.31	1.40	0.929					

- Eave-to-Ridge height is 2.49m

Table 9.23.13.7.-B
Adjustment Factors for the Determination of Minimum Total Braced Wall Panel Lengths for Wind
Forming Part of Sentence 9.23.13.7.(3)

Symbol	Description	*Storey*	Condition	Adjustment Factor
K_{roof} (2)	Roof eave-to-ridge height: apply factor separately to each *storey*	*Storey* supporting roof only	≤ 1.5 m 3.0 m 4.5 m 6.0 m	0.52 1.00 1.58 1.99
		Storey supporting roof and 1 floor	≤ 1.5 m 3.0 m 4.5 m 6.0 m	0.79 1.00 1.26 1.47
		Storey supporting roof and 2 floors	≤ 1.5 m 3.0 m 4.5 m 6.0 m	0.87 1.00 1.16 1.31

Source: BC Building Code 2024

Example House (Not as Simple)

Calculate for Wind

Band ID	Unadjusted Length	Factors						Adjusted Length
		K(W)exp	K(W)roof	K(W)spac	K(W)num	Kgyp	Ksheath	
R+1F-D	1.31	1.40	0.929	0.551	1.28			

For this Orthogonal Direction
- Average Spacing is 4.12m
- Number of Bands is 3

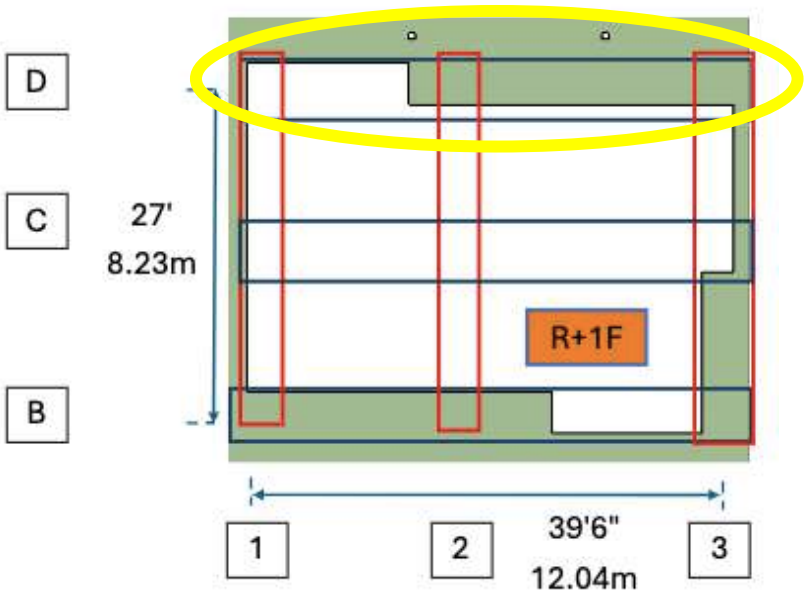


Table 9.23.13.7.-B
Adjustment Factors for the Determination of Minimum Total Braced Wall Panel Lengths for Wind
Forming Part of Sentence 9.23.13.7.(3)

Symbol	Description	*Storey*	Condition	Adjustment Factor
$K_{Wspacing}$ (2) (3) (4)	*Braced wall band* spacing: apply factor to all *braced wall panels* per *building* plan direction	Any *storey*	3.8 m 7.6 m 10.6 m 15 m (5)	0.51 1.00 1.35 1.86
$K_{Wnumber}$	Number of parallel *braced wall bands*: apply factor to all *braced wall panels* per *building* plan direction	Any *storey*	2 3 4 ≥ 5	1.00 1.28 1.38 1.43

Source: BC Building Code 2024

Example House (Not as Simple)

Calculate for Wind

Band ID	Unadjusted Length	Factors						Adjusted Length
		K(W)exp	K(W)roof	K(W)spac	K(W)num	Kgyp	Ksheath	
R+1F-D	1.31	1.40	0.929	0.551	1.28	1	1.15	

- Interior/Reverse Gypsum board installed
- Intermittently sheathed

Table 9.23.13.7.-B
Adjustment Factors for the Determination of Minimum Total Braced Wall Panel Lengths for Wind
Forming Part of Sentence 9.23.13.7.(3)

Symbol	Description	*Storey*	Condition	Adjustment Factor
K_{gyp}	Interior gypsum board: apply factor in accordance with whether gypsum board is installed or ommited on interior side of *braced wall panels*	Any *storey*	Installed Omitted, blocked wall Omiitted, unblocked wall	1.00 1.20 1.40
K_{sheath}	Intermittent *braced wall panels*: apply factor in accordance with continuity of sheathing within *braced wall band*	Any *storey*	Continuously sheathed Intermittently sheathed	1.00 1.15

