BCBC2024
Part 9 Lateral Bracing Series

Presentation 1of 2 : February 5th, 2025

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This material is for informational purposes only and does not replace building codes or professional advice.

The creators assume no liability for errors, omissions, or actions taken based on this information.

Always consult local authorities or professionals for guidance on building regulations.

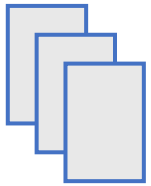
Welcome

1. Introduction
2. Today's Presentation
   - Lateral Bracing Fundamentals
   - Code Framework
   - Design Process
   - The Rules
   - New Concepts
   - Resources
   - The Second Presentation
   - Questions?

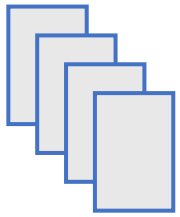
The Development of BCBC Lateral Bracing

2006

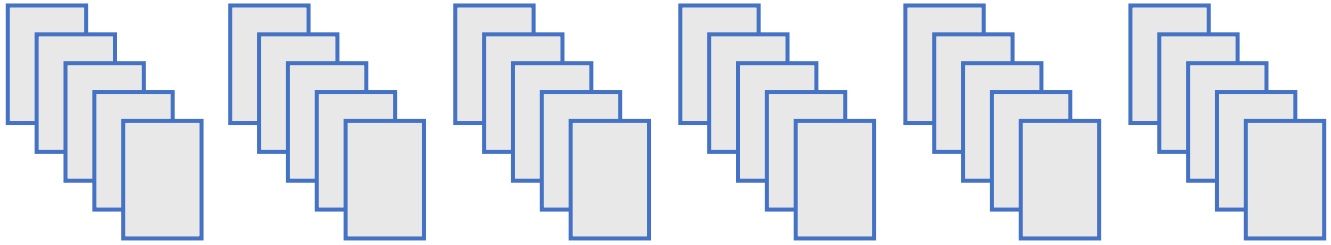
2012



2018



2024



Why is our Building Code changing?

1. Our Environment is Changing
2. Our Understanding of our Environment is Changing
3. Our Buildings are Changing
4. Bridging an existing gap between Part 4 and Part 9 lateral bracing design

