Mid-rise Tips

Helping You Pick the Right Products and Fire Resistance Assemblies

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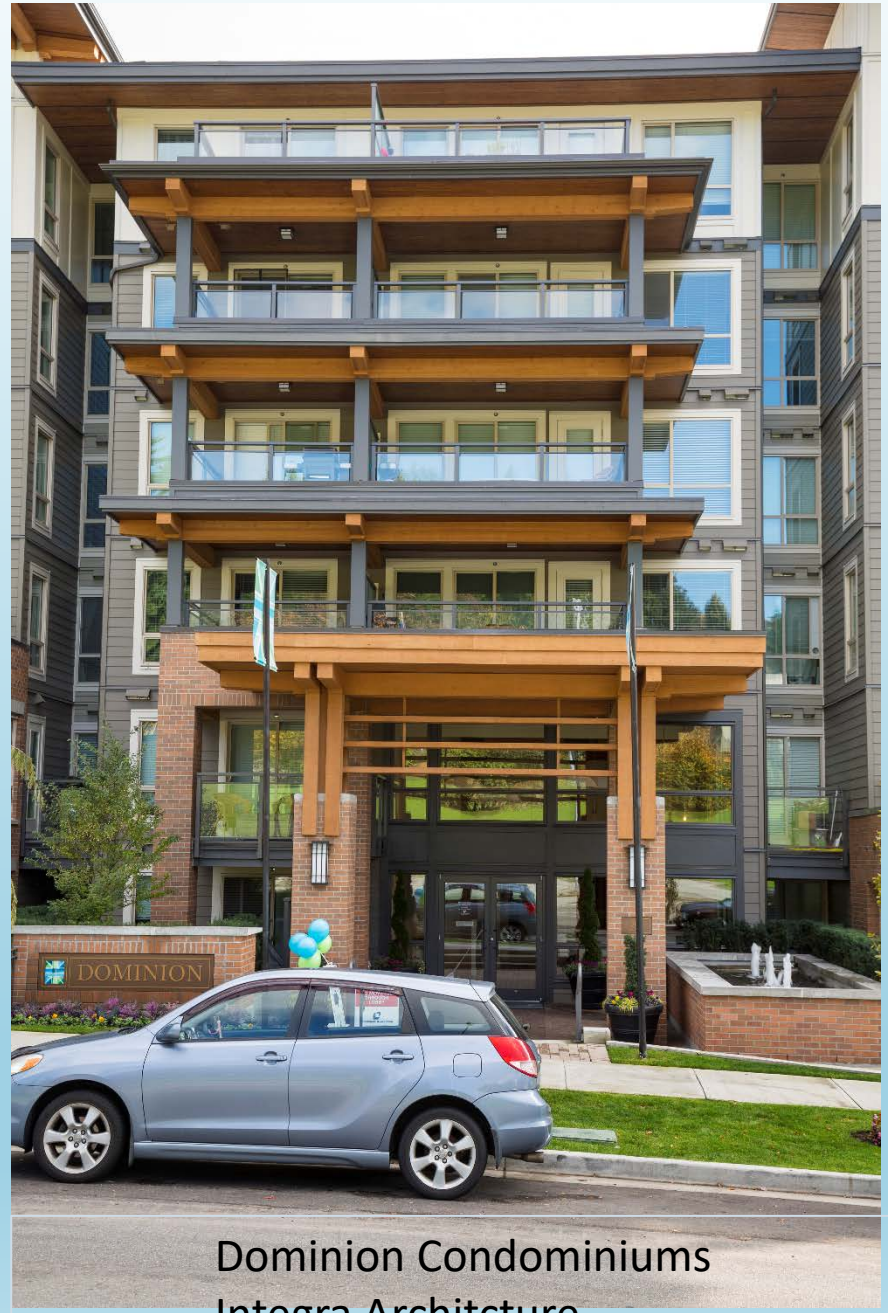
Weyerhaeuser Canada

Trafalgar Landing
Great Gulf Homes
Credit: H+ME Technologies

How many times have you been asked to consider an alternate product on a project?

How do you evaluate that alternative?

This session will help you make that evaluation.



Dominion Condominiums
Integra Architcture
Credit: WoodWORKS BC

Our Session today will cover 3 areas:

- Fire Assemblies
  - Important facts about Floor /Ceiling Assemblies
- Structural Components
  - The right products to meet NAILING, BOLTING CHALLENGES
- Supplier Qualifications
  - What to ask for, so that your designs are realized on site

Determining Fire-resistance

- The test that matters in Canada when evaluating fire-resistance-rated assemblies:

- CAN/ULC S-101 → Evaluates Assemblies & Materials

- What about Flame Spread?

Evaluates Material Properties

(CAN/ULC S-102)

Photo Credit: Calgary Herald

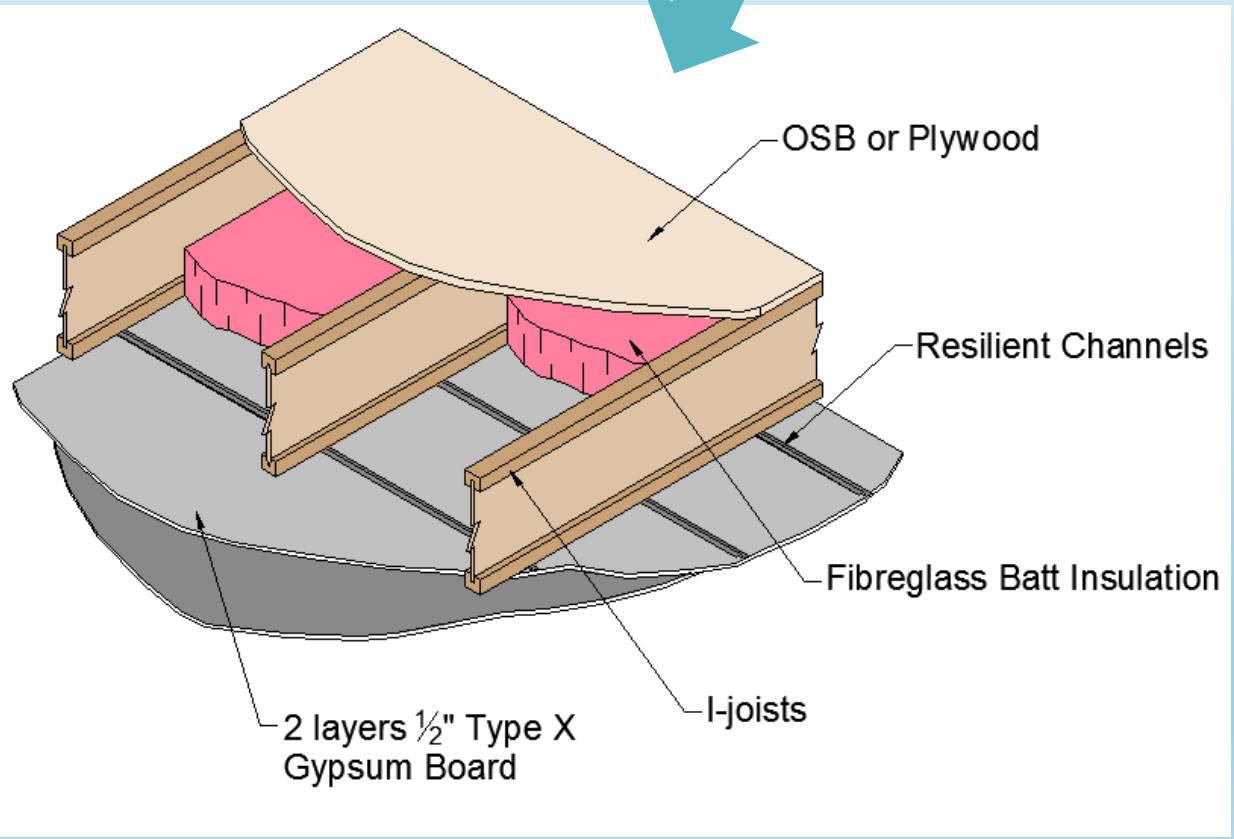
1-hour Fire-rated Floor/Ceiling Assembly:

- 2 options when choosing the gypsum board:
  - 2-layers of gypsum board, or
  - 1-layer
- Your decision can significantly affect the cost of the framing package

Option 1: “Double-Layer” Gypsum Ceiling

This is the most common assembly in mid-rise construction today

- Benefits:
  - Few restrictions on grades of materials
  - Generally free to choose any I-joist
  - Better sound-transmission results
- Costs:
  - More gypsum material (but materials are cheaper)
  - More labour to install gypsum

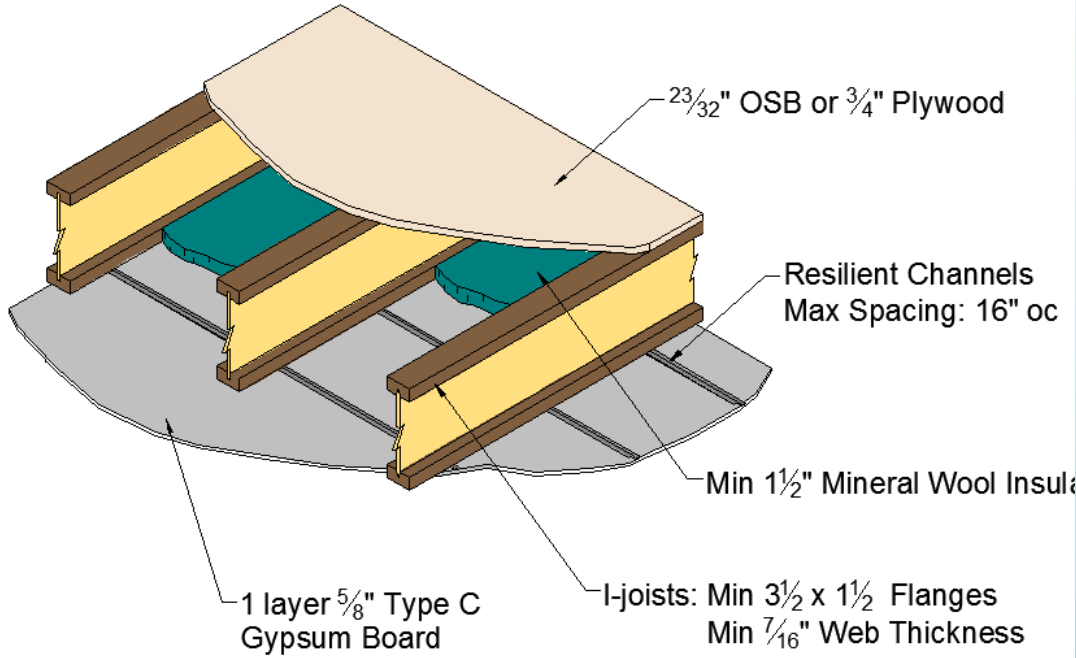


Intertek® listing WNR FCA 60-01

Option 2: Single-Layer

- Benefits:
  - Less Ceiling Material
  - Less Labour
- Costs:
  - Lower Sound Transmission (STC) values
  - Restricted options for insulation, gypsum board grades
  - Requires larger (more expensive) I-joist members. Most I-joist types are not permissible in this type of assembly.

Note: It's more difficult to achieve 1-hour with a Single-layer of gypsum



Single-layer System - 2x4 flange

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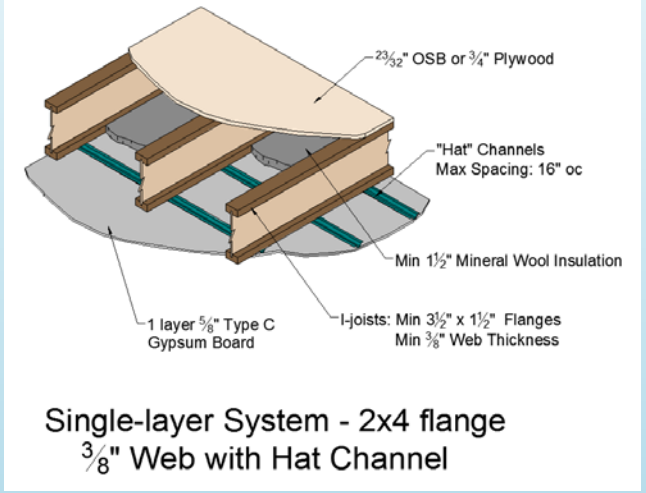
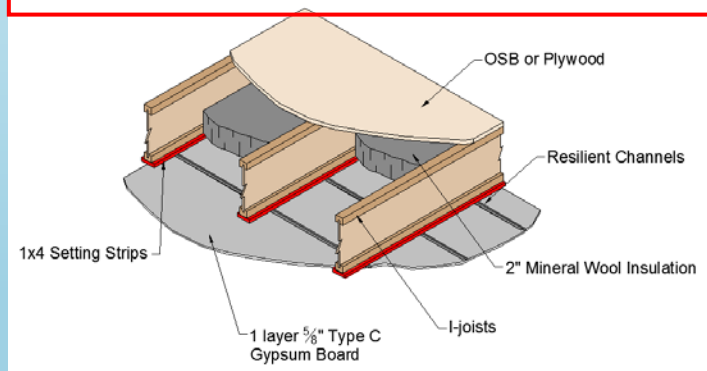
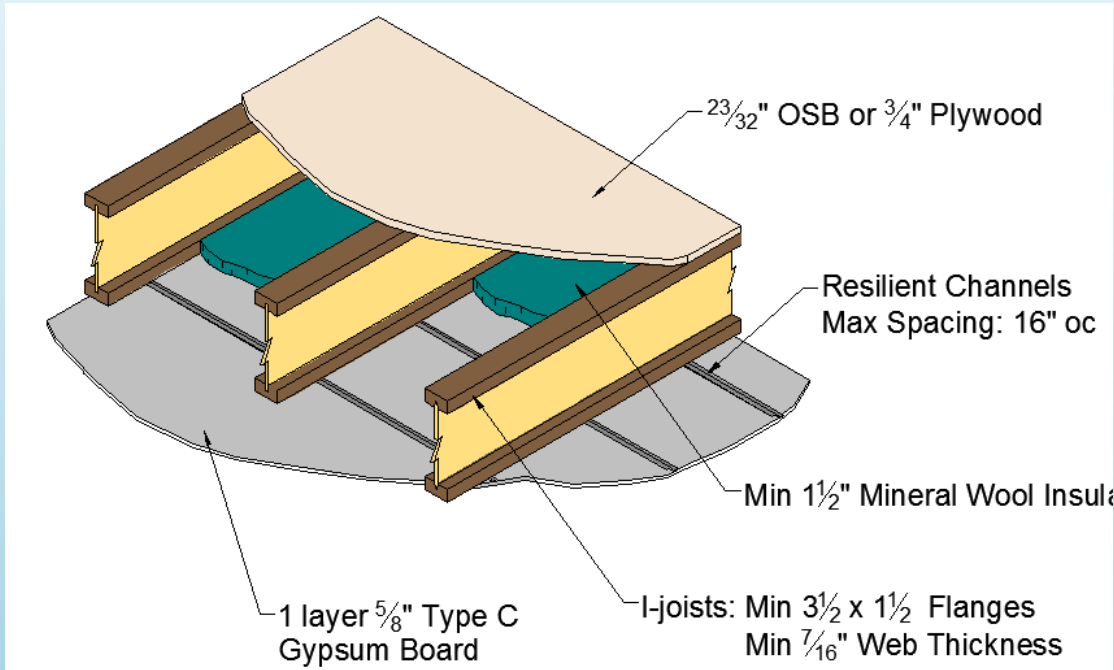
Option 2: Additional Single-Layer choices