Source: BC Building Code 2024

Example House (Not as Simple)

Calculate for Wind

Band ID	Unadjusted Length	Factors						Adjusted Length
		K(W)exp	K(W)roof	K(W)spac	K(W)num	Kgyp	Ksheath	
R+1F-D	1.31	1.40	0.929	0.551	1.28	1	1.15	1.380

3) For resistance to wind pressure, the minimum total length of *braced wall panels* in each *braced wall band*, L_w, shall be determined by applying the adjustment factors provided in Table 9.23.13.7.-B to the unadjusted minimum total *braced wall panel* length Luw provided in Table 9.23.13.7.-A using the following equation:

$$L_w = L_{uw}\, K_{exp}\, K_{roof}\, K_{Wspacing}\, K_{Wnumber}\, K_{gyp}\, K_{sheath} \geq BWP_{min}$$

Source: BC Building Code 2024

Example House (Not as Simple)

Calculate for Wind

Band ID	Unadjusted Length	Factors						Adjusted Length
		K(W)exp	K(W)roof	K(W)spac	K(W)num	Kgyp	Ksheath	
R+1F-B	1.31	1.40	0.929	0.551	1.28	1	1.15	1.380
R+1F-C	1.31	1.40	0.929	0.551	1.28	1	1.15	1.380
R+1F-D	1.31	1.40	0.929	0.551	1.28	1	1.15	1.380
R+1F-1	1.31	1.40	0.929	0.796	1.28	1	1.15	1.996
R+1F-2	1.31	1.40	0.929	0.796	1.28	1	1.15	1.996
R+1F-3	1.31	1.40	0.929	0.796	1.28	1	1.15	1.996

For this Orthogonal Direction
- Average Spacing is 6.02m
- Number of Bands is 3

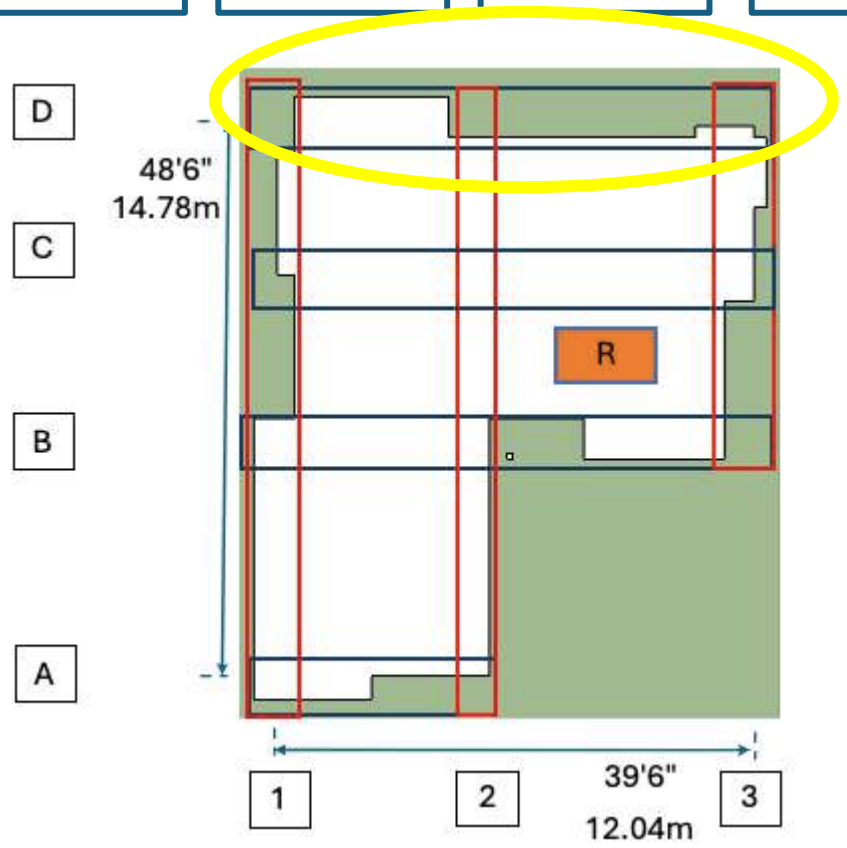
$K_{Wspacing}$ (2) (3) (4)	*Braced wall band* spacing: apply factor to all *braced wall panels* per *building* plan direction	Any *storey*	3.8 m 7.6 m 10.6 m 15 m (5)	0.51 1.00 1.35 1.86