Lateral Loads: Fundamentals

BCBC 9.23.13

Bracing

to

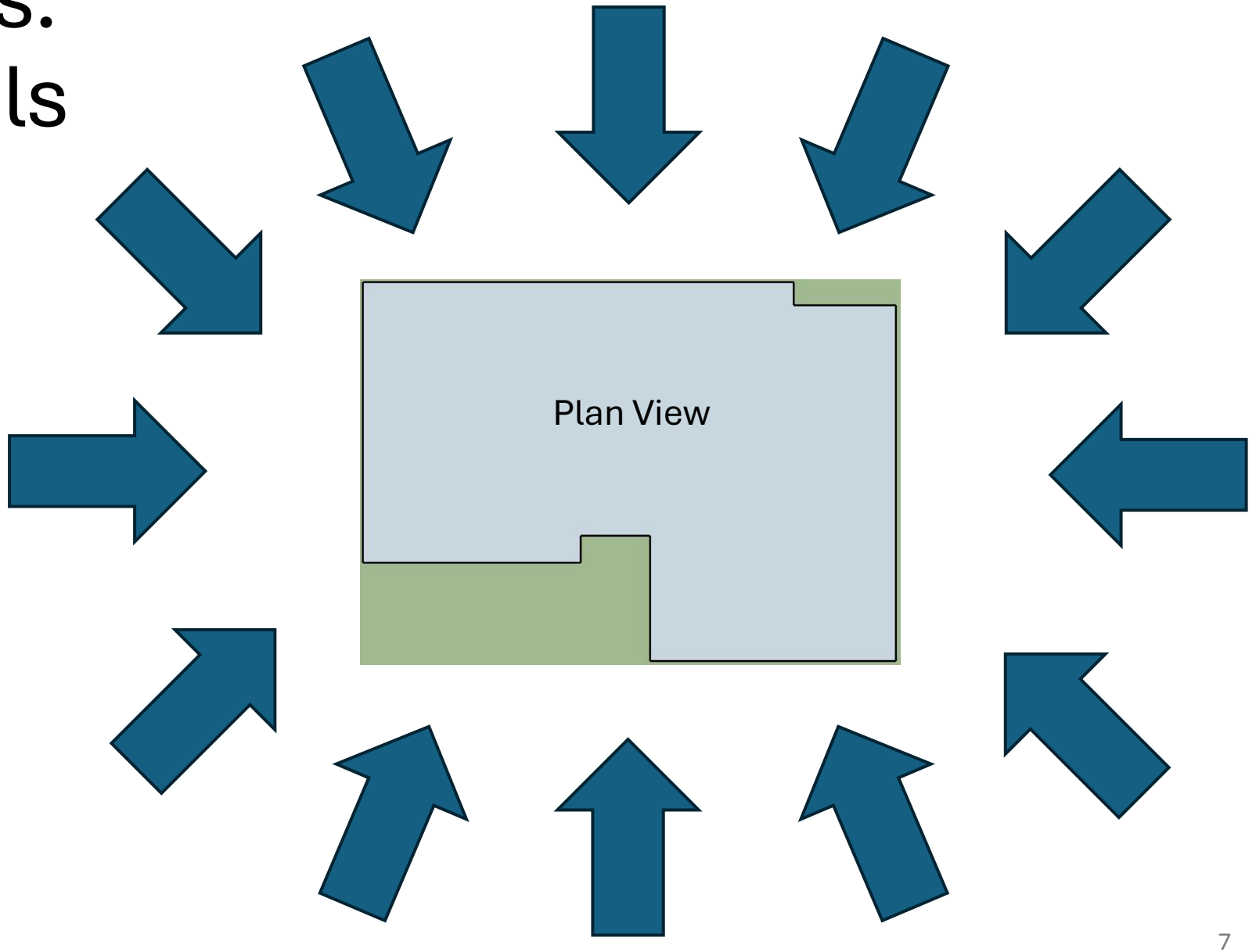
Resist

Lateral Loads

due to

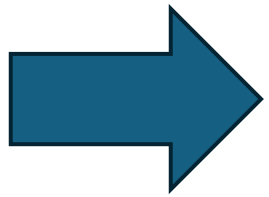
Wind and Earthquake

Lateral Loads: Fundamentals

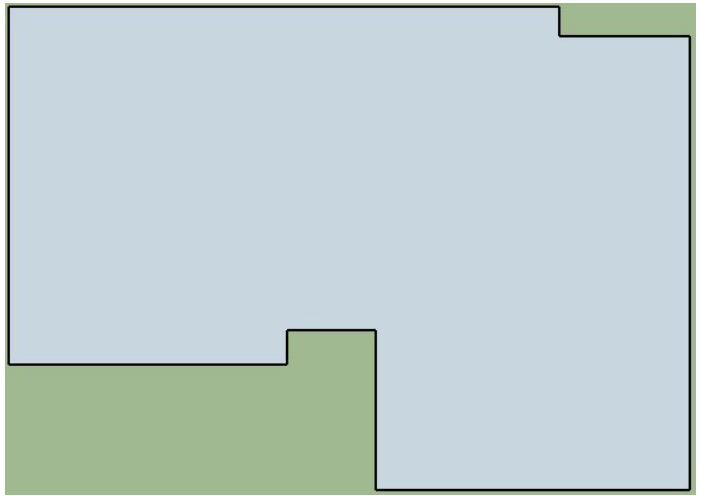


Lateral Loads from all horizontal directions

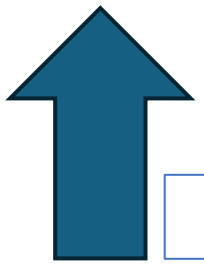
Lateral Loads: Fundamentals



Lateral Load

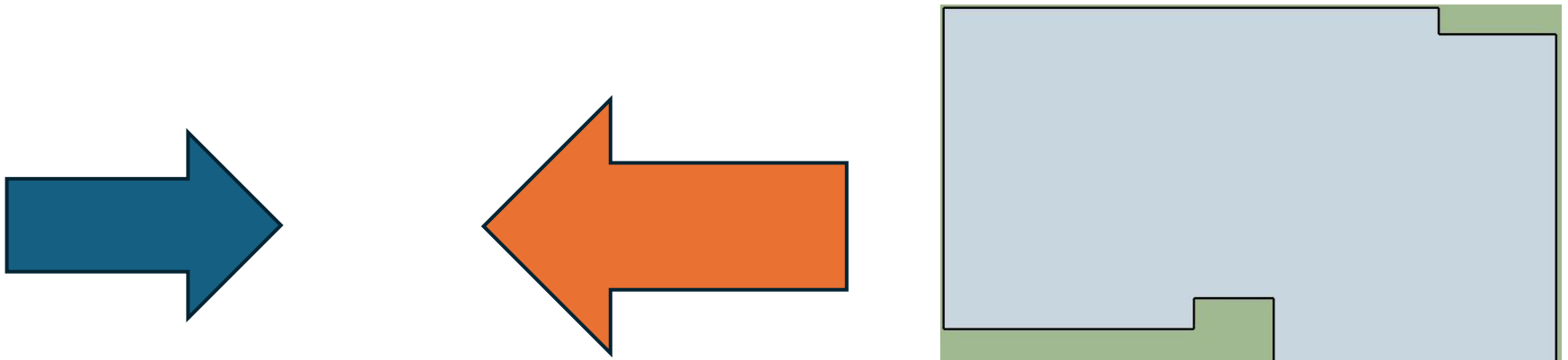


We design for Lateral Loads acting on our building in Two Orthogonal Directions



Lateral Load

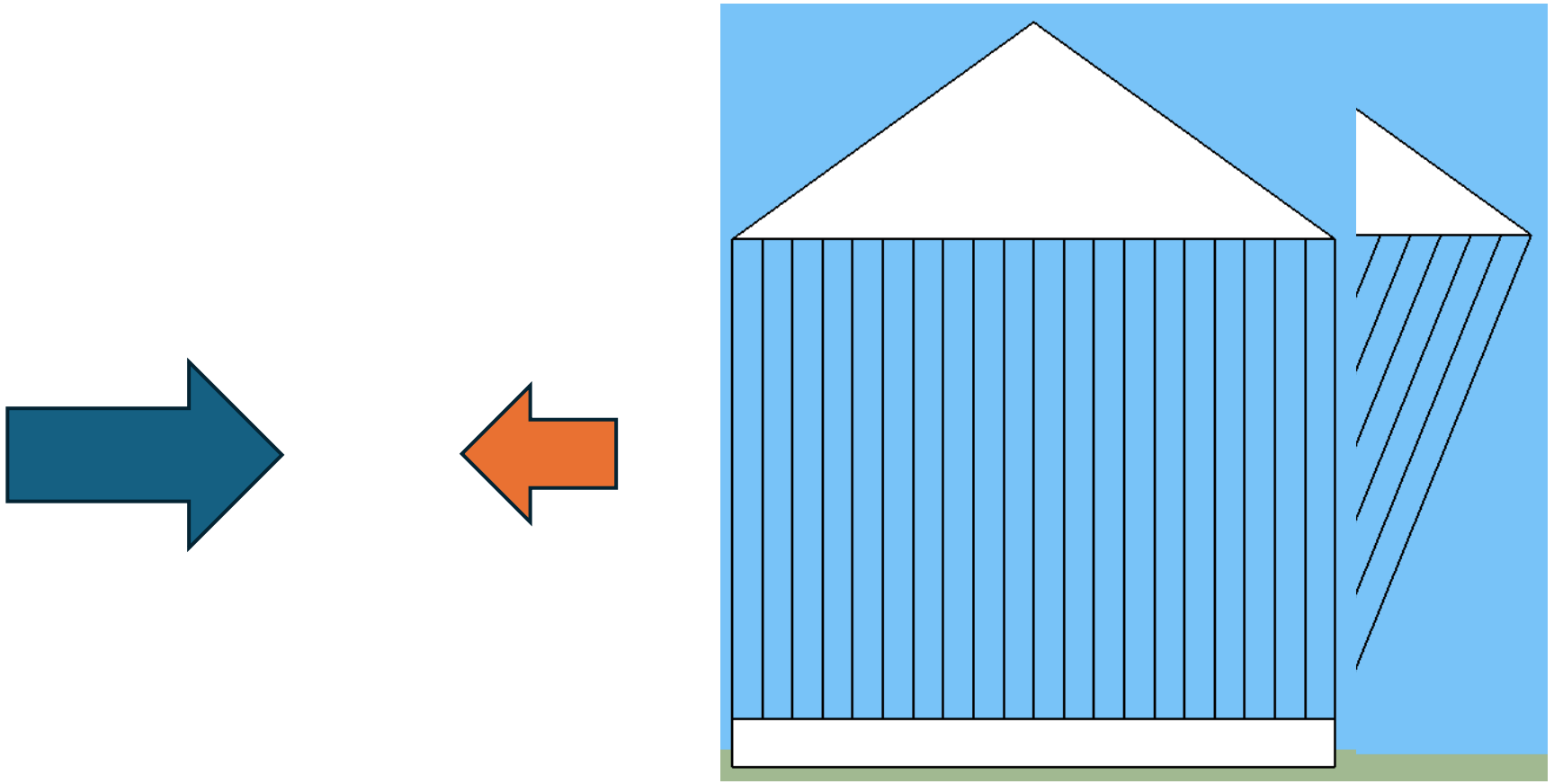
Lateral Loads: Fundamentals



Lateral Load

Resistance to Lateral Load

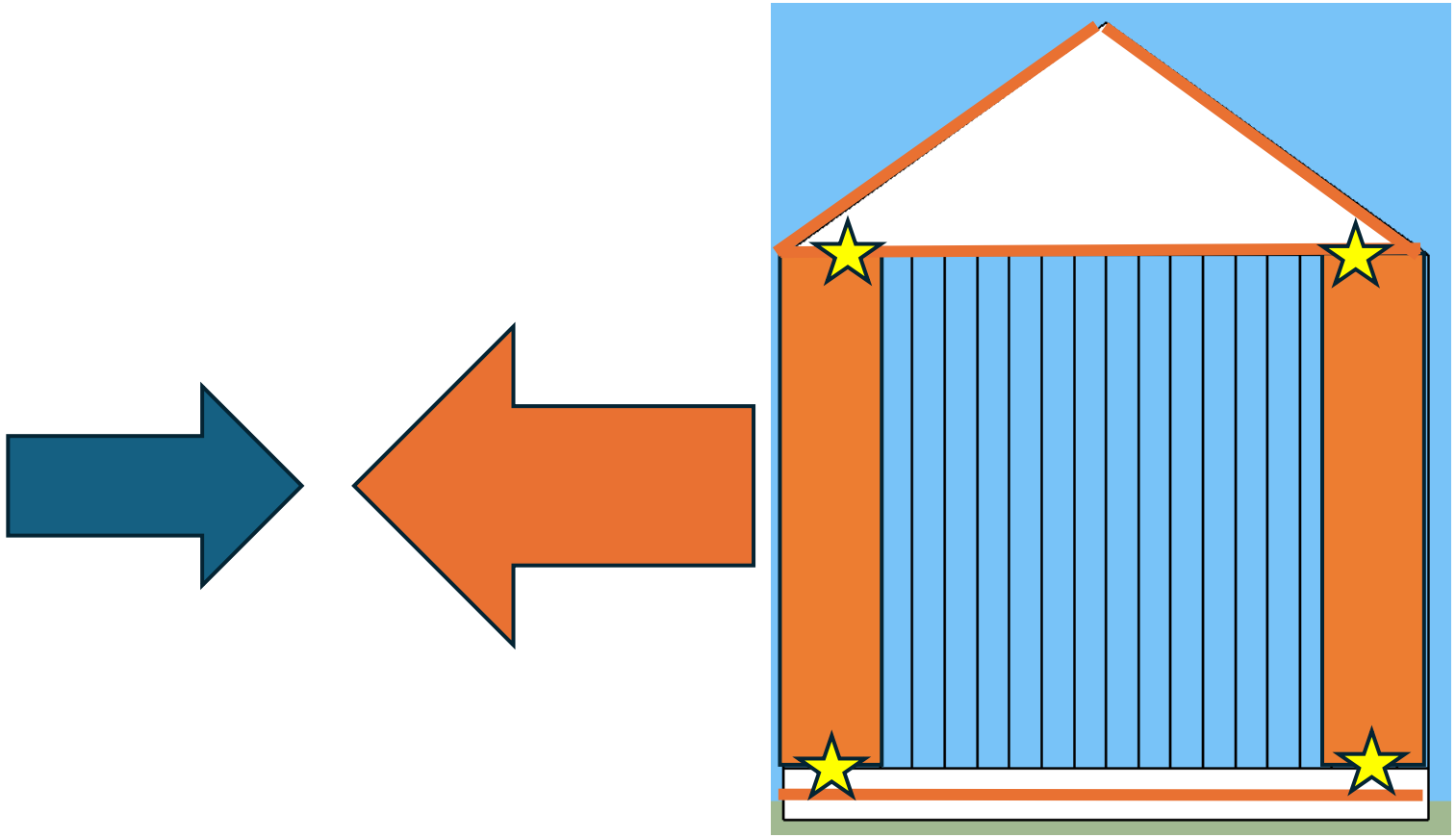
Lateral Loads: Fundamentals



Lateral Load

Not Enough Resistance to Lateral Load

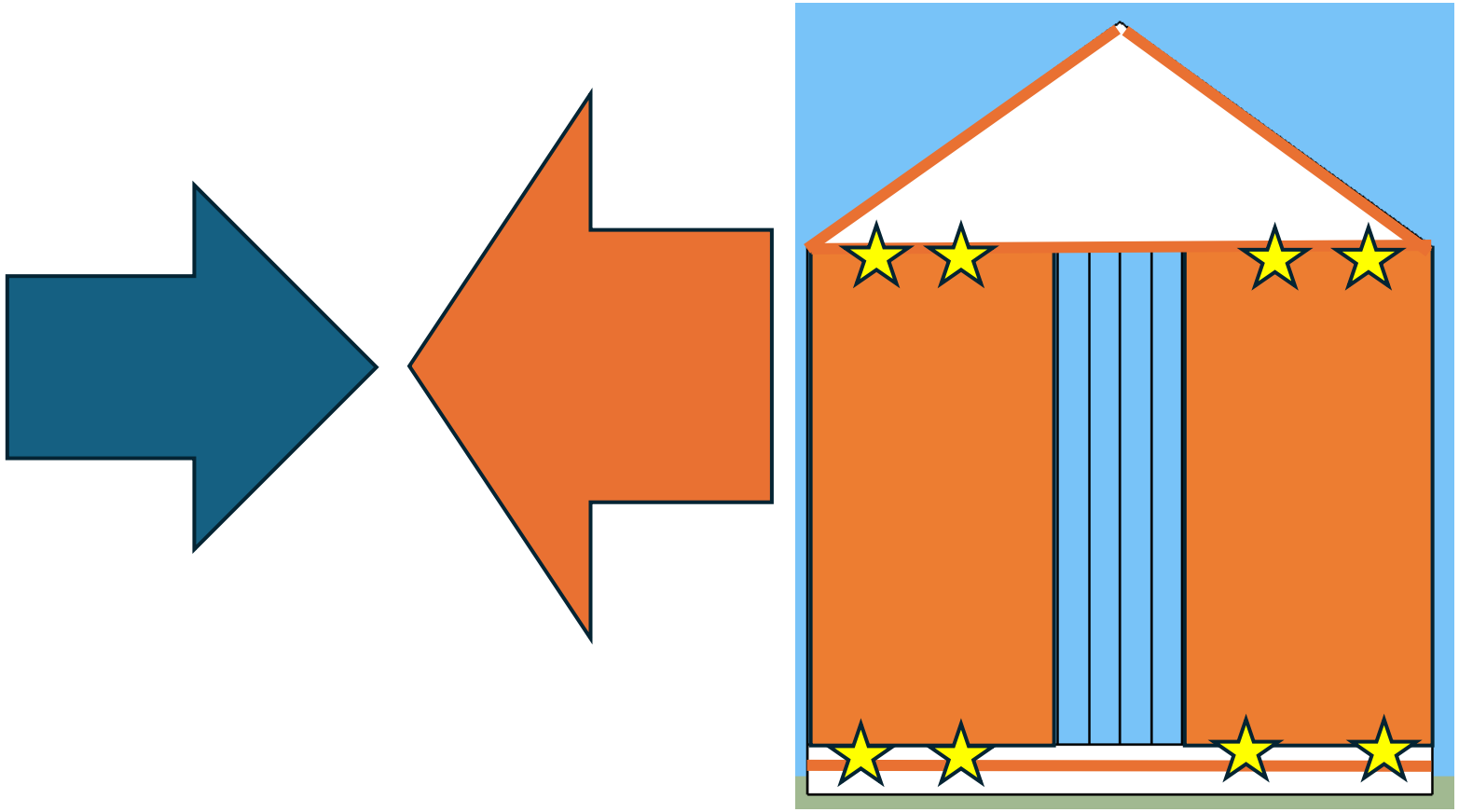
Bracing: Fundamentals



Lateral Load

Enough Resistance to Lateral Load

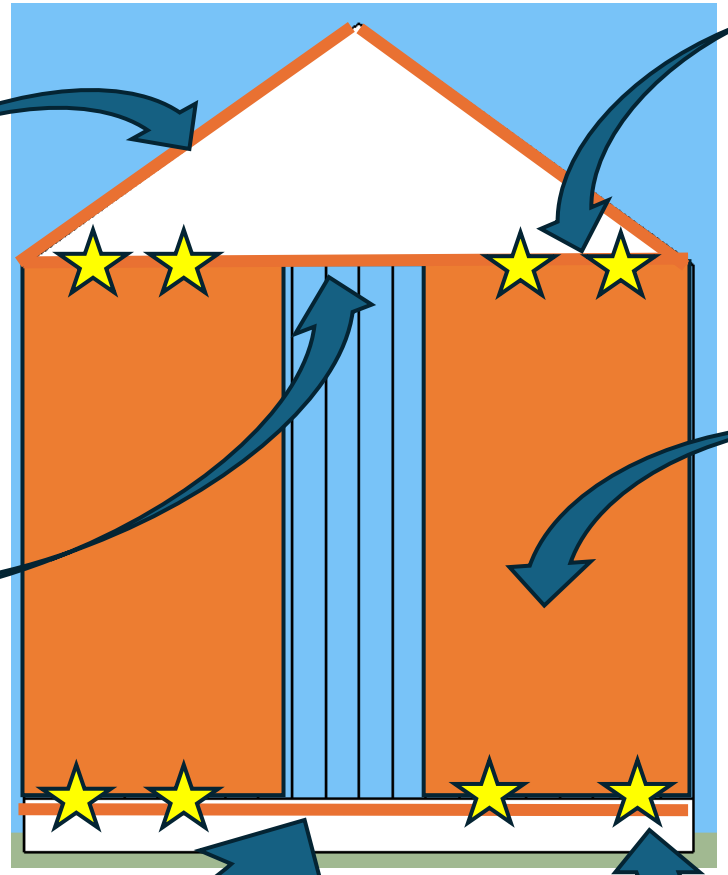
Bracing: Fundamentals



Lateral Load

Enough Resistance to Lateral Load

Bracing: Fundamentals



Framing Connections (Nails)