Single-layer System - 2x4 flange
3/8" Web with Hat Channel



Single-layer System - 1x4 Strips



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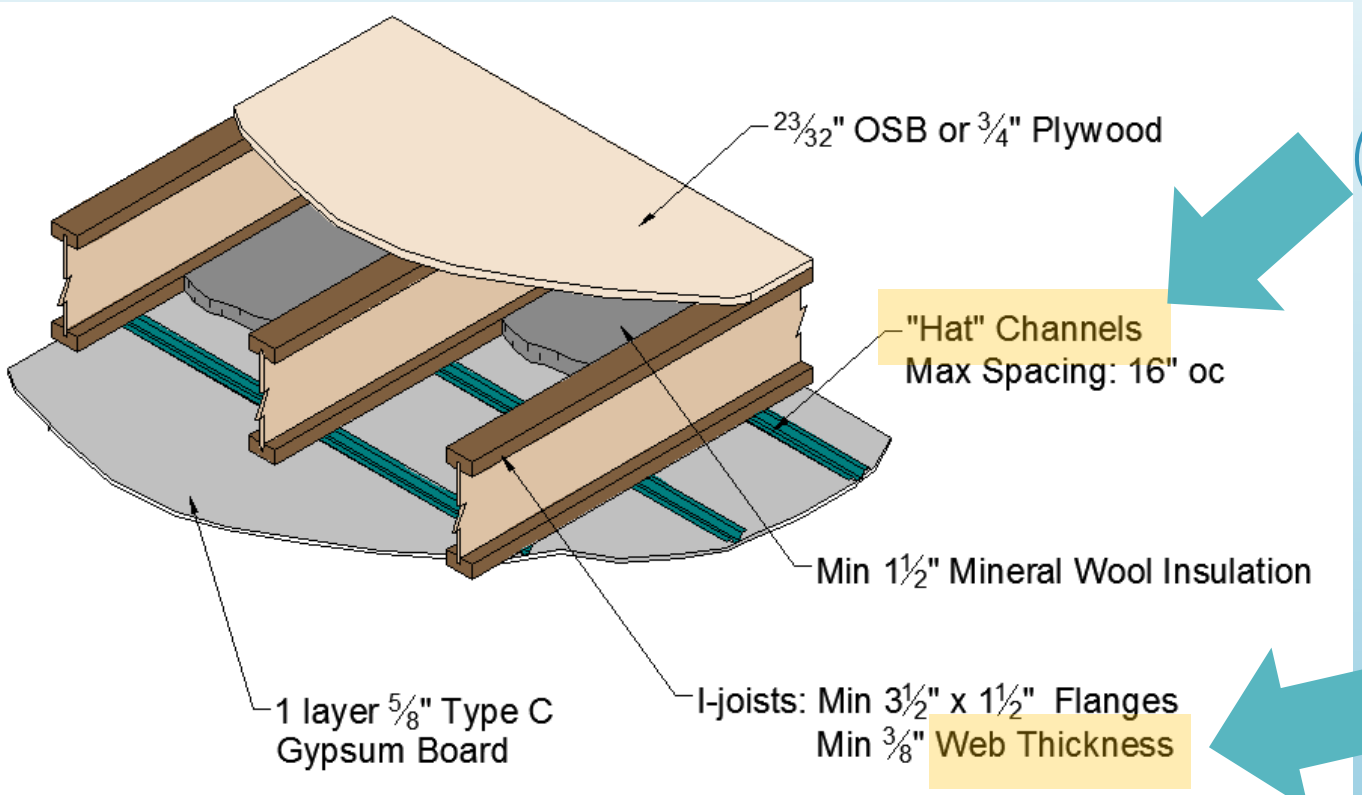


Single-layer System - 2x4 flange
3/8" Web with Hat Channel

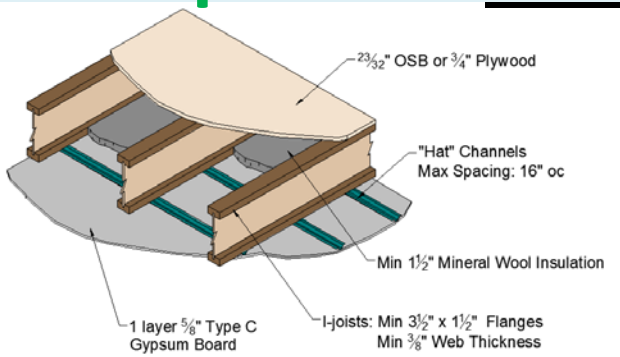
"Hat Channel": sound transmission properties are not as good

Thinner (3/8") web material

American Wood Council DCA-3

US Code reference, check with I-Joist supplier for Canadian options

Option 2: Additional Single-Layer choices



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3/8" Web with Hat Channel

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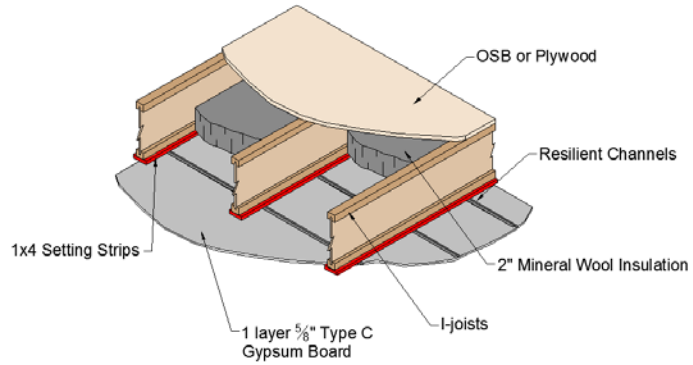
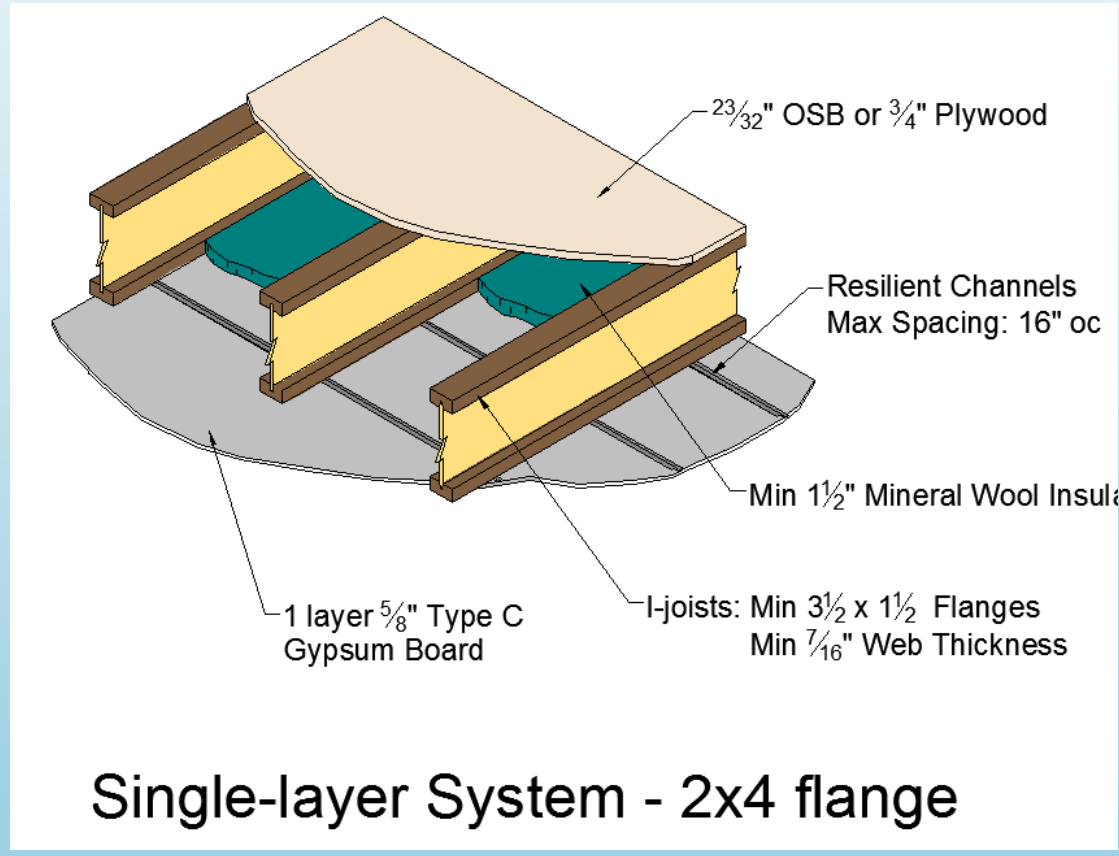