Example House (Not as Simple)

Calculate for Wind

Band ID	Unadjusted Length	Factors						Adjusted Length
		K(W)exp	K(W)roof	K(W)spac	K(W)num	Kgyp	Ksheath	
R-D								

- Identify Band for specific Storey for Bracing, Orthogonal Direction and relationship to other Bands



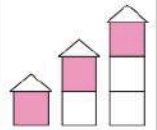
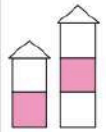
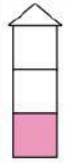
Example House (Not as Simple)

Calculate for Wind

Band ID	Unadjusted Length	Factors						Adjusted Length
		K(W)exp	K(W)roof	K(W)spac	K(W)num	Kgyp	Ksheath	
R-D	0.64							

- HWP (1/50): 0.40
- Band is on Storey for Bracing with walls supporting R
- Reference Framing Type is WSP-D

Table 9.23.13.7.-A
Unadjusted Minimum Total Braced Wall Panel Lengths for Wind
Forming Part of Sentence 9.23.13.7.(3)

		Unadjusted Minimum Total *Braced Wall Panel* Length for Wind, Luw, m (1)									
		Diagonal- Lumber-Sheathed Framing Type (with gypsum board on opposite side) (2)	Gypsum-Sheathed Framing Type (with gypsum board on only one side) (2) (3)				Wood-sheathed Framing Type (with gypsum board on opposite side) (2)				
HWP	*Storey*	DWB	GWB-A	GWB-B	GWB-C	GWB-D	WSP-A	WSP-B	WSP-C	WSP-D	WSP-E
0.3 < HWP ≤ 0.4		0.86	4.38	2.54	1.89	1.52	1.52	0.80	0.70	0.64	0.57
		1.78	9.00	5.23	3.88	3.14	3.14	1.65	1.43	1.31	1.18
		2.69	13.61	7.91	5.86	4.75	4.75	2.50	2.17	1.98	1.79

Source: BC Building Code 2024

Example House (Not as Simple)

Calculate for Wind

Band ID	Unadjusted Length	Factors						Adjusted Length
		K(W)exp	K(W)roof	K(W)spac	K(W)num	Kgyp	Ksheath	
R-D	0.64	1.40						

- Terrain is Open

Table 9.23.13.7-B
Adjustment Factors for the Determination of Minimum Total Braced Wall Panel Lengths for Wind
Forming Part of Sentence 9.23.13.7.(3)

Symbol	Description	*Storey*	Condition	Adjustment Factor
K_{exp} (1)	Wind exposure: apply factor to all *storeys* in both directions	All *storeys* All *storeys* in 1 – *storey building* All *storeys* in 2 – *storey building* All *storeys* in 3 – *storey building*	Rough terrain Open terrain	1.00 1.29 1.40 1.48

Source: BC Building Code 2024

Example House (Not as Simple)

Calculate for Wind

Band ID	Unadjusted Length	Factors						Adjusted Length
		K(W)exp	K(W)roof	K(W)spac	K(W)num	Kgyp	Ksheath	
R-D	0.64	1.40	0.837					

- Eave-to-Ridge height is 2.49m

Table 9.23.13.7.-B
Adjustment Factors for the Determination of Minimum Total Braced Wall Panel Lengths for Wind
Forming Part of Sentence 9.23.13.7.(3)

Symbol	Description	*Storey*	Condition	Adjustment Factor
K_{roof} (2)	Roof eave-to-ridge height: apply factor separately to each *storey*	*Storey* supporting roof only	≤ 1.5 m 3.0 m 4.5 m 6.0 m	0.52 1.00 1.58 1.99
		Storey supporting roof and 1 floor	≤ 1.5 m 3.0 m 4.5 m 6.0 m	0.79 1.00 1.26 1.47
		Storey supporting roof and 2 floors	≤ 1.5 m 3.0 m 4.5 m 6.0 m	0.87 1.00 1.16 1.31

Source: BC Building Code 2024

Example House (Not as Simple)

Calculate for Wind

Band ID	Unadjusted Length	Factors						Adjusted Length
		K(W)exp	K(W)roof	K(W)spac	K(W)num	Kgyp	Ksheath	
R-D	0.64	1.40	0.837	0.650	1.38			