Sheathed Roof, Ceiling and Floor Framing

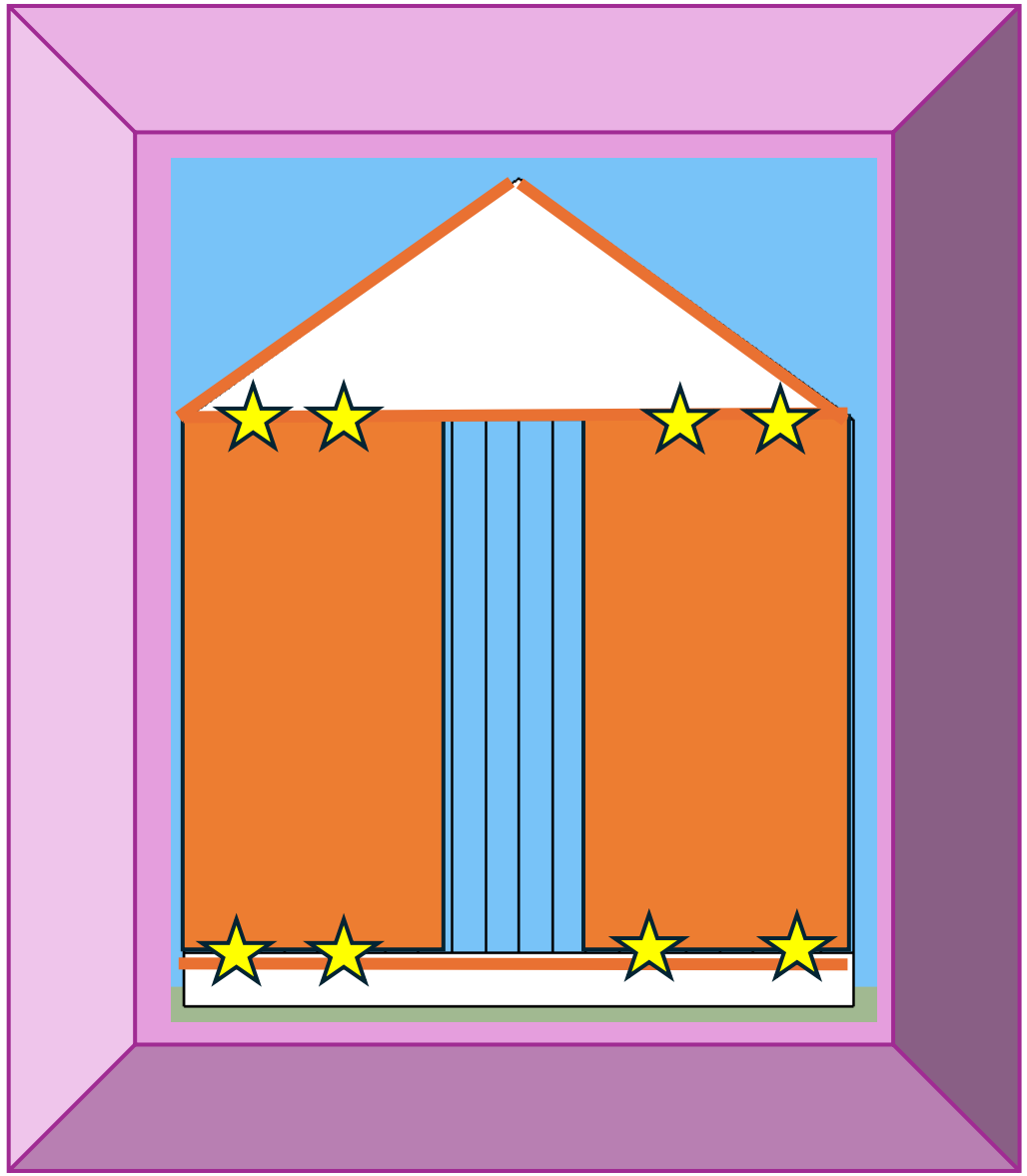
Braced Wall Panels

Anchorage

Resistance to Lateral Load

Bracing: Fundamentals

Braced Wall Bands



Subsection 9.23.13 Framework

Part 9:
Housing and Small Buildings

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

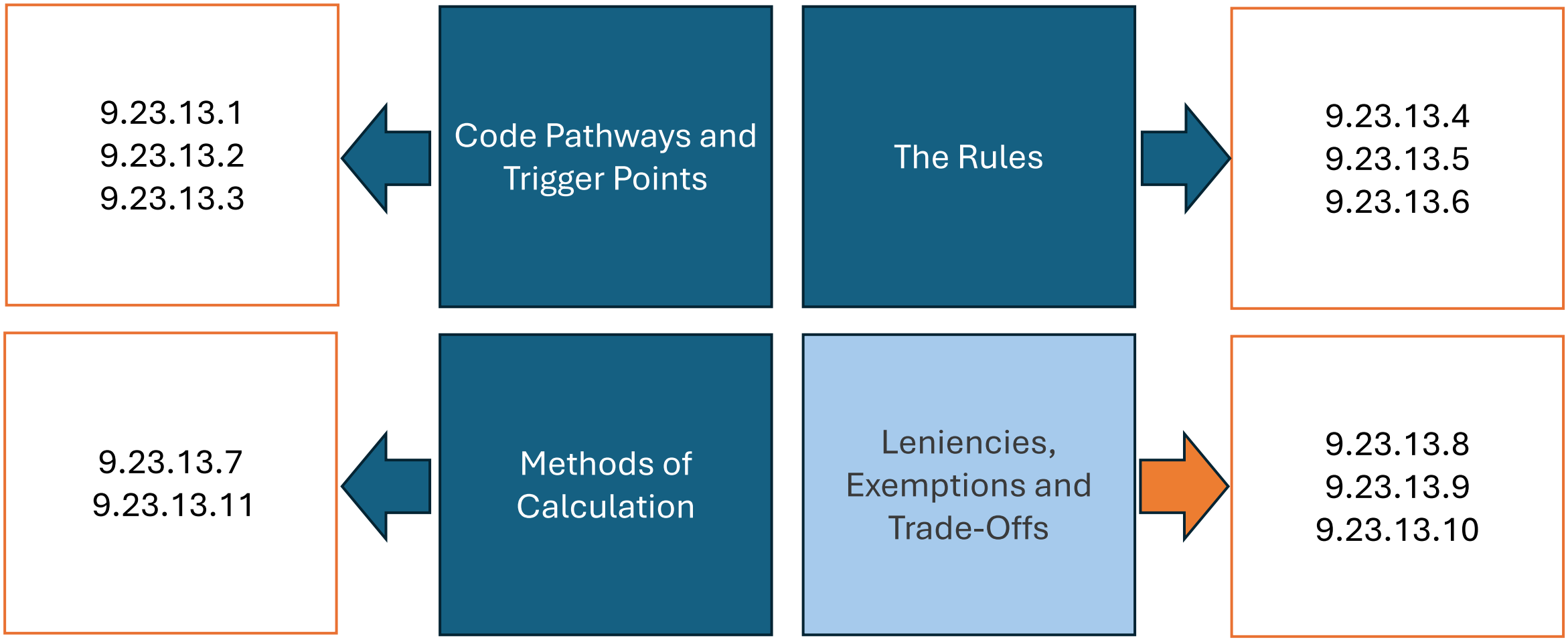
?

?

?

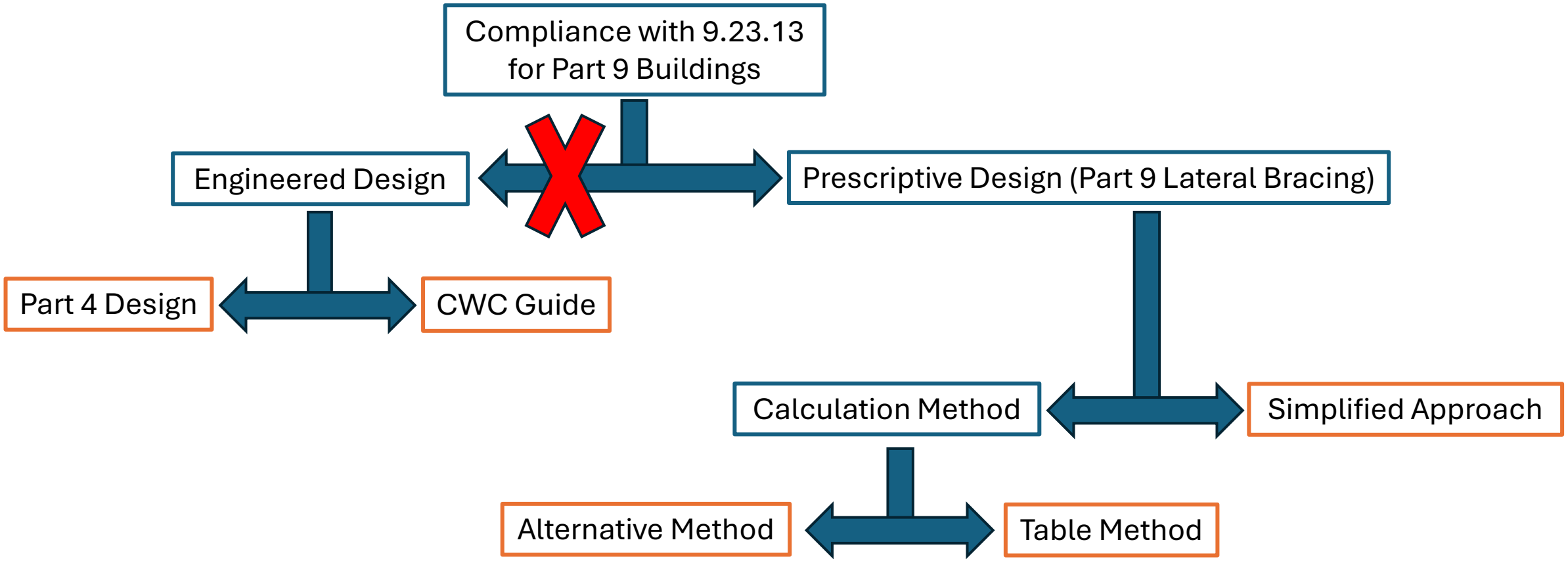
?

Subsection 9.23.13 Framework



Subsection 9.23.13 Framework

Box 1: Code Pathways and Trigger Points



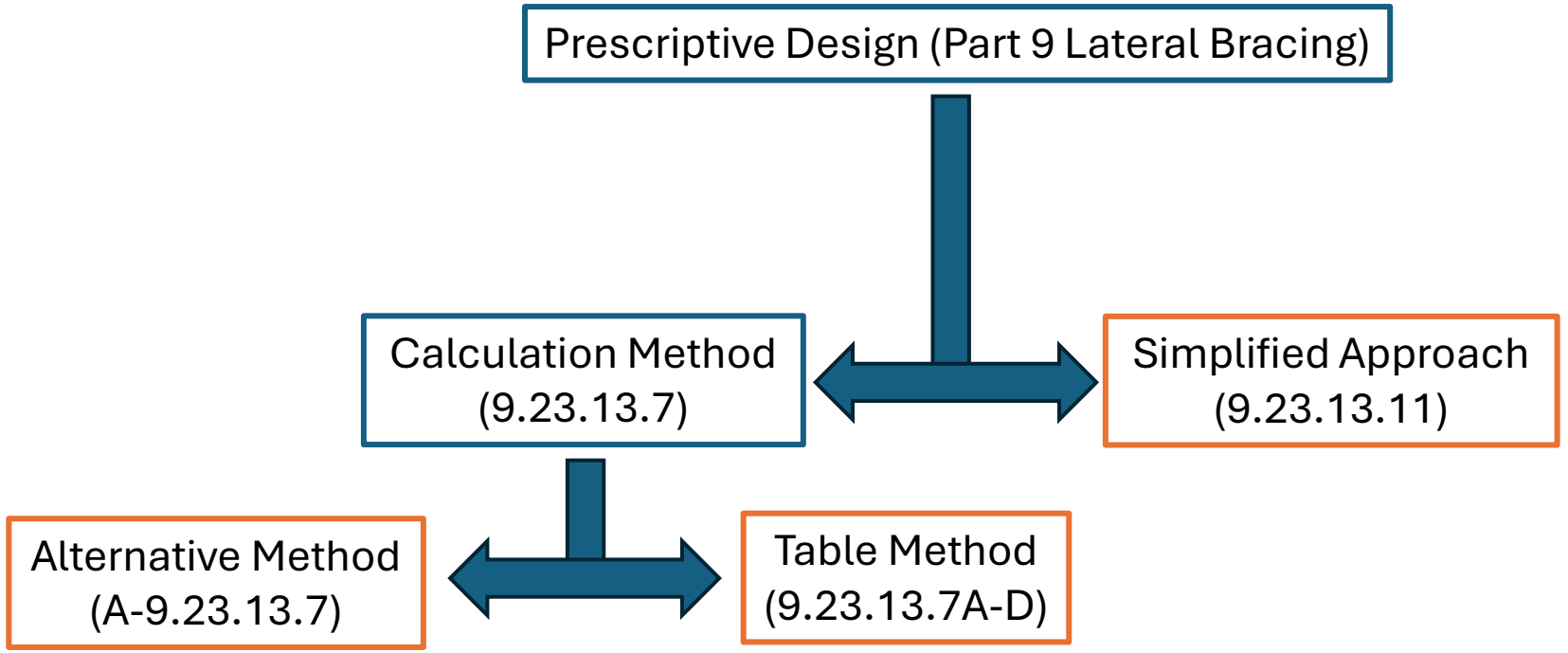
Subsection 9.23.13 Framework

Box 2: The Rules

Braced Wall Band Rules	Maximum width of a Braced Wall Band is 4ft (1.2m)
	Braced Wall Bands must align with Bands above and below
Braced Wall Panel Rules	Minimum length of a Braced Wall Panel is 2ft (.6m)
	Maximum height of a Braced Wall Panel is 10ft (3.1m)
Material Selection Rules	Braced Wall Panels in a Basement/Crawlspace must be constructed with wood-based sheathing

