OVERVIEW OF
PART 9 REQUIREMENTS FOR
BRACING TO RESIST LATERAL LOADS DUE TO WIND AND EARTHQUAKE

BOABC 2012 BC Building Code Change Seminar
November - December 2012
Why?
Where?
When?
What?
How?
Why the new requirements?

1. clarify application of code

before: seismic was considered implicitly
Why the new requirements?

1. clarify application of code
2. reduce risks
now

explicit and detailed requirements
Where are the new requirements?

Subsection 9.23.13.

... and several in existing subsections in Section 9.23.
Where / When do we apply them?

according to

Articles 9.23.13.1. to 9.23.13.3.
structural design requirements in Part 9

seismic

9.4.1.1.

Part 9

9.23.13.

good engineering practice

Canadian Wood Council
“Engineering Guide for Wood Frame Construction”

Part 4

gravity

9.23.13.4. to 9.23.13.7.

+ other cross-referenced provisions
<table>
<thead>
<tr>
<th>Forces</th>
<th>traditional construction</th>
<th>9.23.13.4. to 9.23.13.7.</th>
<th>Part 4</th>
<th>good engineering practice</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extreme</td>
<td>x</td>
<td>x</td>
<td>✓</td>
<td>optional</td>
</tr>
<tr>
<td>9.23.13.3.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High</td>
<td>x</td>
<td>✓*</td>
<td>optional</td>
<td>optional</td>
</tr>
<tr>
<td>9.23.13.2.</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Low -Moderate</td>
<td>✓</td>
<td>optional</td>
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</table>

- Wind
  - $q_{50} = 1.2$
  - $S_a(0.2) = 1.2^*$

- Earthquake
  - $q_{50} = 0.8$
  - $S_a(0.2) = 0.7$

* different limits for heavy construction
Sa(0.2) values can be found in Div. B Appendix C.
What are the new requirements?

• concept
• basic requirements
• exceptions
Concept
figure from
HPO Illustrated Guide for
Seismic Design of Houses
New Key Components:

imaginary
braced wall band

real
braced wall panel
**Braced Wall Band**

an imaginary continuous straight band extending vertically and horizontally through the building or part of the building, within which *braced wall panels* are constructed

**Braced Wall Panel**

a portion of a wood-frame wall where bracing, sheathing, cladding or interior finish is designed and installed to provide the required resistance to lateral loads due to wind or earthquake
figure from
HPO Illustrated Guide for
Seismic Design of Houses
figure from
HPO Illustrated Guide for Seismic Design of Houses
- **main goal:**
  strong stable overall frame

- **fundamental requirement:**
  adequate amount of properly constructed walls
  - how to locate and size walls
  - how to build and fasten walls
Basic Requirements
Braced Wall Bands shall

- be full storey height
- be ≤ 1.2m wide
- lap at both ends with another BWB
- be aligned with BWBs on storeys above & below
- be spaced, at maximum,
  - 10.6 m
  - 7.6m where 1.0 ≤ $S_a(0.2) ≤ 1.2$ [Victoria]
figure from HPO Illustrated Guide for Seismic Design of Houses

Max 1.2 m

Max 10.6 m (7.6 m)  Max 10.6 m (7.6 m)

Max 1.2 m  Max 1.2 m  Max 1.2 m
Braced Wall Panels shall

- be located within BWBs
- extend from top of supporting footing, slab or subfloor to underside of floor ceiling or roof framing above
- conform to limits on
  - max spacing
  - max distance from end of BWB
  - min length
  - min total length
Minimum Total Length of Braced Wall Panels

in a braced wall band

for light construction

<table>
<thead>
<tr>
<th>1 storey</th>
<th>2 storeys</th>
<th>3 storeys</th>
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<tbody>
<tr>
<td>25%</td>
<td>25%</td>
<td>25%</td>
</tr>
<tr>
<td>25%</td>
<td></td>
<td>40%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>75%</td>
</tr>
</tbody>
</table>
### 9.23.13.6. Materials in Braced Wall Panels

<table>
<thead>
<tr>
<th>Cladding</th>
<th>Compliance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Panel-type (plywood, hardboard, OSB)</td>
<td>9.27</td>
</tr>
<tr>
<td>Plywood, OSB, waferboard, or diagonal lumber sheathing</td>
<td>9.23.3.5</td>
</tr>
<tr>
<td>Panel-type (gypsum board)</td>
<td></td>
</tr>
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</table>
Sheathing for BWP

**Interior** BWPs:
- finished both sides with gypsum board
- sheathed both sides with wood-based material
- sheathed one side only but with
  - plywood, OSB or waferboard only
  - fastener spacing reduced by half

**Exterior** BWPs:
- interior gypsum board not considered acceptable
Additional Requirement for BWP

9.23.13.6.(4)

When any one BWP is required to be of a wood-based material,

all other required BWPs in that BWB shall be of wood-based material.
# Fasteners for Sheathing

in required BWPs

<table>
<thead>
<tr>
<th>Plywood, OSB or waferboard</th>
<th>Minimum Length (mm)</th>
<th>Maximum Spacing (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Nails</td>
<td>Screws</td>
</tr>
<tr>
<td>t \leq 20 mm</td>
<td>63</td>
<td>51</td>
</tr>
<tr>
<td>20 mm &lt; t \leq 25 mm</td>
<td>63</td>
<td>57</td>
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</table>

- longer minimum lengths

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9.23.3.5.
## Nailing of Framing

<table>
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<th>Minimum Length (mm)</th>
<th>Maximum Spacing or Minimum Number</th>
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- **required Braced Wall Panels**
  - to framing above and below (interior walls)

- **bottom wall plate or sole plate in required BWPs**
  - to floor joists, rim joists or blocking (exterior walls)
  - 82
  - 150 mm o.c.

- **rim joist, blocking**
  - to sill plate or top wall plate (supporting walls with required BWPs)
Anchorage of Building Frames

- **minimum 2 anchor bolts per BWP**
- located *within 500 mm* of end of foundation
- > **15.9 mm φ** @ max **2400 mm** o.c.
- > **12.7 mm φ** @ max **1700 mm** o.c.
Exceptions
9.23.13.5.(3)

porches & sun rooms

• ≤ 3.5m projection
• 1:2 plan dimensions
• no floor above
• integral with main roof or fastened to wall

➢ BWPs not required
attached garages

- ≤ 7.6m between front and back
- ≥ 50% of back wall is BWPs
- ≥ 25% of side walls is BWPs
- ≤ 1 floor above

BWPs not required in front wall
bigger openings in exterior walls

- additional interior braced wall required
- reduced total length in upper storeys (soft storey)

reduced to min. 25%

figure from HPO Illustrated Guide for Seismic Design of Houses
full-height basements

- stop BWPs at ground floor

Max 15m

Figure from HPO Illustrated Guide for Seismic Design of Houses
setbacks

- additional requirements for adjacent interior braced wall band
- sheathed floor and roof at setback
- additional fastening in perpendicular walls
heavy construction
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\[
S_a(0.2) = 1.1
\]

\[
S_a(0.2) = 0.7
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Minimum Total Length of Braced Wall Panels

in a braced wall band

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![Red X symbol]
How to check for the requirements?

from whole to detail
braced wall band

or

braced wall panel

first?
consider exceptions

➢ set all braced wall bands

➢ set all braced wall panels

➢ check min total lengths of panels (ie. 25%, 40%, 75%) in each braced wall band
impact on design
✓ materials in braced wall panels
✓ fastening of sheathing in braced wall panels
✓ nailing of framing
✓ anchorage of frame and braced wall panels
Thank You