For this Orthogonal Direction
- Average Spacing is 4.927m
- Number of Bands is 4

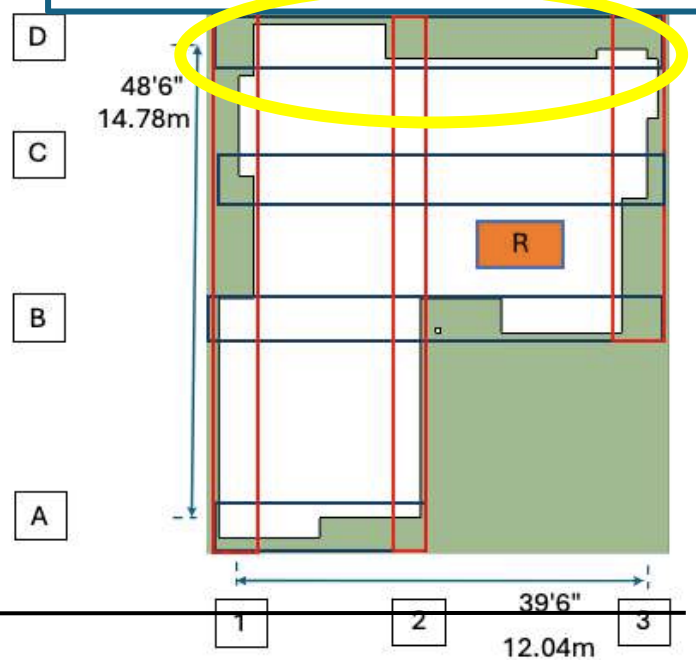


Table 9.23.13.7.-B
Adjustment Factors for the Determination of Minimum Total Braced Wall Panel Lengths for Wind
Forming Part of Sentence 9.23.13.7.(3)

Symbol	Description	*Storey*	Condition	Adjustment Factor
$K_{Wspacing}$ (2) (3) (4)	*Braced wall band* spacing: apply factor to all *braced wall panels* per *building* plan direction	Any *storey*	3.8 m 7.6 m 10.6 m 15 m (5)	0.51 1.00 1.35 1.86
$K_{Wnumber}$	Number of parallel *braced wall bands*: apply factor to all *braced wall panels* per *building* plan direction	Any *storey*	2 3 4 ≥ 5	1.00 1.28 1.38 1.43

Source: BC Building Code 2024

Example House (Not as Simple)

Calculate for Wind

Band ID	Unadjusted Length	Factors						Adjusted Length
		K(W)exp	K(W)roof	K(W)spac	K(W)num	Kgyp	Ksheath	
R-D	0.64	1.40	0.837	0.650	1.38	1	1.15	

- Interior/Reverse Gypsum board installed
- Intermittently sheathed

Table 9.23.13.7.-B
Adjustment Factors for the Determination of Minimum Total Braced Wall Panel Lengths for Wind
Forming Part of Sentence 9.23.13.7.(3)

Symbol	Description	*Storey*	Condition	Adjustment Factor
K_{gyp}	Interior gypsum board: apply factor in accordance with whether gypsum board is installed or ommited on interior side of *braced wall panels*	Any *storey*	Installed Omitted, blocked wall Omiitted, unblocked wall	1.00 1.20 1.40
K_{sheath}	Intermittent *braced wall panels*: apply factor in accordance with continuity of sheathing within *braced wall band*	Any *storey*	Continuously sheathed Intermittently sheathed	1.00 1.15

Source: BC Building Code 2024

Example House (Not as Simple)

Calculate for Wind

Band ID	Unadjusted Length	Factors						Adjusted Length
		K(W)exp	K(W)roof	K(W)spac	K(W)num	Kgyp	Ksheath	
R-D	0.64	1.29	0.833	0.650	1.38	1	1.15	0.780

3) For resistance to wind pressure, the minimum total length of *braced wall panels* in each *braced wall band*, L_w, shall be determined by applying the adjustment factors provided in Table 9.23.13.7.-B to the unadjusted minimum total *braced wall panel* length Luw provided in Table 9.23.13.7.-A using the following equation:

$$L_w = L_{uw}\, K_{exp}\, K_{roof}\, K_{Wspacing}\, K_{Wnumber}\, K_{gyp}\, K_{sheath} \geq BWP_{min}$$

Source: BC Building Code 2024

Example House (Not as Simple)