Subsection 9.23.13 Framework

Box 3: Methods of Calculation

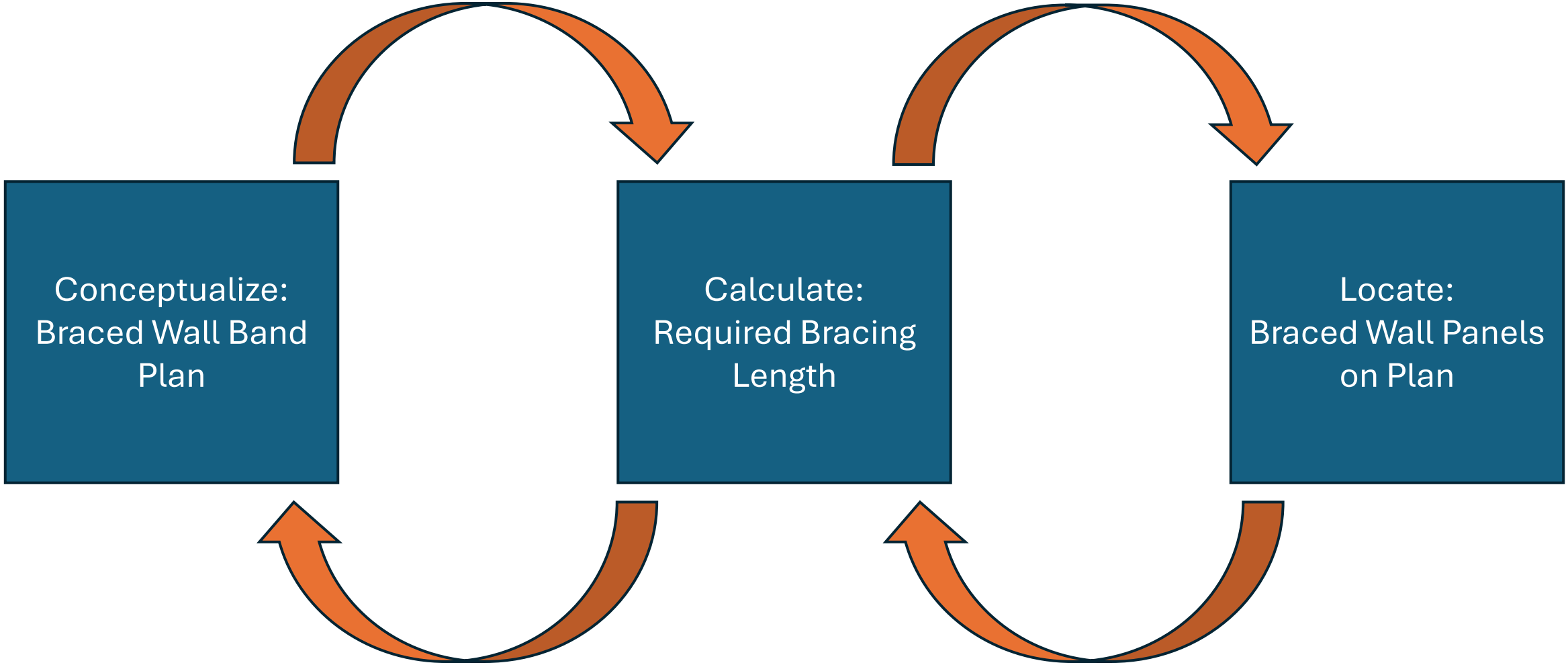


Subsection 9.23.13 Framework

Box 4: Leniencies, Exemptions and Trade-Offs

Leniencies	Basements/Crawlspaces (9.23.13.5)
	Cripple Walls and Stepped Foundations
Exemptions	Garage Door, Open/Enclosed Spaces Exemptions
Trade-Offs	Setback Walls on Uppermost Storey Trade-Off
	Garage Door Trade-Off
	Distance between Braced Wall Panels Trade-Off

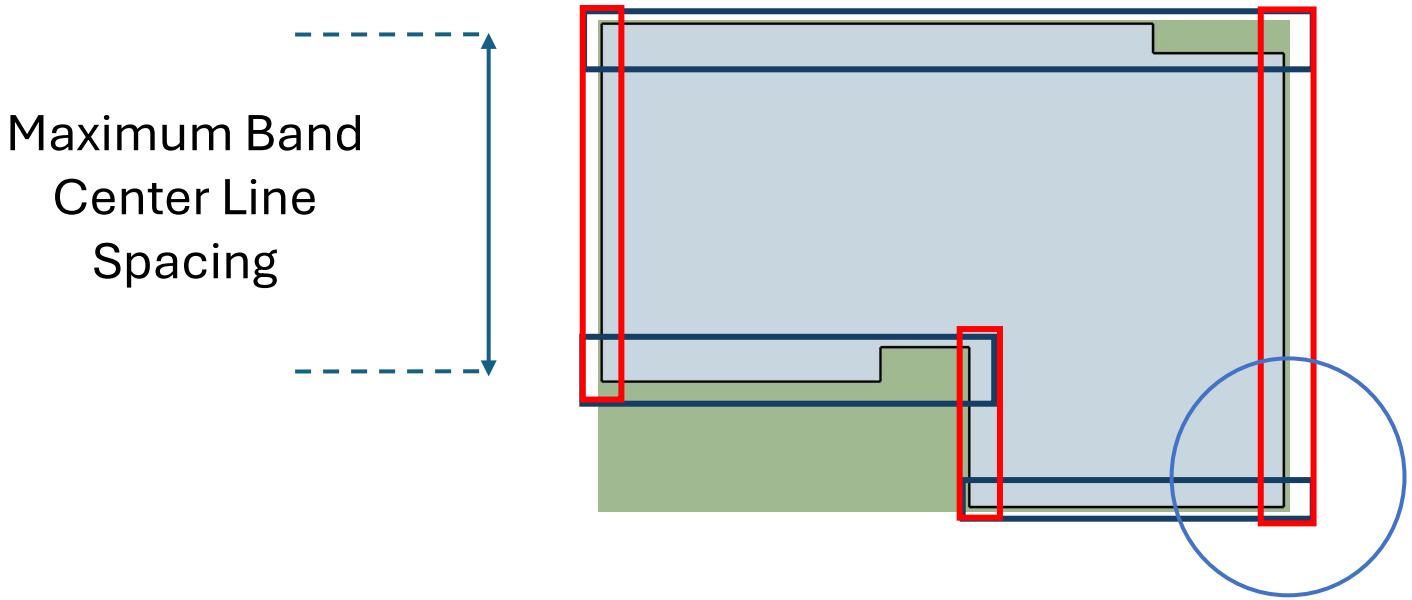
Overview of the Design Process



Overview of the Design Process

Step 1: Conceptualize the Braced Wall Band

- Conceptualize the Braced Wall Band Plan, in accordance with the Rules



Overview of the Design Process

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

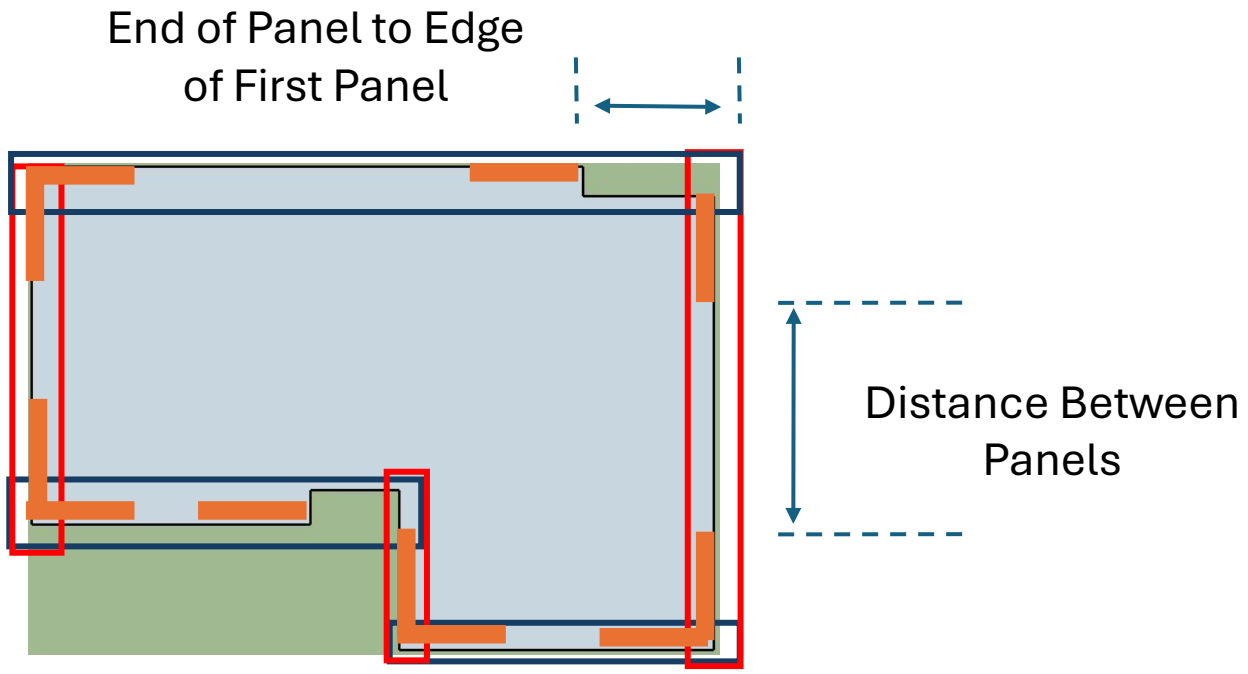
Process through a Method of Calculation

Amount of Bracing Length

Overview of the Design Process

Step 3: Locate the Braced Wall Panels on Plan

- Locate the required amount of Braced Wall Panel length, into the Plan, in accordance with the Rules



The Rules

Braced Wall Band Rules

Braced Wall Panel Rules

Material Selection Rules

The Rules

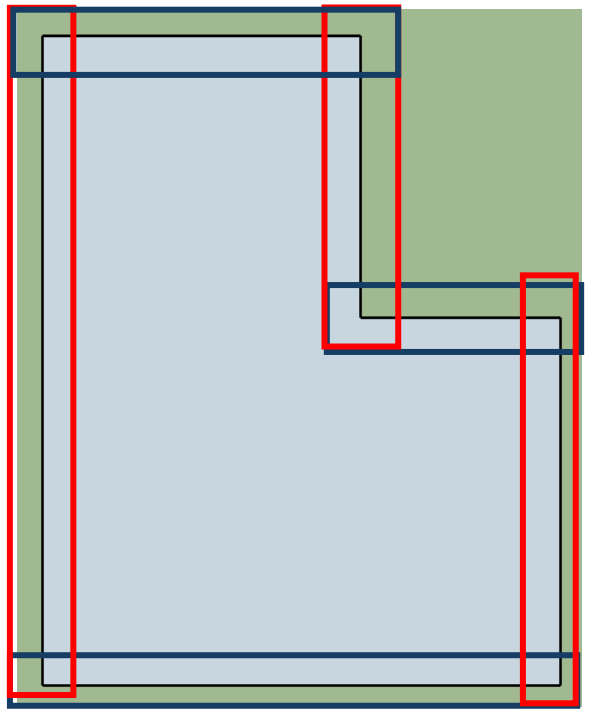
Braced Wall Band Rules

- Bands must *surround* the perimeter of the building*
- Bands must lap at each end with another band
- Bands must be full storey height
- Bands must stack (align) with bands above and below*
- Maximum width of 4' (1.2m)
- Maximum 34'9" (10.6m) spacing between centerlines of Bands*
- *Sometimes* Bands must continue into the roof framing
- If the floor diaphragm steps, there needs to be a Band at the step