Single-layer System - 1x4 Strips

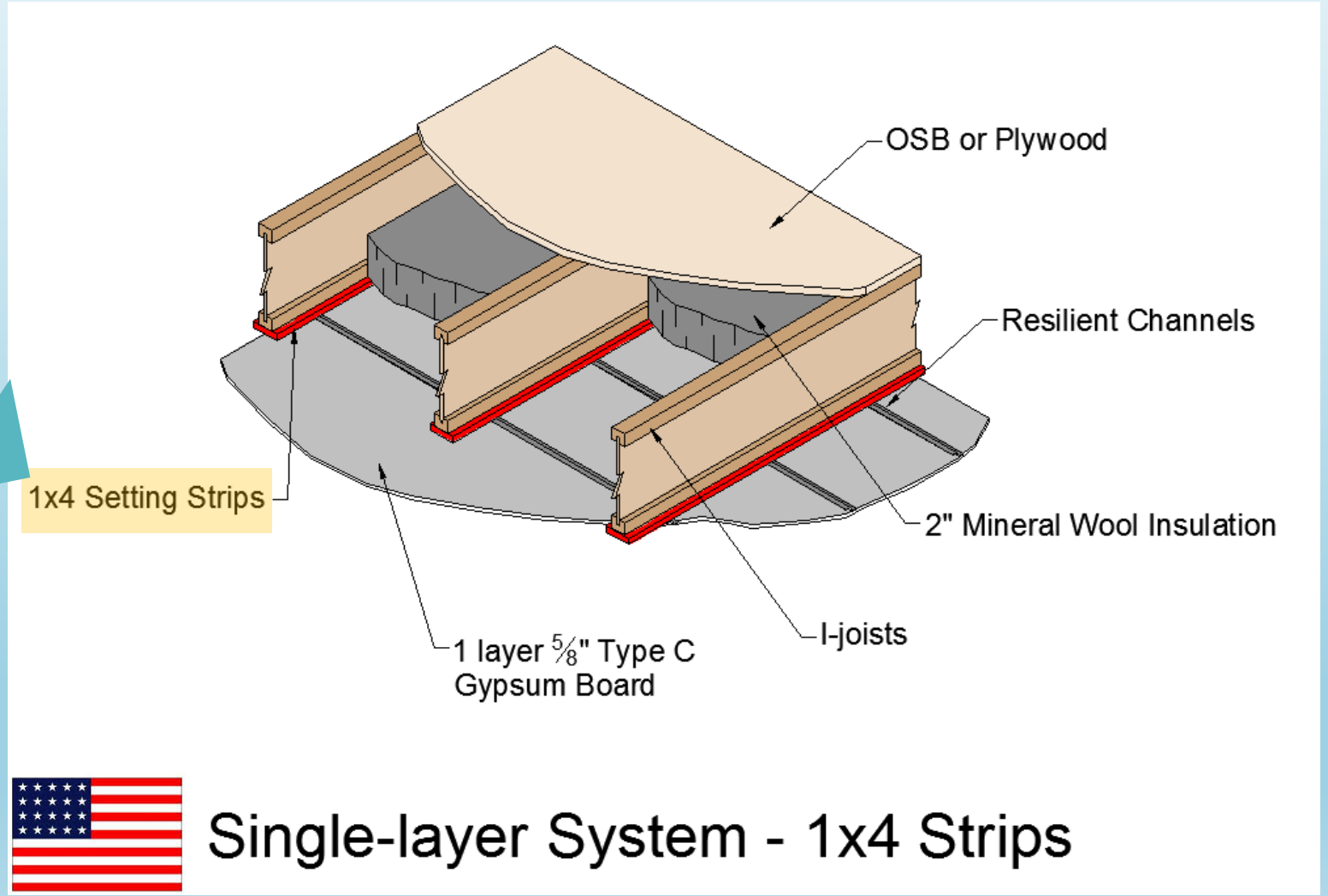


Single-layer System - 2x4 flange

Intertek® listing WNR FCA 60-07

Option 2: Additional Single-Layer choices

Most I-joist sizes, but
Must install additional 1x4
"Setting Strips"



American Wood Council DCA-3

US Code reference, check with I-Joist supplier for Canadian options

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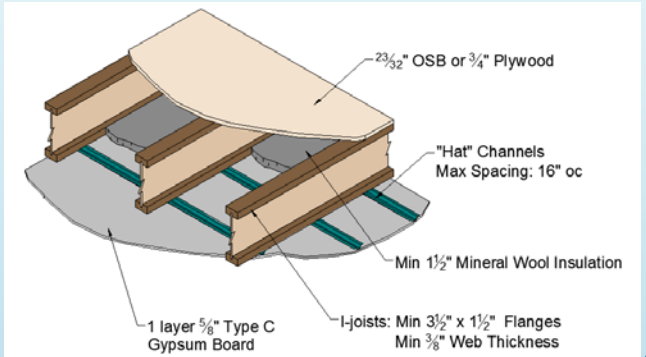
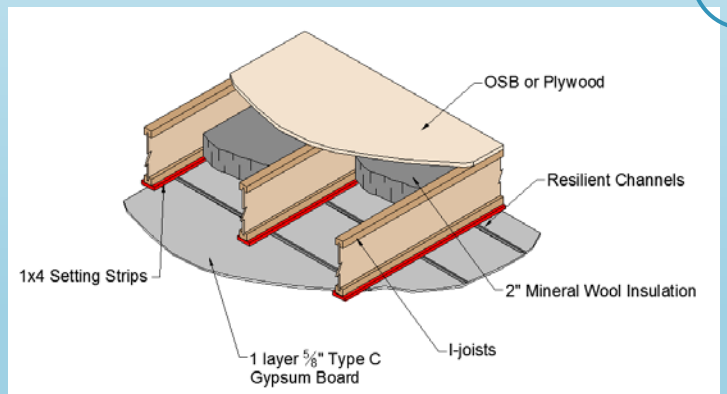
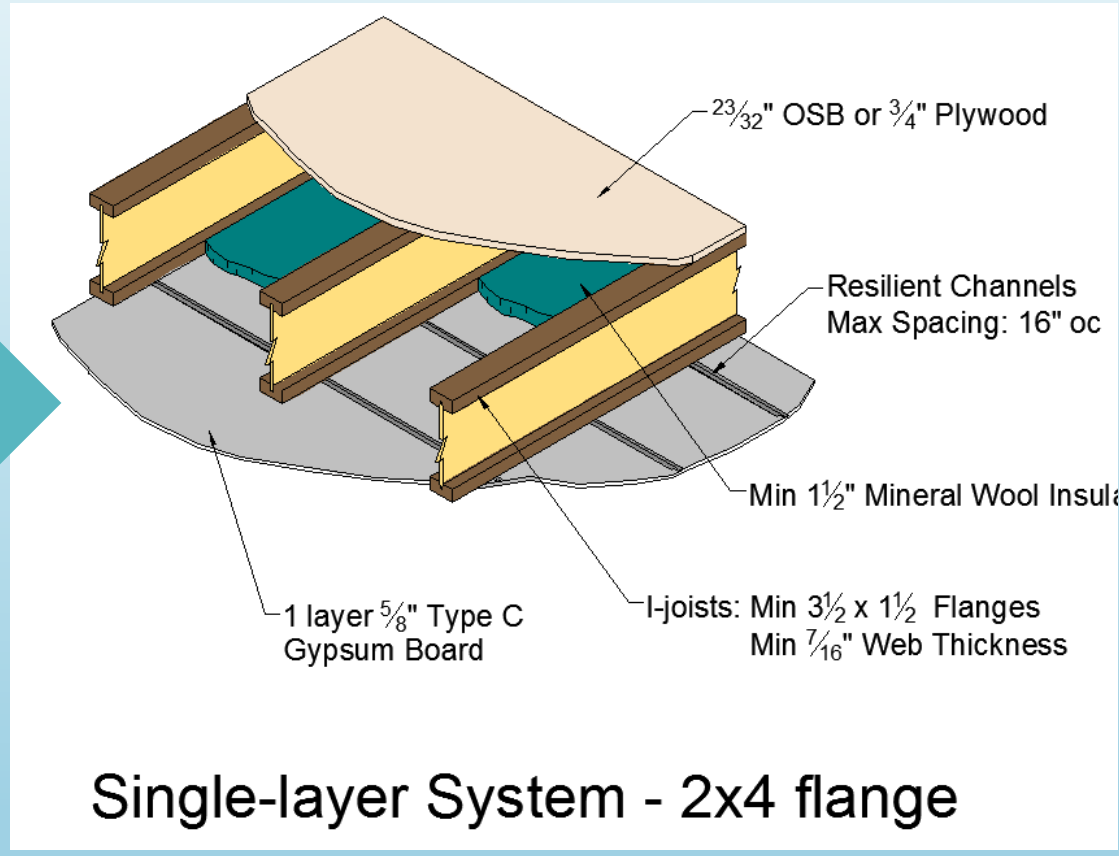