Calculate for Wind

Band ID	Unadjusted Length	Factors						Adjusted Length
		K(W)exp	K(W)roof	K(W)spac	K(W)num	Kgyp	Ksheath	
R-A	0.64	1.40	0.837	0.650	1.38	1	1.15	0.780
R-B	0.64	1.40	0.837	0.650	1.38	1	1.15	0.780
R-C	0.64	1.40	0.837	0.650	1.38	1	1.15	0.780
R-D	0.64	1.40	0.837	0.650	1.38	1	1.15	0.780
R-1	0.64	1.40	0.837	0.786	1.28	1	1.15	0.868
R-2	0.64	1.40	0.837	0.786	1.28	1	1.15	0.868
R-3	0.64	1.40	0.837	0.786	1.28	1	1.15	0.868
R-4	0.64	1.40	0.837	0.786	1.28	1	1.15	0.868

For this Orthogonal Direction
- Average Spacing is 6.02m
- Number of Bands is 3

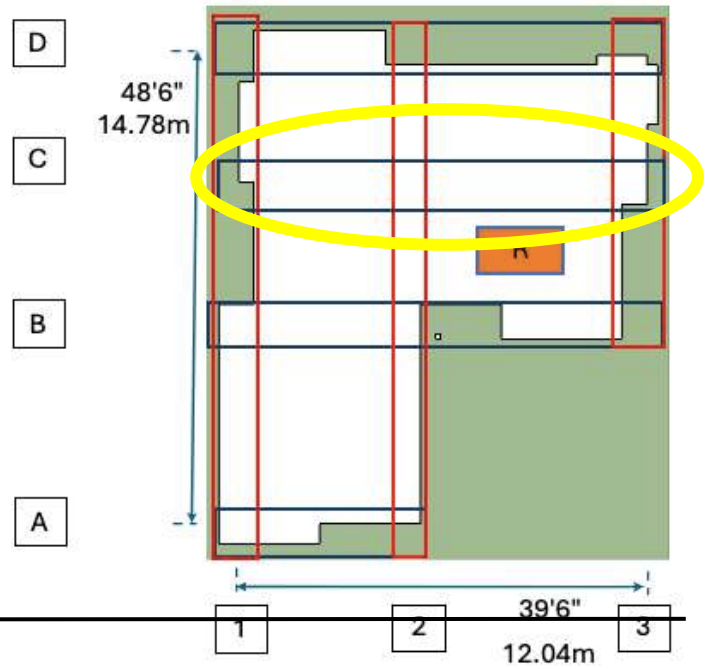
$K_{Wspacing}$ (2) (3) (4)	*Braced wall band* spacing: apply factor to all *braced wall panels* per *building* plan direction	Any *storey*	3.8 m 7.6 m 10.6 m 15 m (5)	0.51 1.00 1.35 1.86

Example House (Not as Simple)

Calculate for Wind

Band ID	Unadjusted Length	Factors						Adjusted Length
		K(W)exp	K(W)roof	K(W)spac	K(W)num	Kgyp	Ksheath	
R-C	2.54	1.40	0.837	0.650	1.38	-	1	2.691

- Reference Framing Type is GWB-B



Source: BC Building Code 2024

Table 9.23.13.7.-A
Unadjusted Minimum Total Braced Wall Panel Lengths for Wind
Forming Part of Sentence 9.23.13.7.(3)

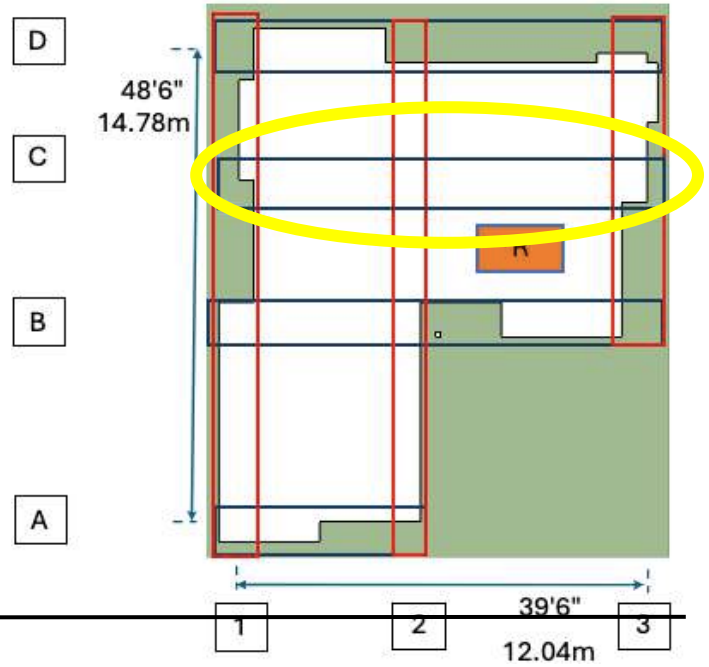
		Unadjusted Minimum Total *Braced Wall Panel* Length for Wind, Luw, m (1)								
		Diagonal- Lumber-Sheathed Framing Type (with gypsum board on opposite side) (2)	Gypsum-Sheathed Framing Type (with gypsum board on only one side) (2) (3)				Wood-sheathed Framing Type (with gypsum board on opposite side) (2)				
HWP	*Storey*	DWB	GWB-A	GWB-B	GWB-C	GWB-D	WSP-A	WSP-B	WSP-C	WSP-D	WSP-E
0.3 < HWP ≤ 0.4		0.86	4.38	2.54	1.89	1.52	1.52	0.80	0.70	0.64	0.57
		1.78	9.00	5.23	3.88	3.14	3.14	1.65	1.43	1.31	1.18
		2.69	13.61	7.91	5.86	4.75	4.75	2.50	2.17	1.98	1.79