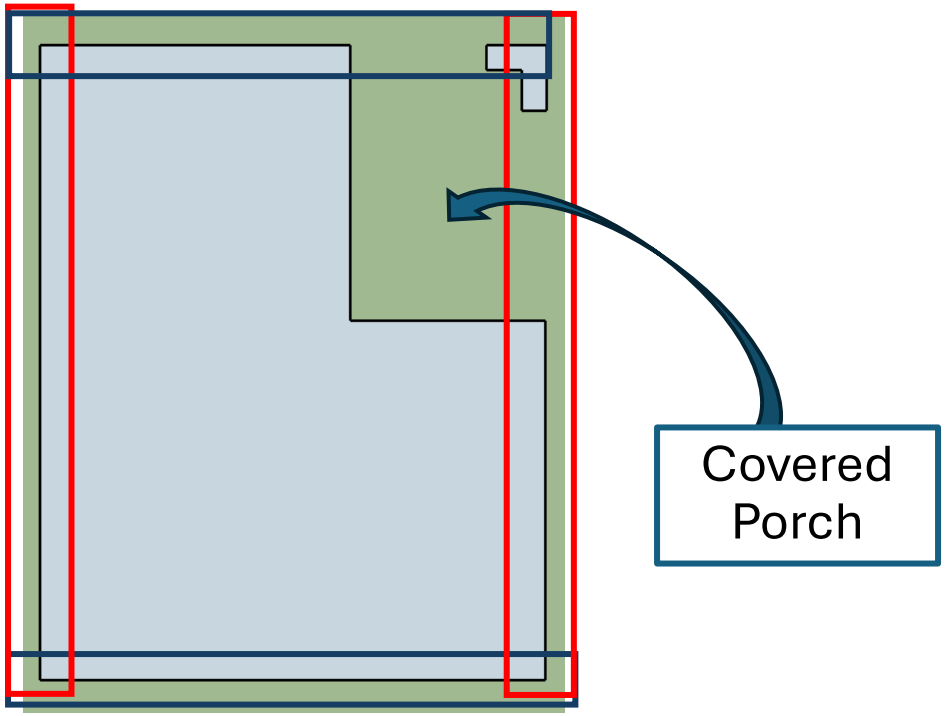
The Rules

Braced Wall Band Rules

- Bands must <u>surround</u> the perimeter of the building*



Example 1



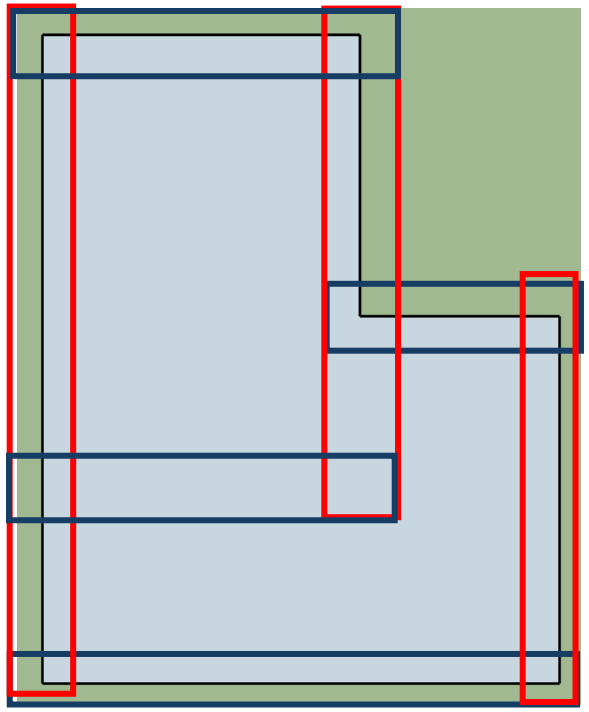
Example 2

The Rules

Braced Wall Band Rules

- Bands must lap at each end with another band

4 Bands along Vertical Axis

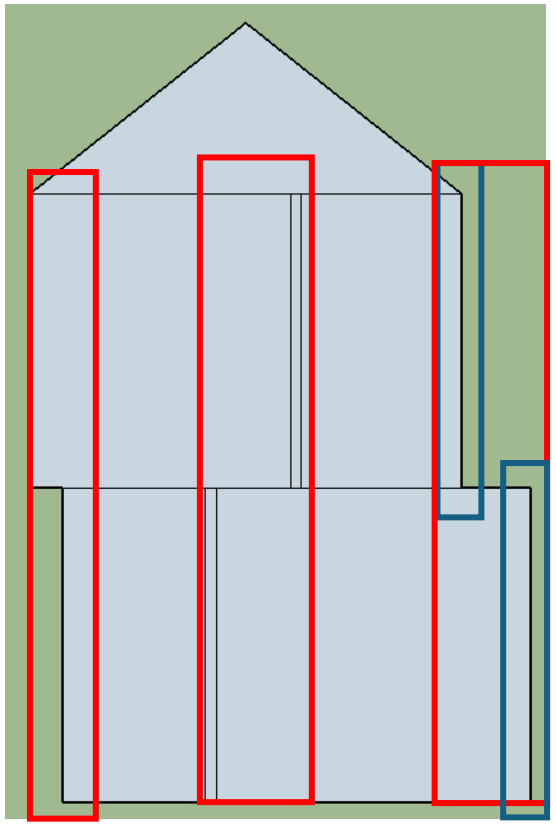


3 Bands along Horizontal Axis

The Rules

Braced Wall Band Rules

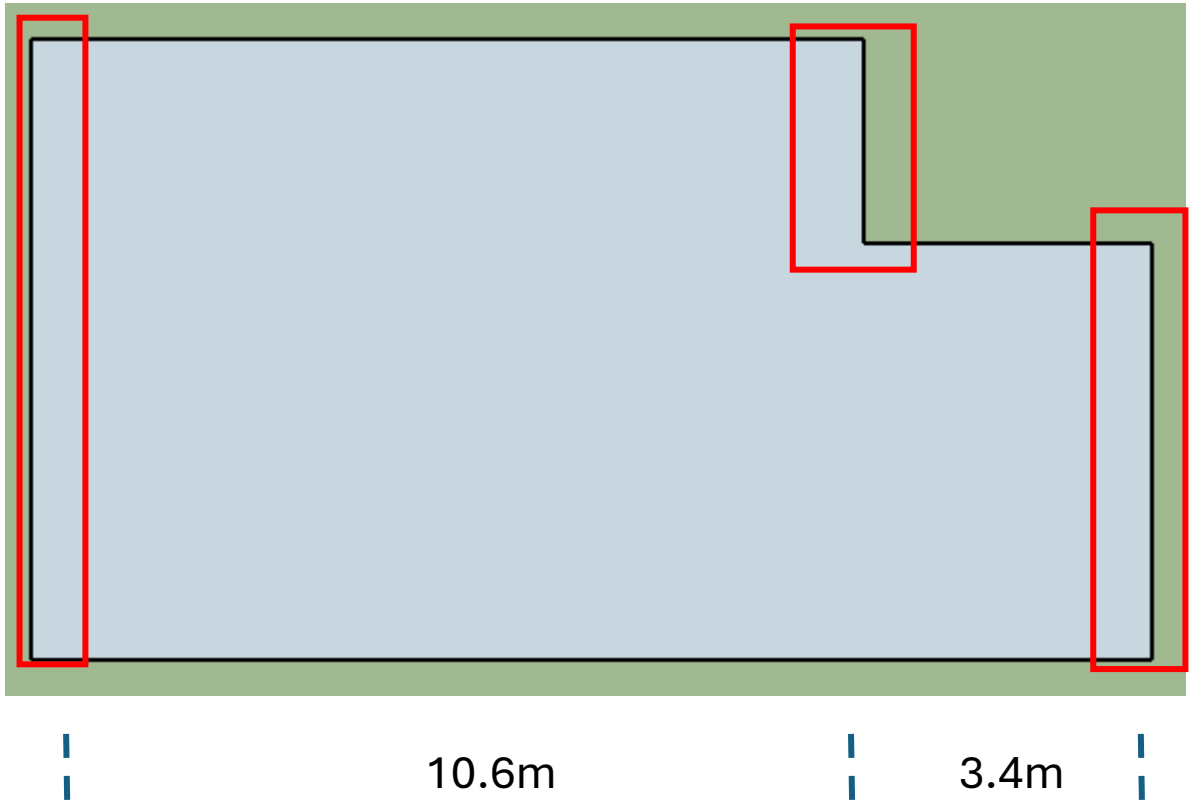
- Bands must stack (align) with bands above and below*
- Maximum of 4' (1.2m) wide