Single-layer System - 2x4 flange
3/8" Web with Hat Channel



Single-layer System - 1x4 Strips

(The most common choice in single-layer systems)



Single-layer System - 2x4 flange

Intertek® listing WNR FCA 60-07

How do you choose between “Double-layer” & Single?

Let's compare system costs (ballpark)

Large midrise project: 3 buildings
5 floors each wood
260,000 sq ft total floor area

Gypsum + I-Joists only (no beams, subfloor): ~$1.2MM

Double Layer: ("ballpark" figures)

Extra gypsum material (2 layers):	$40K (3%)
Extra gypsum labour:	$65K (5%)
Material savings for smaller I-joists:	< $47-200K > (4-17%)
Fibreglass savings vs Rock Wool:	< $26K > (2%)

Why the range of results?
Projects with "shorter spans" become more expensive if the fire-assembly requires large I-joists

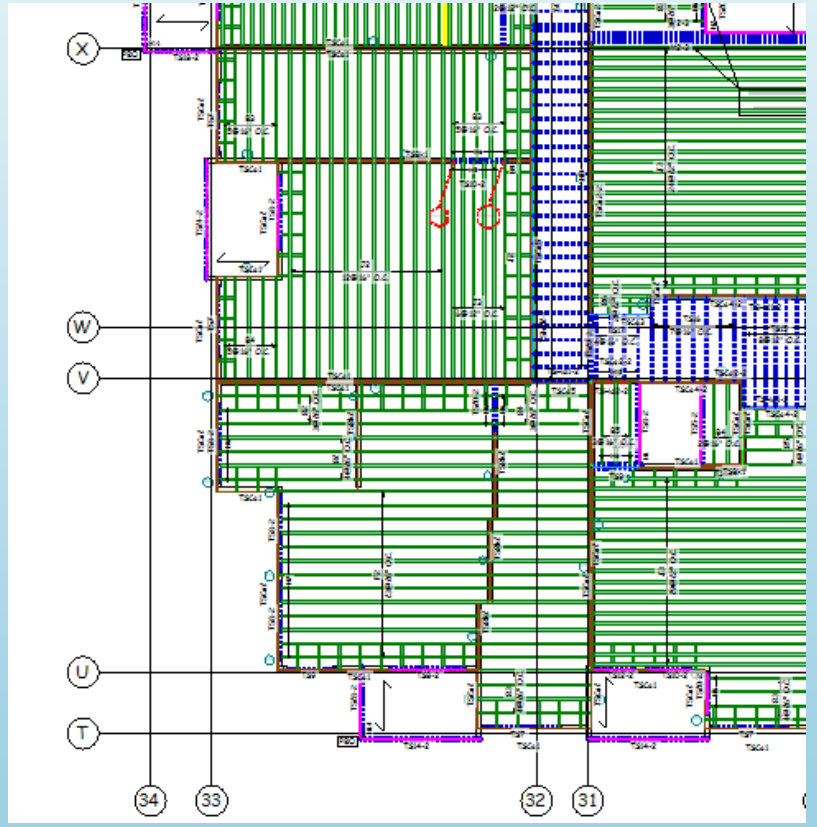
Range of results: $32K more for double-layer (longer span projects)
$120K less for double-layer (short span projects)

Choosing between “Double-layer” & Single Layer systems

Key Considerations:

(Nobody wants to design these structures twice)

- *consult with your structural engineer,*
- *“ acoustic consultant and*
- *“ an I-joist supplier for options.*



Fire-Assembly Listings:

See Handouts for list of relevant listings

Agenda

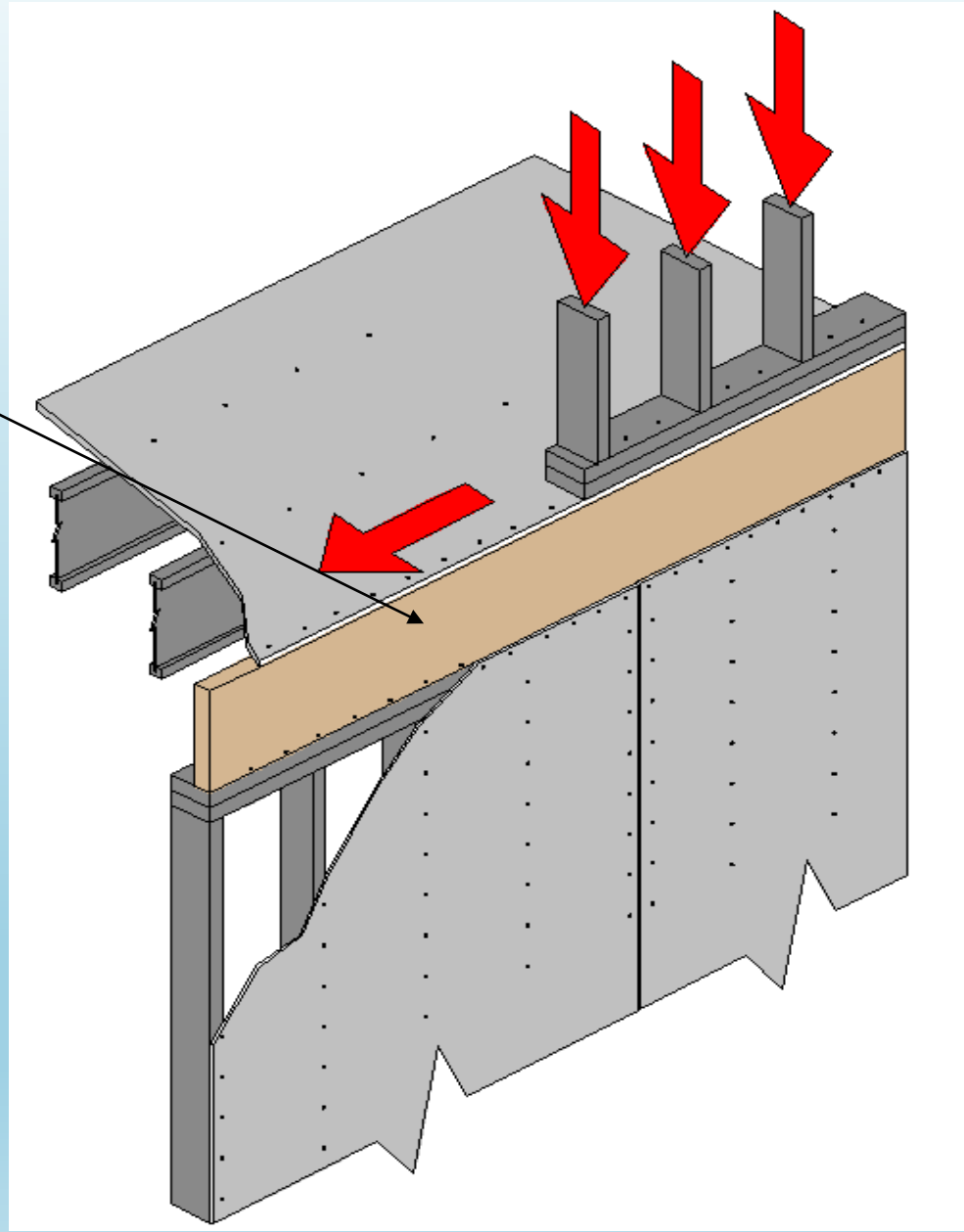
- Fire Assemblies
  - Important facts about Floor /Ceiling Assemblies
- Structural Components
  - The right products to meet NAILING CHALLENGES
- Supplier Qualifications
  - What to ask for, so that your designs are realized on site