Example House (Not as Simple)

Calculate for Wind

Band ID	Unadjusted Length	Factors						Adjusted Length
		K(W)exp	K(W)roof	K(W)spac	K(W)num	Kgyp	Ksheath	
R-C	2.54	1.40	0.837	0.650	1.38	-	1	2.691 / 2 = 1.354

- Reference Framing Type is GWB-Bx2
- Length halved per 9.23.13.7.(6)



Source: BC Building Code 2024

Table 9.23.13.7.-A
Unadjusted Minimum Total Braced Wall Panel Lengths for Wind
Forming Part of Sentence 9.23.13.7.(3)

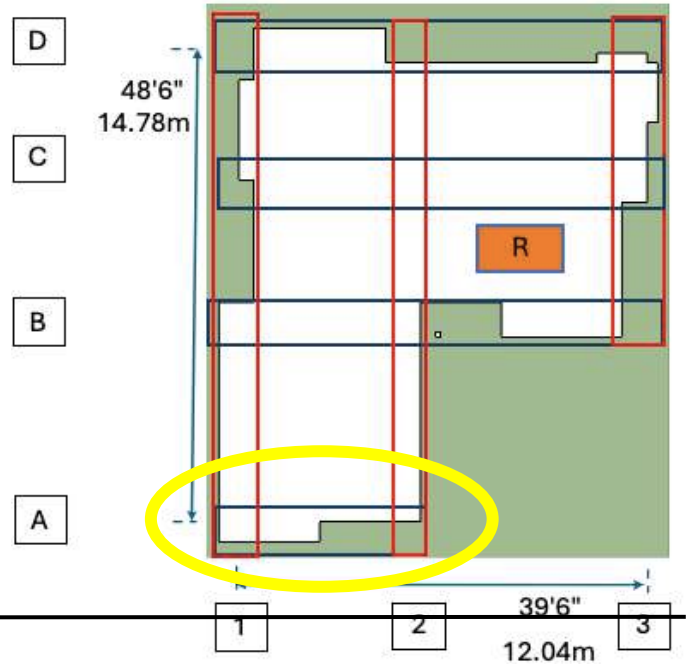
		Unadjusted Minimum Total *Braced Wall Panel* Length for Wind, Luw, m (1)									
		Diagonal- Lumber-Sheathed Framing Type (with gypsum board on opposite side) (2)	Gypsum-Sheathed Framing Type (with gypsum board on only one side) (2) (3)				Wood-sheathed Framing Type (with gypsum board on opposite side) (2)				
HWP	*Storey*	DWB	GWB-A	GWB-B	GWB-C	GWB-D	WSP-A	WSP-B	WSP-C	WSP-D	WSP-E
0.3 < HWP ≤ 0.4		0.86	4.38	2.54	1.89	1.52	1.52	0.80	0.70	0.64	0.57
		1.78	9.00	5.23	3.88	3.14	3.14	1.65	1.43	1.31	1.18
		2.69	13.61	7.91	5.86	4.75	4.75	2.50	2.17	1.98	1.79

Example House (Not as Simple)

Calculate for Wind

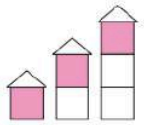
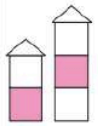
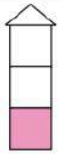
Band ID	Unadjusted Length	Factors						Adjusted Length
		K(W)exp	K(W)roof	K(W)spac	K(W)num	Kgyp	Ksheath	
R-A	0.570	1.40	0.837	0.650	1.38	1.2	1.15	0.833