The Rules

Braced Wall Band Rules

- Maximum 34'9" (10.6m) spacing between centerlines of Bands*



10.6 + 3.4 = 14m

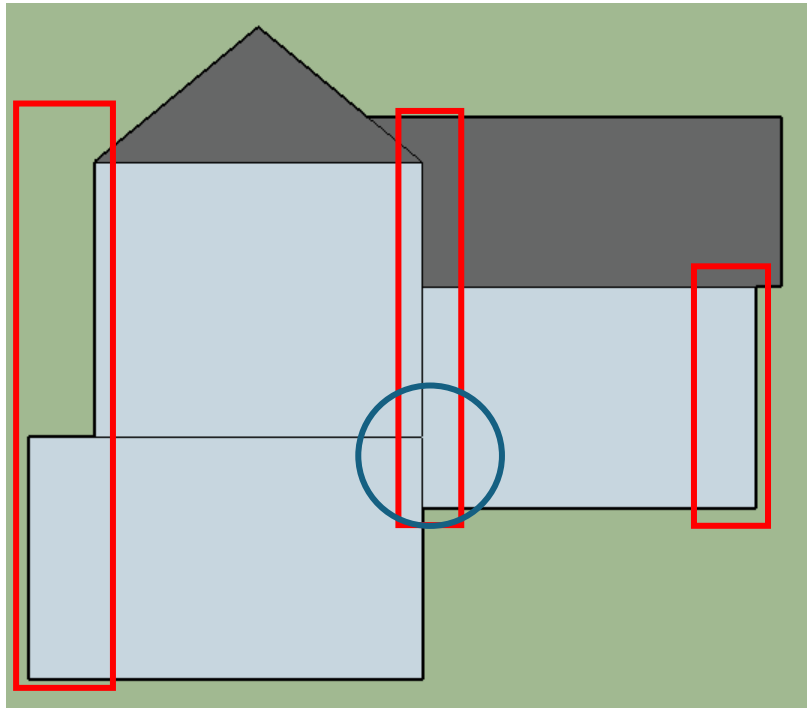
14m / 2 spacings

Average Band Spacing = 7m

The Rules

Braced Wall Band Rules

- If the floor diaphragm steps, there needs to be a Band at the step



The Rules

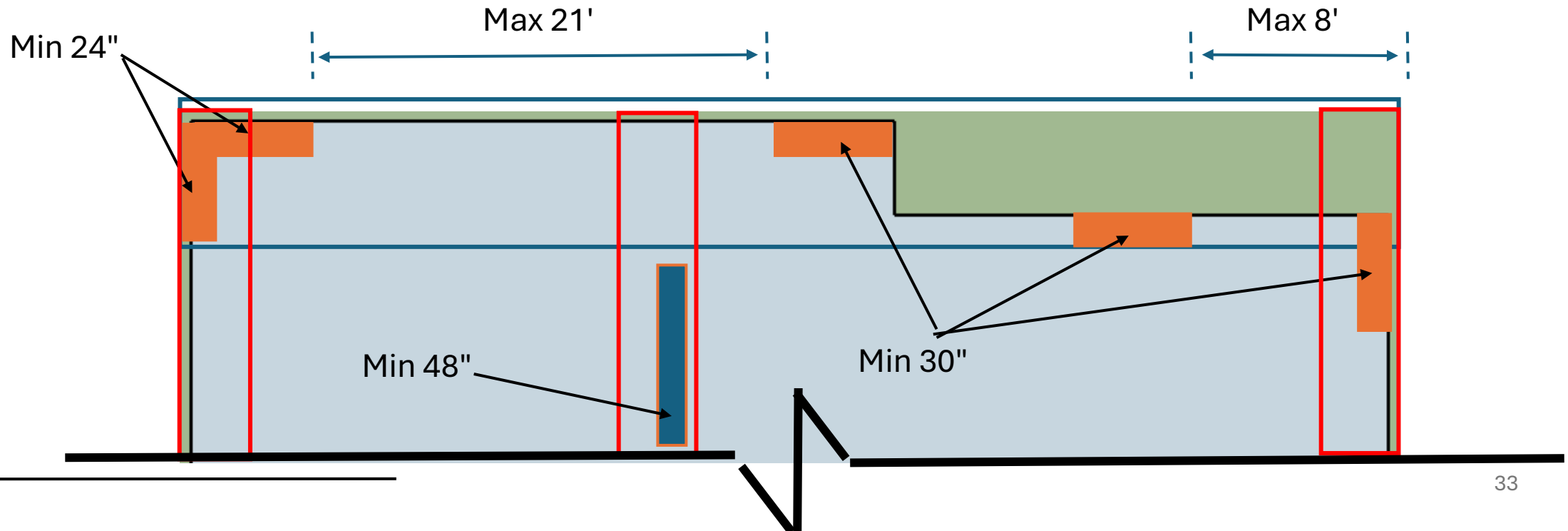
Braced Wall Panel Rules

- Panels must be located in Bands
- Panels must be laterally supported at top and bottom
- Panels must extend from the top of the supporting footing, slab or subfloor to the underside of the floor, ceiling or roof framing above
- Minimum 24" (0.6m) length when wood-based, at the end of a Band, and connected to another Panel in another Band
- Minimum 30" (0.75m) length when wood-based, and not connected to another Panel
- Minimum 4' (1.2m) length when gypsum-based
- Maximum 10' (3.1m) in height
- Maximum 21' (6.4m) between adjacent Panel edges in the same Band*
- Panel positioning must start within 8' (2.4m) of end of Band
- *Sometimes* Panels must continue into the roof

The Rules

Braced Wall Panel Rules

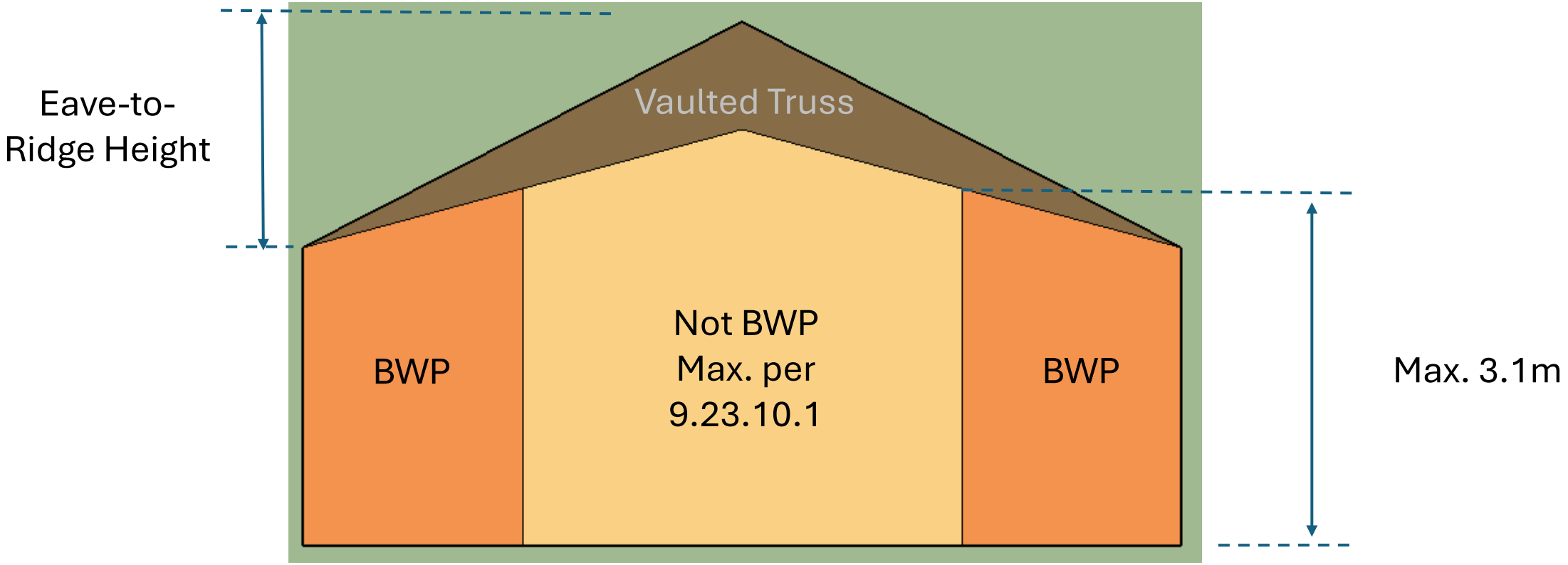
- Minimum 24" (0.6m) length when wood-based, at the end of a Band, and connected to another Panel in another Band
- Minimum 30" (0.75m) length when wood-based, and not connected to another Panel
- Minimum 48" (1.2) length when gypsum-based
- Maximum 21' (6.4m) between adjacent Panel edges in the same Band
- Panel positioning must start within 8' (2.4m) of end of Band



The Rules

Braced Wall Panel Rules

- Maximum 10' (3.1m) in height



The Rules

Material Selection Rules

- Panels must be constructed with wood-based or gypsum-based primary bracing sheathing
- Adjacent Panels within the same Band can use different materials, but the design must select the most restrictive form
- Stacked (aligned) Bands can use different materials, but…
- Bands using wood-based Panels must be supported by Bands using wood-based Panels
- Panels in a Basement/Crawlspace must be wood-based

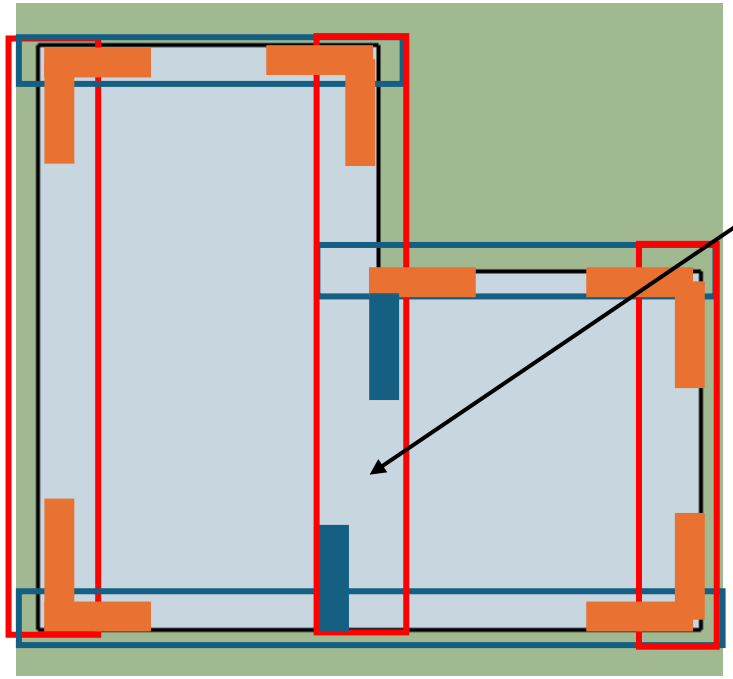
The Rules

Material Selection Rules

- Adjacent Panels within the same Band can use different materials, but the design must select the most restrictive form

Less Restrictive

More Restrictive



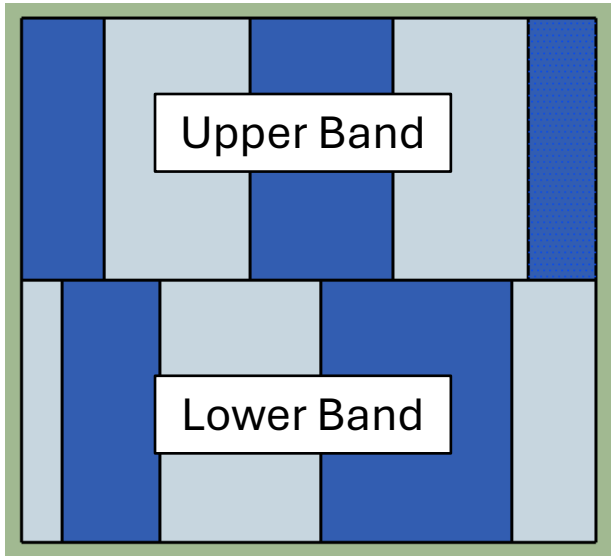
Design Band to Most Restrictive Bracing Element

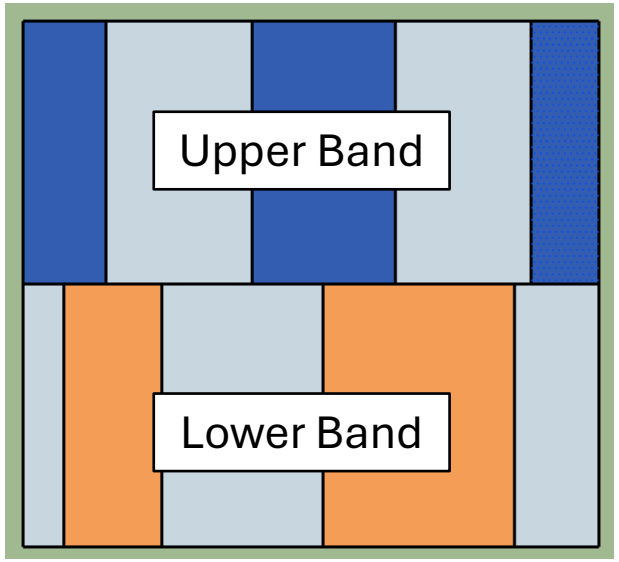
*See 9.23.13.6 (5)

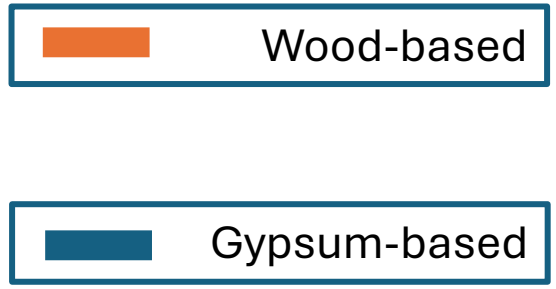
The Rules

Material Selection Rules

- Panels must be constructed with wood-based or gypsum-based primary sheathing
- Stacked (aligned) Bands can use different materials, but…
- Bands using wood-based Panels must be supported by Bands using wood-based Panels