Evaluating Rim Board Options

In a competitive project, you can be presented with many choices:

"OSB", "LSL", "LVL"…
what's the difference?

…quite a lot, it turns out

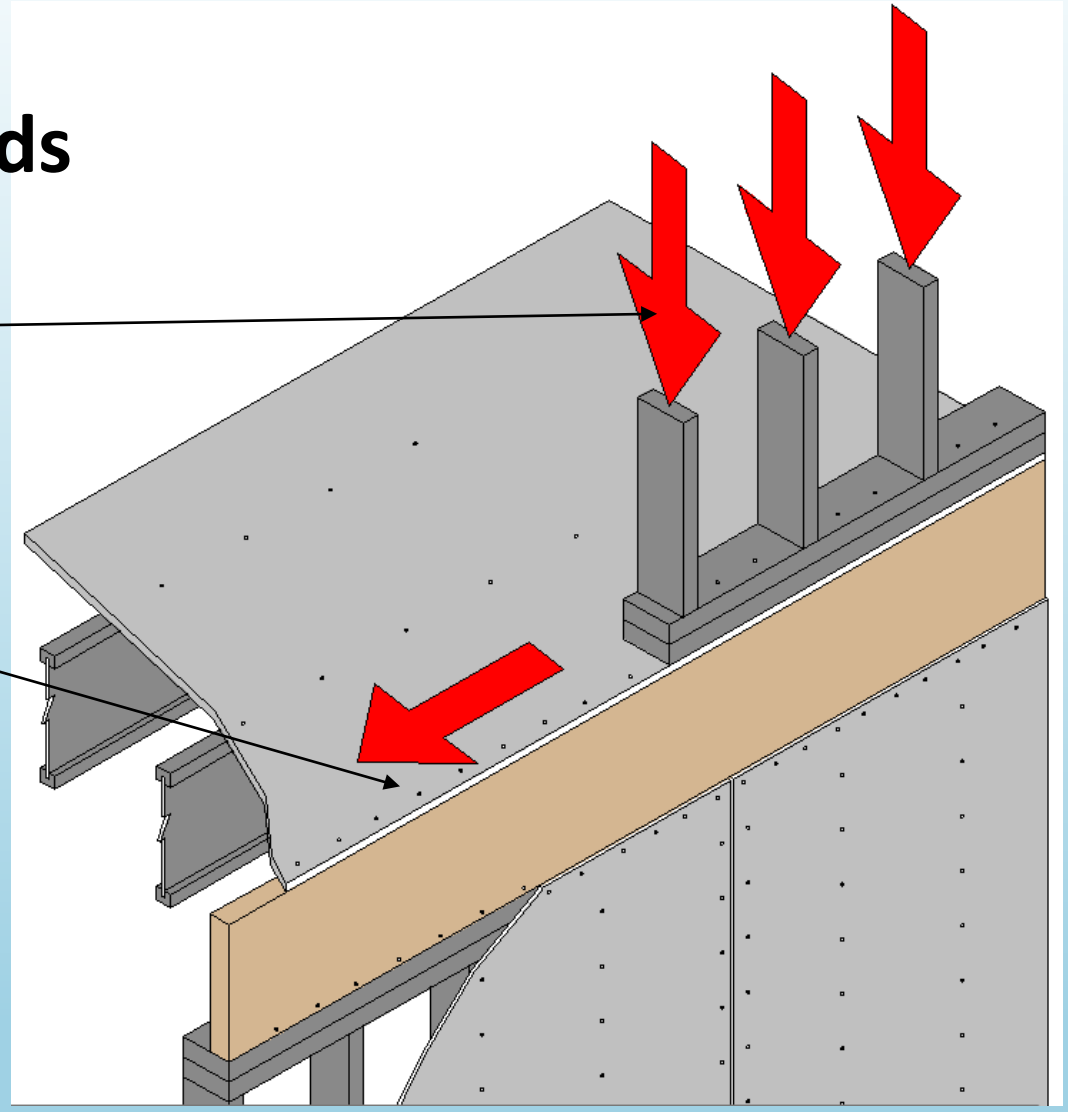


Support of Vertical & Lateral Loads

High vertical loads: supported by Rim Board.

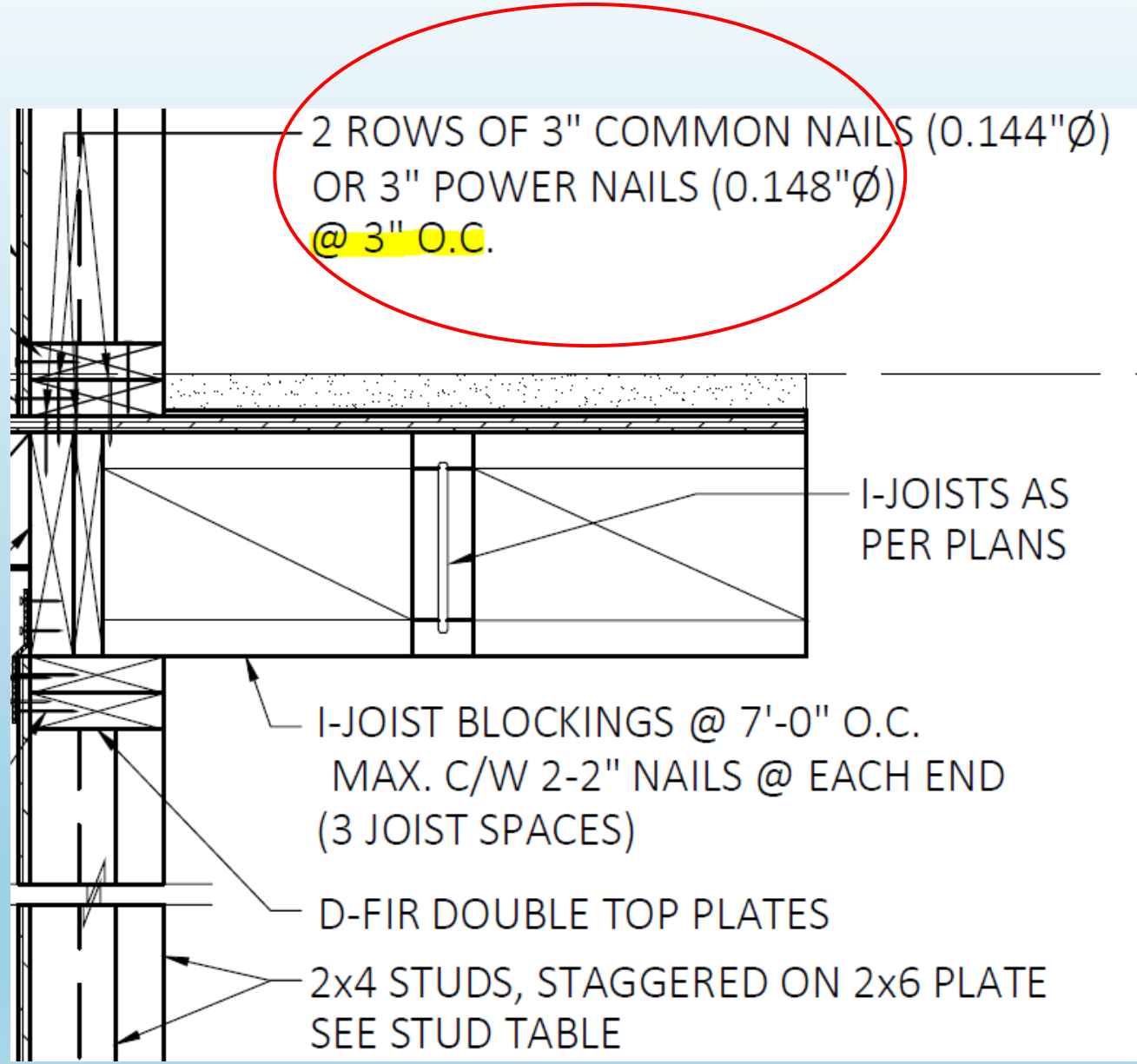
Nails (or Lag Screws) transfer shear loads through the Rim Board to wall below.