- Reference Framing Type is WSP-E



Source: BC Building Code 2024

Table 9.23.13.7.-A
Unadjusted Minimum Total Braced Wall Panel Lengths for Wind
Forming Part of Sentence 9.23.13.7.(3)

		Unadjusted Minimum Total *Braced Wall Panel* Length for Wind, Luw, m (1)								
		Diagonal- Lumber-Sheathed Framing Type (with gypsum board on opposite side) (2)	Gypsum-Sheathed Framing Type (with gypsum board on only one side) (2) (3)				Wood-sheathed Framing Type (with gypsum board on opposite side) (2)				
HWP	*Storey*	DWB	GWB-A	GWB-B	GWB-C	GWB-D	WSP-A	WSP-B	WSP-C	WSP-D	WSP-E
0.3 < HWP ≤ 0.4		0.86	4.38	2.54	1.89	1.52	1.52	0.80	0.70	0.64	0.57
		1.78	9.00	5.23	3.88	3.14	3.14	1.65	1.43	1.31	1.18
		2.69	13.61	7.91	5.86	4.75	4.75	2.50	2.17	1.98	1.79

Example House (Not as Simple)

Calculate for Wind

Band ID	Unadjusted Length	Factors						Adjusted Length
		K(W)exp	K(W)roof	K(W)spac	K(W)num	Kgyp	Ksheath	
R-A	0.570	1.40	0.837	0.650	1.38	1.2	1.15	0.833

- Interior drywall omitted, blocked

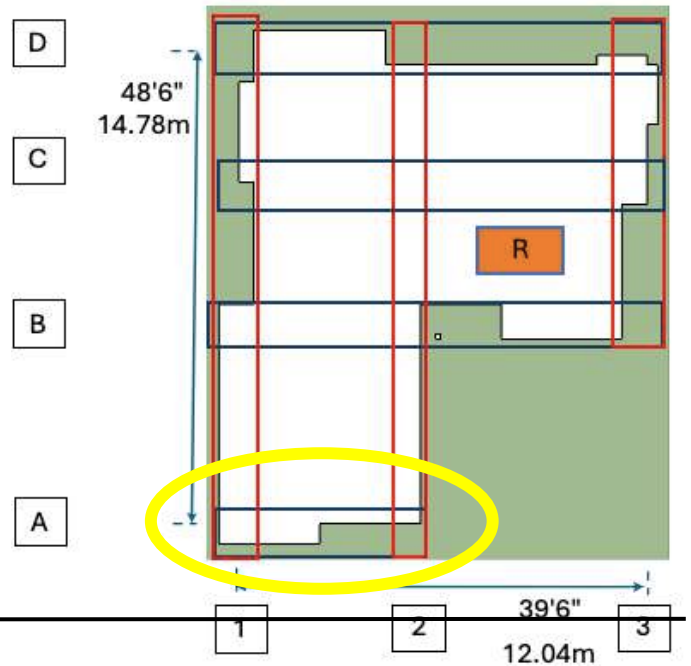


Table 9.23.13.7-B
Adjustment Factors for the Determination of Minimum Total Braced Wall Panel Lengths for Wind
Forming Part of Sentence 9.23.13.7.(3)

Symbol	Description	*Storey*	Condition	Adjustment Factor
K_{gyp}	Interior gypsum board: apply factor in accordance with whether gypsum board is installed or ommited on interior side of *braced wall panels*	Any *storey*	Installed Omitted, blocked wall Omiitted, unblocked wall	1.00 1.20 1.40
K_{sheath}	Intermittent *braced wall panels*: apply factor in accordance with continuity of sheathing within *braced wall band*	Any *storey*	Continuously sheathed Intermittently sheathed	1.00 1.15

Source: BC Building Code 2024

Resources

Plan /Design Checklist

Yes	No	N/A	Lowest exterior wood-framed wall supports a roof, and not more than 1 floor of; Heavy Weight Construction, or Fully clad with Masonry or Stone Veneer	9.23.13.2(1)(d)(ii)

Additional System Considerations (Exemptions and Trade-Offs)				9.23.13.10
Yes	No		Smax is not greater than 1.2	9.23.13.10.(1)(a)
Yes	No		HWP (1/50) is not greater than 1.2kPa	9.23.13.10.(1)(b)

	Additional System Considerations (Exemptions and Trade-Offs) Rules				Rule Code Clause	
	Garage Front Wall Exemption				9.23.13.10.(3)	
	Yes	No			The attached garage serves a single dwelling unit	9.23.13.10.(3)
	Yes	No			The attached garage does not support a floor	9.23.13.10.(3)
	Detached Garage/Accessory Building Exemption					