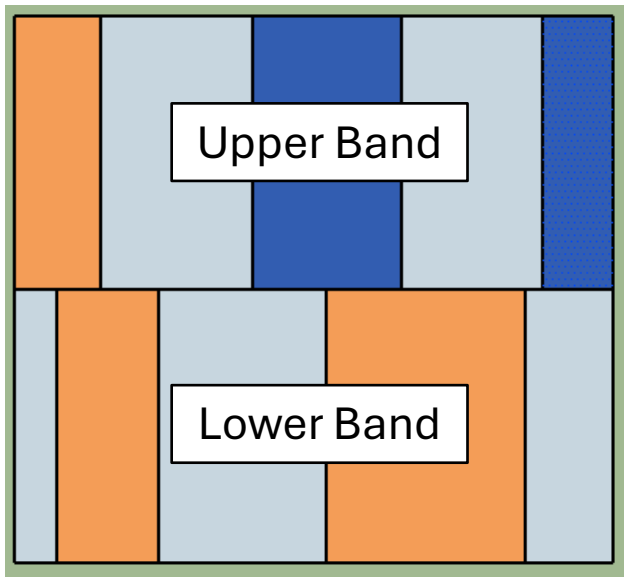


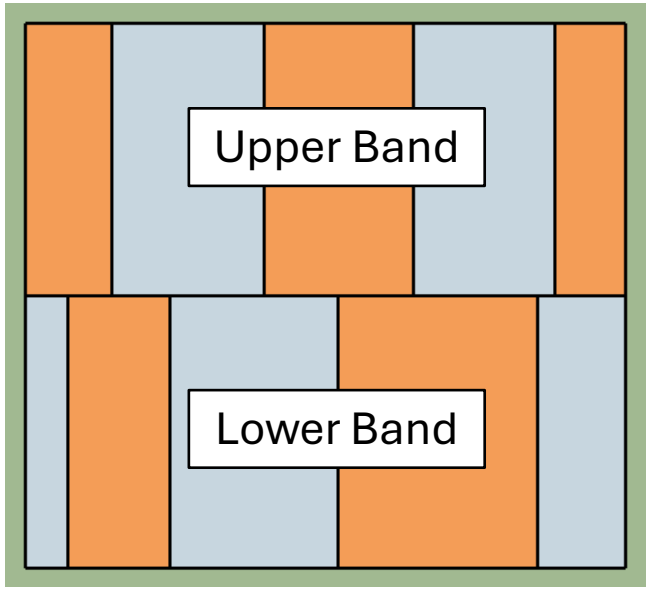


The Rules

Material Selection Rules

- Panels must be constructed with wood-based or gypsum-based primary sheathing
- Stacked (aligned) Bands can use different materials, but…
- Bands using wood-based Panels must be supported by Bands using wood-based Panels





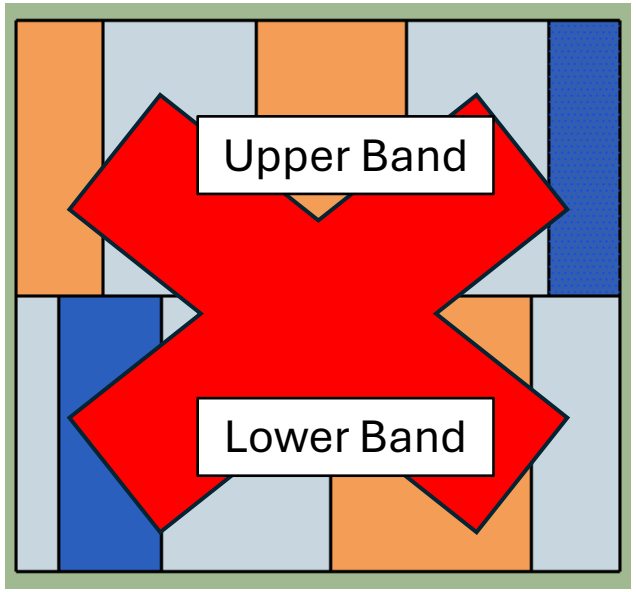
Wood-based

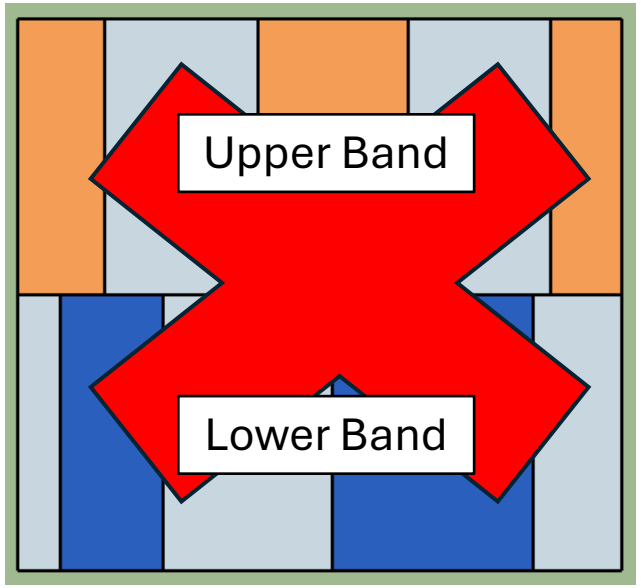
Gypsum-based

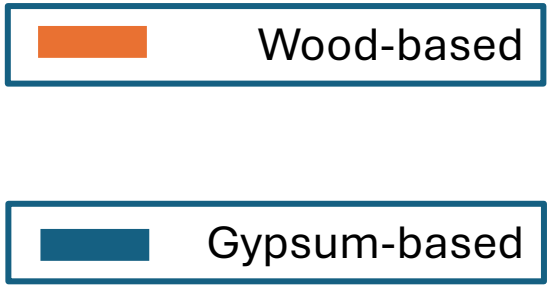
The Rules

Material Selection Rules

- Panels must be constructed with wood-based or gypsum-based primary sheathing
- Stacked (aligned) Bands can use different materials, but…
- Bands using wood-based Panels must be supported by Bands using wood-based Panels







New Concepts

New Concepts to BCBC2024

Building Plan Dimensions

Reference Framing Types

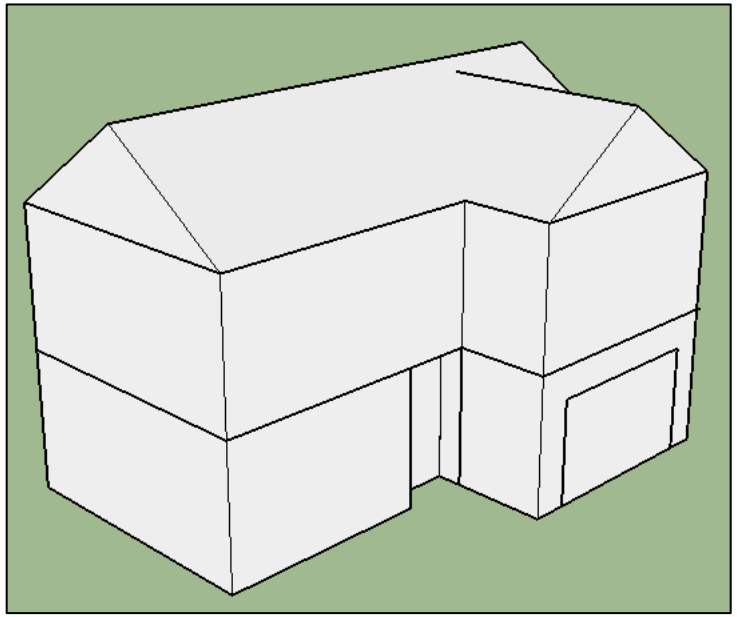
Factors

Eave-to-Ridge Height, Smax, Terrain, Sheathing Continuity

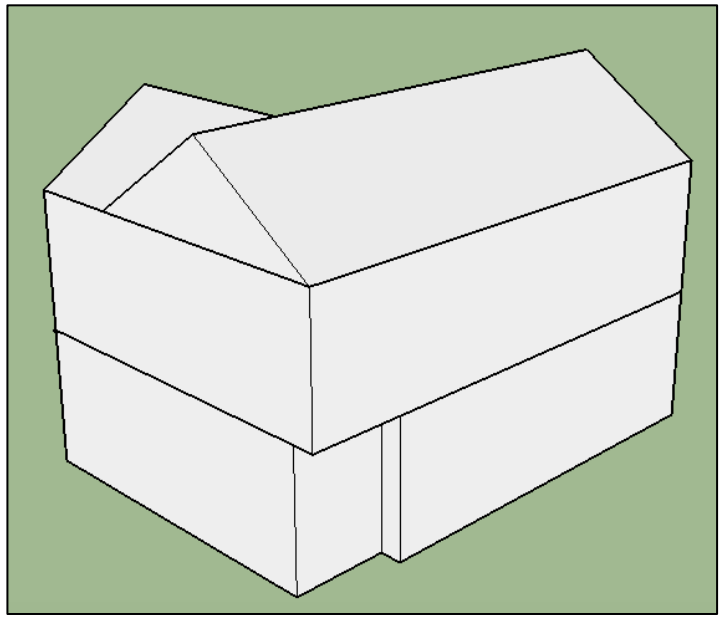
…and more!

New Concepts

Building Plan Dimension (Simple Form Structures)



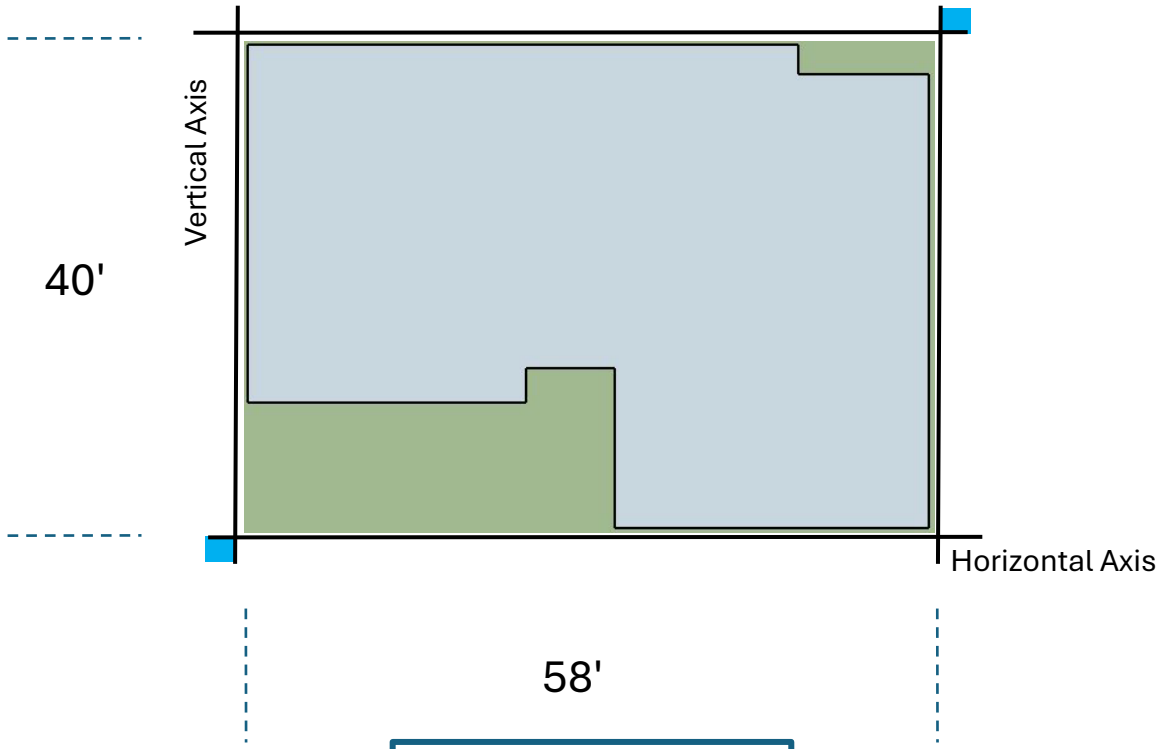
Front Left Isometric



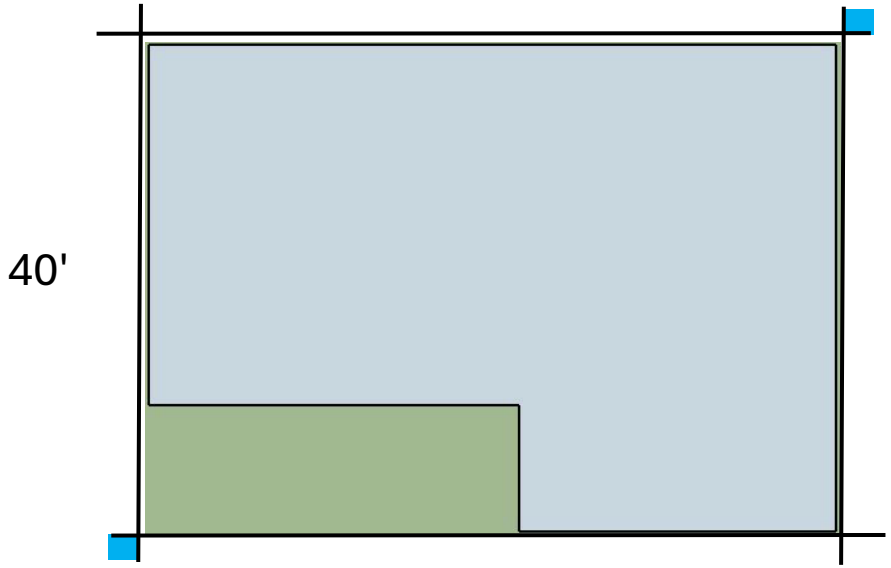
Back Right Isometric

New Concepts

Building Plan Dimension (Simple Form Structures)