Some products can support this kind of nailing, some can't.



Nail Patterns in Midrise

What products are designed to take this type of nailing?



Nailing Comparison: “LVL” vs “OSB” vs “LSL”

TB-206 March 2017 (Expires 3/2019)

TABLE 2: STRUCTURAL COMPOSITE LUMBER[1]

Nail Size		Nails into Wide Face (Perpendicular to Strands)		Nails into Narrow Edge (Parallel to Strands)					Min. End Distance
		Microllam® LVL, Parallam® PSL	TimberStrand® LSL, TJ® Rim Board	Microllam® LVL	Parallam® PSL	TimberStrand® LSL[2], TJ® Rim Board			
						1 ⅛″	1 ¼″	1 ½″	1 ¾″ - 3 ½″
		On-Center Spacing		On-Center Spacing					
6d (2″) common & 8d (2 ½″) box	[0.113″]	2″	2″	3″	3″	6″	4″	3″	3″	2 ½″
12d (3 ¼″) box	[0.128″]	2″	2″	4″	4″	6″	4″	3″	3″	2 ¾″
10d (3″) common	[0.148″]	3″	2 ½″	5″	4″	6″	4″	3″	3″	3″

✖ ✖ ✔

Lower-cost rim board, suitable for Part 9 buildings

Thicker Rim Board

Engineers are also choosing 3½" thick Rim Board to permit use of lag screws.

✓ *Fewer connections*

✓*Easier Inspection*

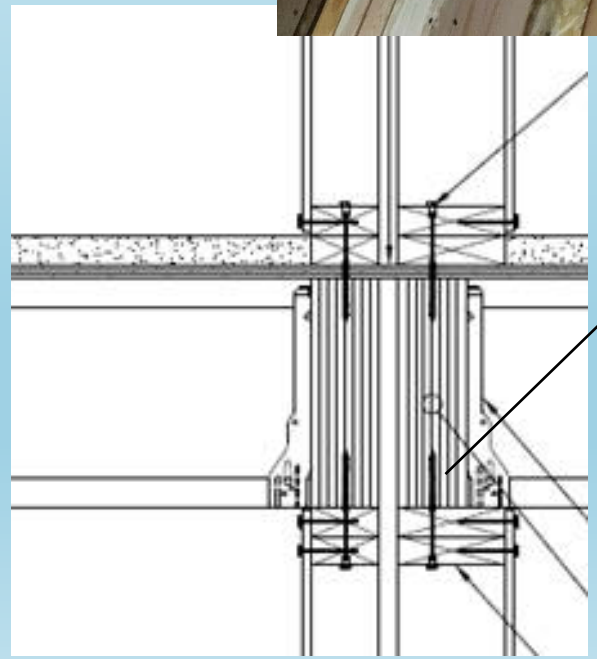


Photo Credit: Weiler Smith Bowers

Rim Board: “LSL” vs “LVL”

In extreme weather conditions…LVL can “cup” if it gets wet on one side.

(Not ideal as a rim board to carry large vertical loads.)

Some LVL is produced with veneers oriented at 90 degrees (like plywood) to mitigate this. That is not a common product in Canada

Rim Board: “LSL” vs “LVL”

“LSL” does not have the same tendency to cup if weathered.

- More stable in the vertical direction
- More suitable for vertical load support
- (It can swell in thickness though).

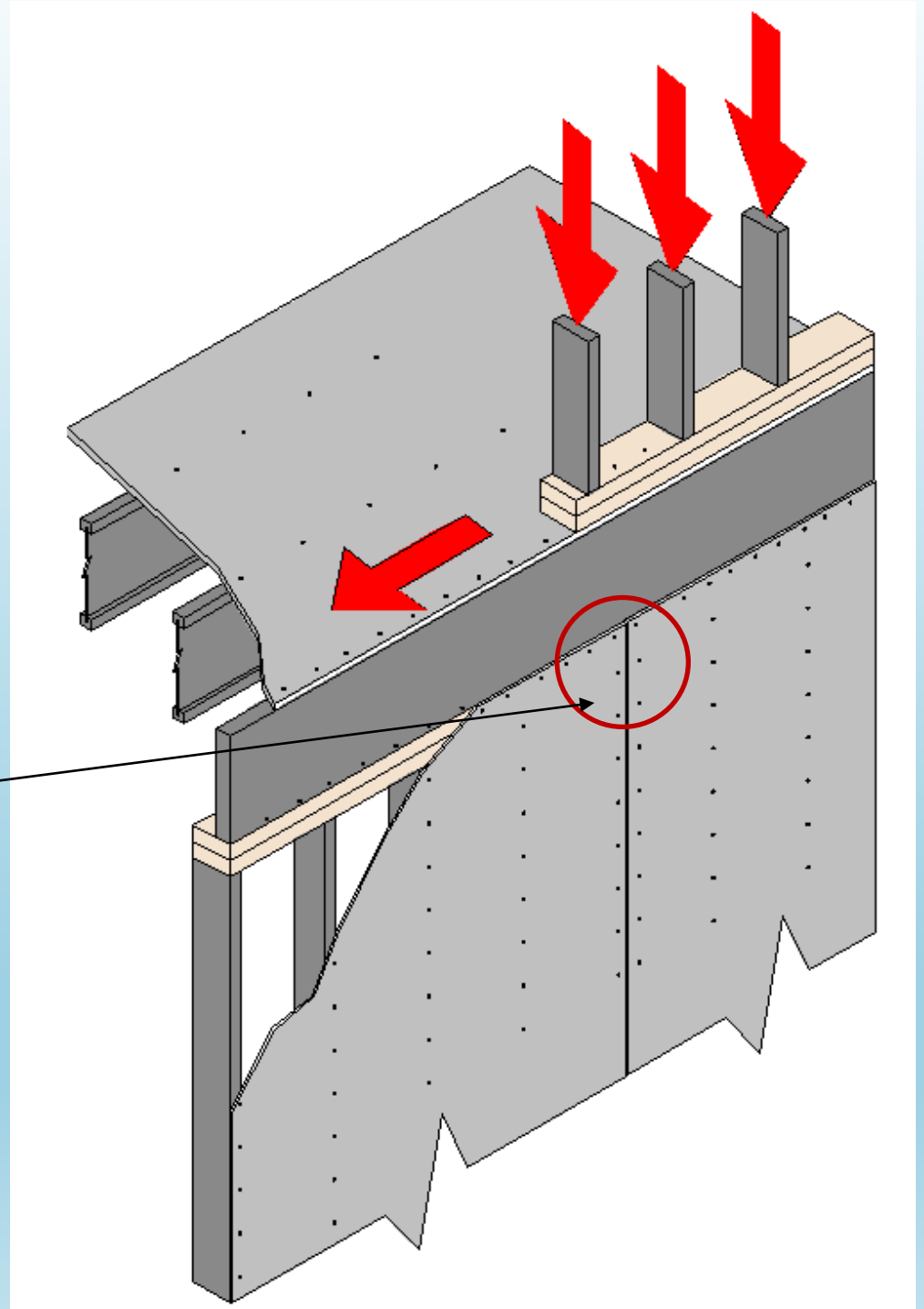
(Please don’t store your products like this)