Resources

Part 9 Bracing Calculator

Part 9 Bracing Calculator

TOGGLE FILTER

beta_1.01

For Design, Compliance and Construction

Sheet (R-2): Report - Adjustment Factors and Adjusted Lengths - Calculation Method (Tables)

Plan Check Note: Review Adjustment Factors against BCBC2024 T-9.23.13.7.-B and T-9.23.13.7.-D

For Storeys designed as Storeys for Bracing

Band ID		Building Dimension || Band (m)	Reference Framing Type	Sheathing Continuity	Interior/Reverse Drywall	WIND							Total	SEISMIC							Total	Most Restrictive	
						L(UW) (m)	K(W) exp	K(W) roof	K(W) spacing	K(W) number	K(W) gyp	K(W) sheath	L(W) (m)	L(US) (m)	K(S) weight	K(S) snow	K(S) spacing	K(S) number	K(S) gyp	K(S) sheath	L(S) (m)	Required Length (m)	Design Driver
R	A	13.259	WSP-E	Intermittent	Omitted, blocked wall	0.570	1.400	0.837	0.655	1.380	1.200	1.150	0.833	0.141	1.409	1.000	0.719	1.500	1.200	1.150	0.295	0.833	WIND
R	B	13.259	WSP-D	Intermittent	Installed	0.640	1.400	0.837	0.655	1.380	1.000	1.150	0.780	0.161	1.409	1.000	0.719	1.500	1.000	1.150	0.281	0.780	WIND
R	C	13.259	GWB-B-2	Continuous	-	1.270	1.400	0.837	0.655	1.380	1.000	1.000	1.345	0.467	1.409	1.000	0.719	1.500	1.000	1.000	0.709	1.345	WIND
R	D	13.259	WSP-D	Intermittent	Installed	0.640	1.400	0.837	0.655	1.380	1.000	1.150	0.780	0.161	1.409	1.000	0.719	1.500	1.000	1.150	0.281	0.780	WIND
R	1	15.697	WSP-D	Intermittent	Installed	0.640	1.400	0.837	0.786	1.280	1.000	1.150	0.868	0.185	1.388	1.000	0.826	1.330	1.000	1.150	0.324	0.868	WIND
R	2	15.697	WSP-D	Intermittent	Installed	0.640	1.400	0.837	0.786	1.280	1.000	1.150	0.868	0.185	1.388	1.000	0.826	1.330	1.000	1.150	0.324	0.868	WIND
R	3	15.697	WSP-D	Intermittent	Installed	0.640	1.400	0.837	0.786	1.280	1.000	1.150	0.868	0.185	1.388	1.000	0.826	1.330	1.000	1.150	0.324	0.868	WIND
R+1F	B	11.887	WSP-D	Intermittent	Installed	1.310	1.400	0.928	0.551	1.280	1.000	1.150	1.380	0.313	1.575	1.000	0.633	1.330	1.000	1.150	0.477	1.380	WIND
R+1F	C	11.887	WSP-D	Intermittent	Installed	1.310	1.400	0.928	0.551	1.280	1.000	1.150	1.380	0.313	1.575	1.000	0.633	1.330	1.000	1.150	0.477	1.380	WIND
R+1F	D	11.887	WSP-D	Intermittent	Installed	1.310	1.400	0.928	0.551	1.280	1.000	1.150	1.380	0.313	1.575	1.000	0.633	1.330	1.000	1.150	0.477	1.380	WIND
R+1F	1	9.449	WSP-D	Intermittent	Installed	1.310	1.400	0.928	0.796	1.280	1.000	1.150	1.996	0.258	1.614	1.000	0.834	1.330	1.000	1.150	0.531	1.996	WIND
R+1F	2	9.449	WSP-D	Intermittent	Installed	1.310	1.400	0.928	0.796	1.280	1.000	1.150	1.996	0.258	1.614	1.000	0.834	1.330	1.000	1.150	0.531	1.996	WIND
R+1F	3	9.449	WSP-D	Intermittent	Installed	1.310	1.400	0.928	0.796	1.280	1.000	1.150	1.996	0.258	1.614	1.000	0.834	1.330	1.000	1.150	0.531	1.996	WIND

Source: www.part9bracing.ca

Resources

Resources

BC Housing Illustrated Guide – Webinar May 6th

BOABC Forum

Online Calculators

Checklists

Building Permit Submission Requirements
City of Kelowna
City of Nanaimo

End/Questions:

Tim Warner
Twarner@boabc.org