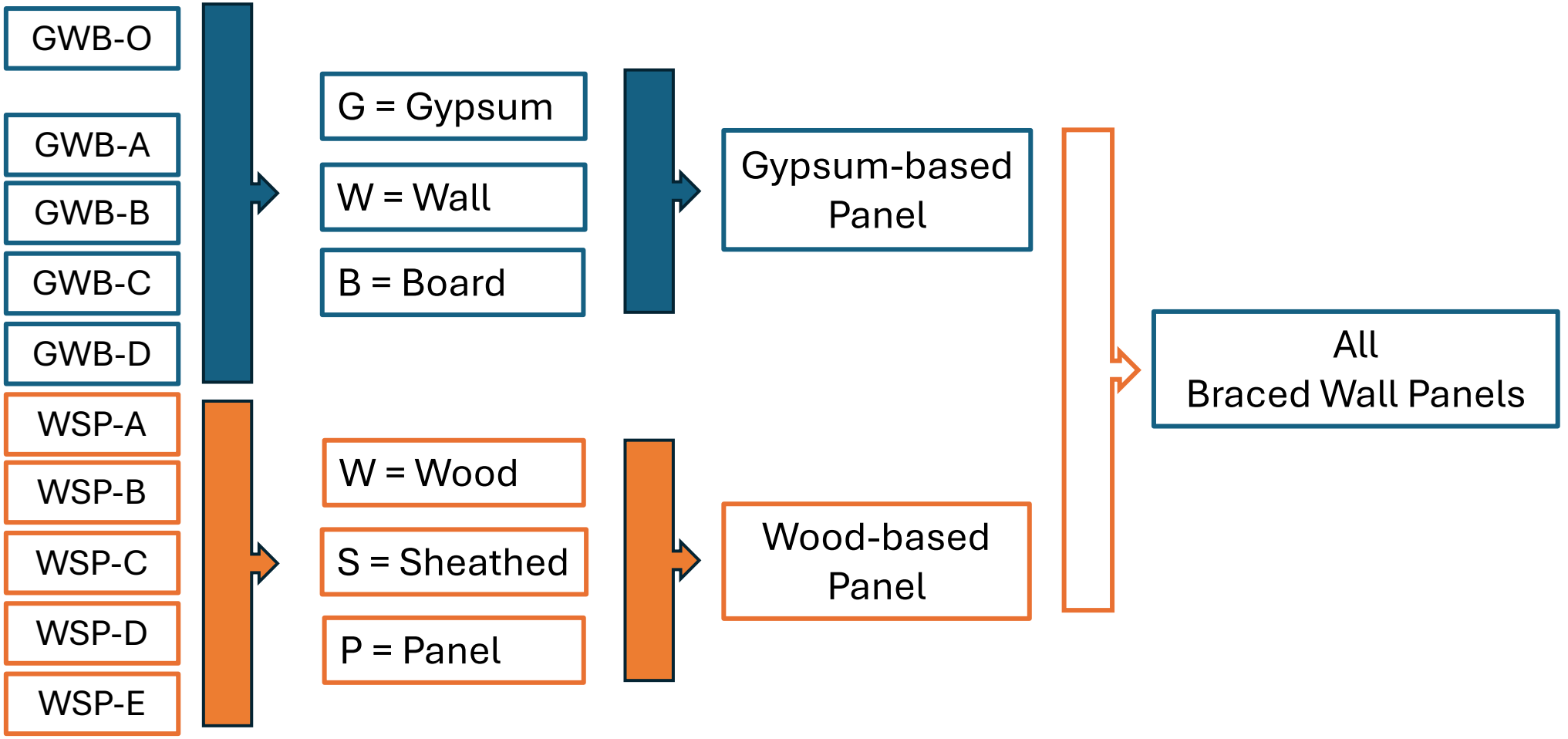
First Floor



Second Floor

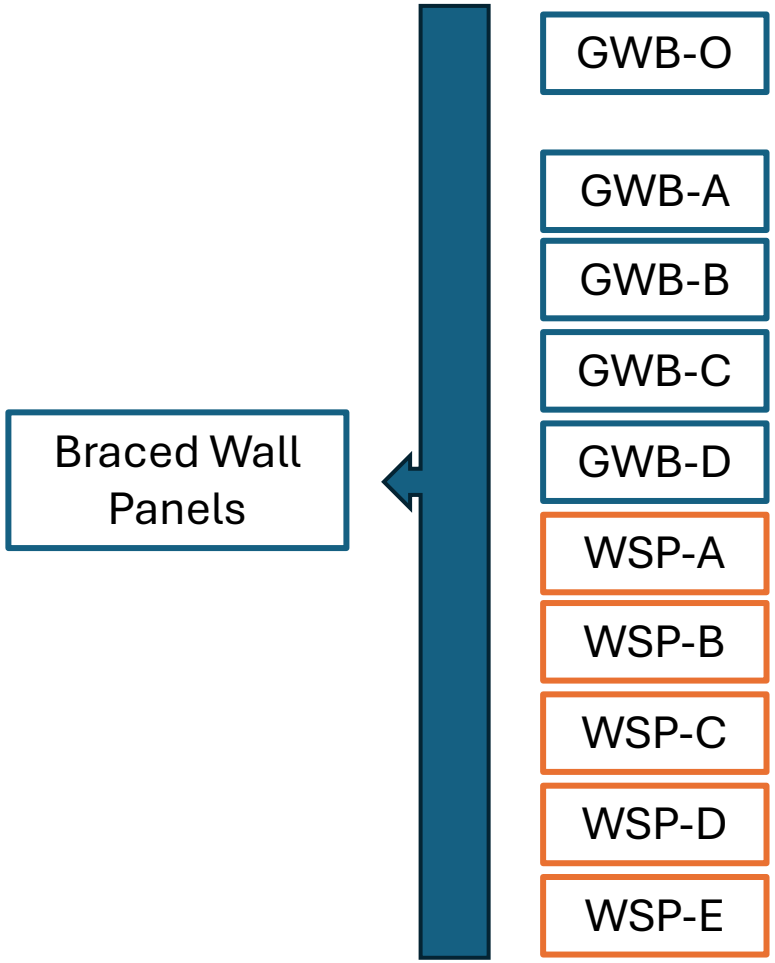
New Concepts

Reference Framing Types



New Concepts

Reference Framing Types



Why?

A way of Rating a BWPs Resistance to Lateral Loads

How?

Assigns a set of Construction Requirements to each Reference Framing Type

Outcome?

Choice for Code Users

New Concepts

Reference Framing Types

GWB-O

Design Default:

1 sided

Design Options:

Can be double sided (to increase Rating)

GWB-A

GWB-B

GWB-C

GWB-D

WSP-A

WSP-B

WSP-C

WSP-D

WSP-E

Design Default:

GWB-O installed on the reverse side of framing

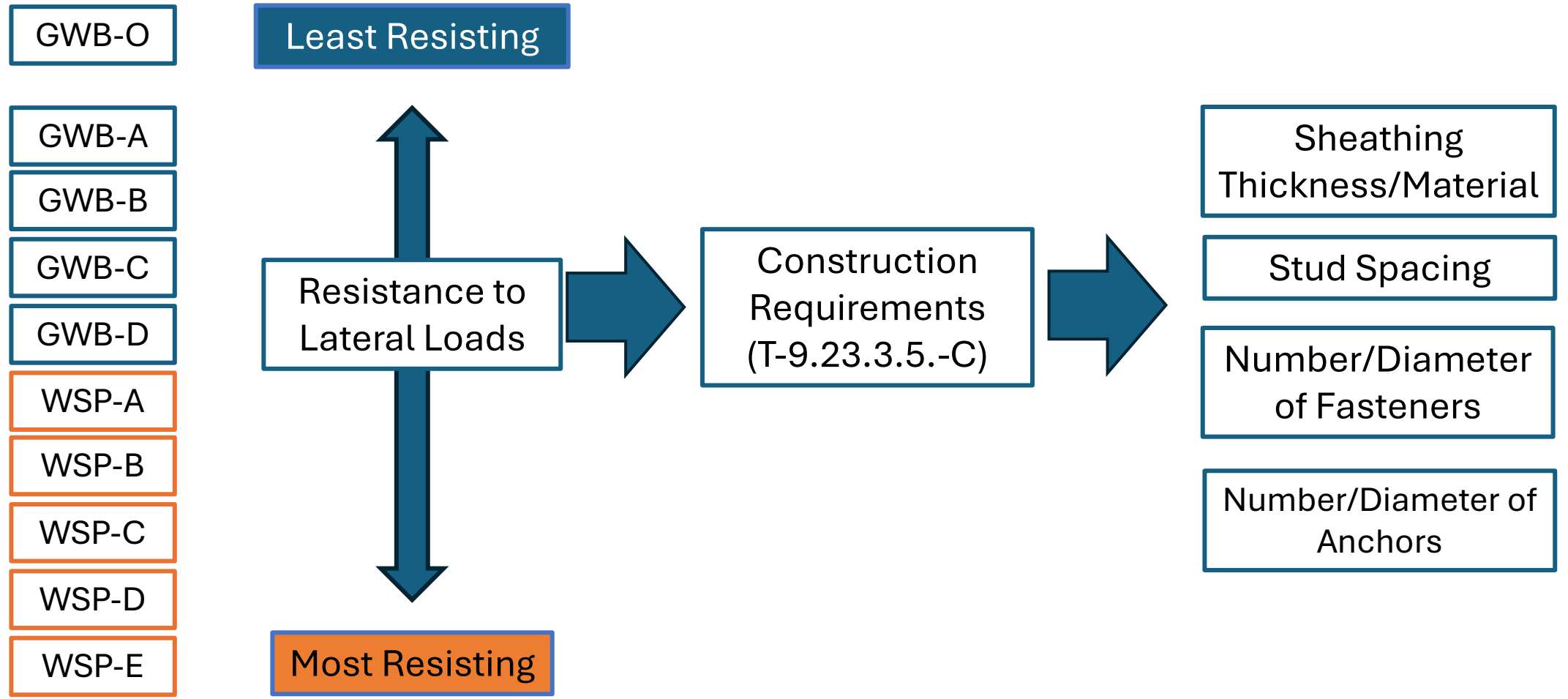
Types "stronger" than WSP-A require bracing into the roof system

Design Options:

The reverse GWB-O can be omitted (with reduced Rating)

New Concepts

Reference Framing Types



New Concepts

Reference Framing Types

- GWB-O
- GWB-A
- GWB-B
- GWB-C
- GWB-D
- WSP-A
- WSP-B
- WSP-C
- WSP-D
- WSP-E

- Framing:
  - 2x framing 16" o.c.
- Primary Bracing Element:
  - 3/8 wood-based sheathing
  - Fastened with 2.84mm x 51mm nails
  - Fasteners spaced 12" o.c. field, 6" o.c. edges
  - Blocking of joints not required
- Secondary Bracing Element (GWB-O):
  - ½" gypsum-based sheathing
  - Fastened with 3.45mm drywall screws
  - Fasteners spaced 12" o.c. field, 12" o.c. field
  - Blocking of joints not required

End / Questions?

Resources

BC Housing Illustrated Guide

CWC Bracing Calculator

Building Code Appeals Board

Session Two / Youtube / Slides

Community

BOBAC Forum

Building Code Interpretation Committee

...and more!

Contact

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