Choosing Rim Board - Summary

Key Considerations:

- *Nail-spacing requirements may be too tight for standard 1-1/8” residential Rim Board*
- *LVL is great for beams, not the best option for Rim Board. Consider LSL or (where nailing permits) OSB*
- *Consider using lag screws and thicker Rim Board at high-load locations.*

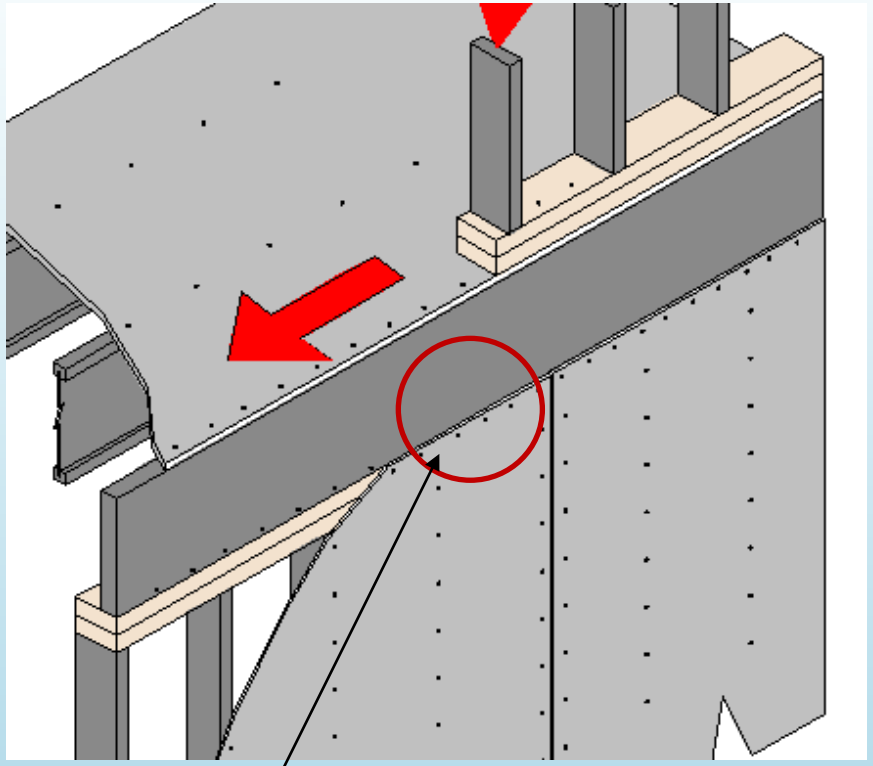
Wall Plates



Wall Plates

SHEAR WALL SCHEDULE

LEVEL	SHEATHING	SIDES	NAIL SPACING (in)	# COMP. STUDS (2x6)	BOTTOM OF WALL TO RIM CONNECTION	TOP OF WALL TO RIM CONNECTION
ROOF	1/2" OSB	1	6	4	SEE DET. 6H02 TYPE A	SEE DET. 6H0 TYPE A
5		1	6	4		
4		1	4	4		
3		1	3	4		
2		1	3	4		
FOUNDATION	5/8"ø BOLTS @ 16" O/C					



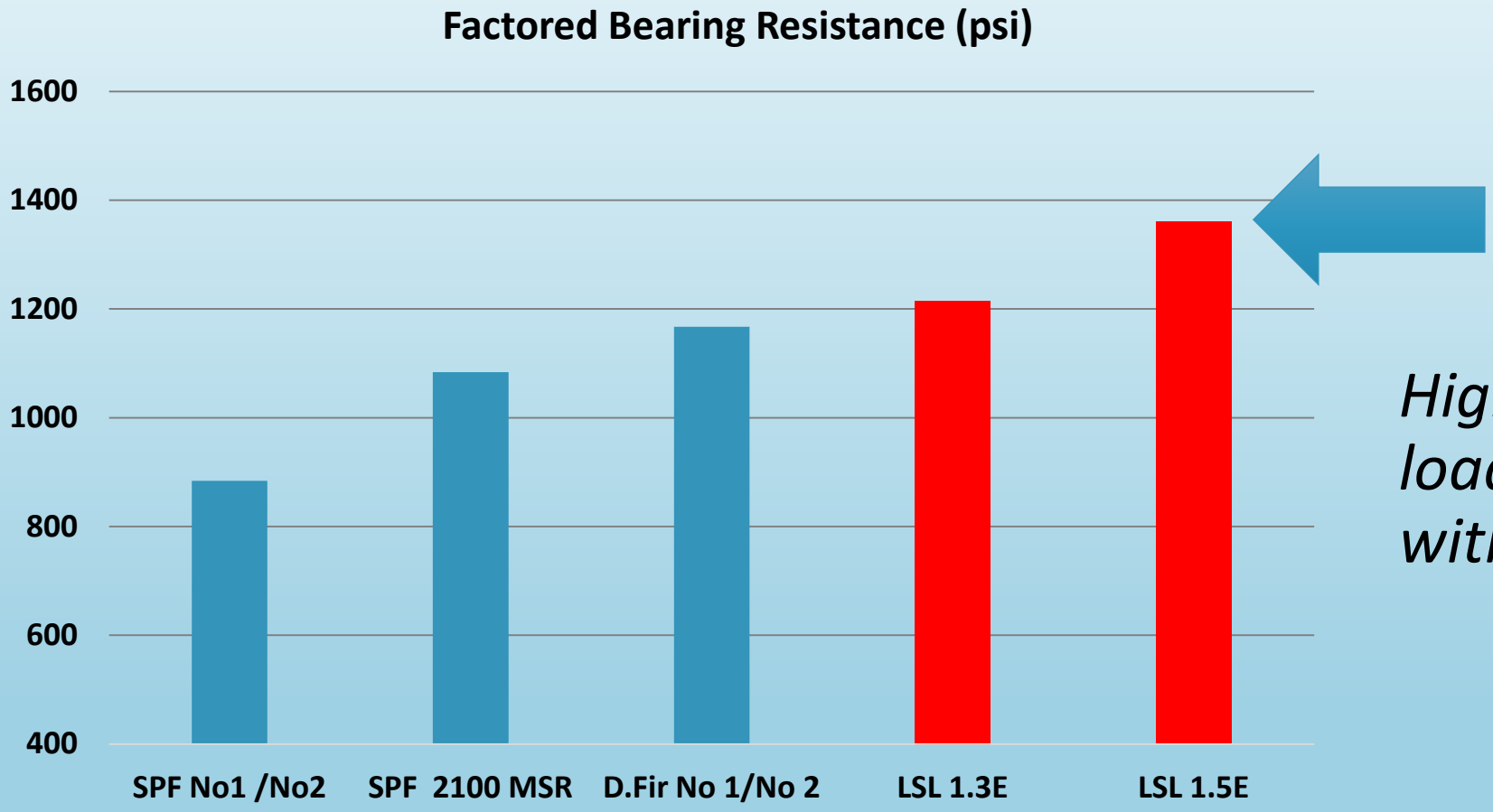
Tight Fastener spacing – even in wind-governed designs

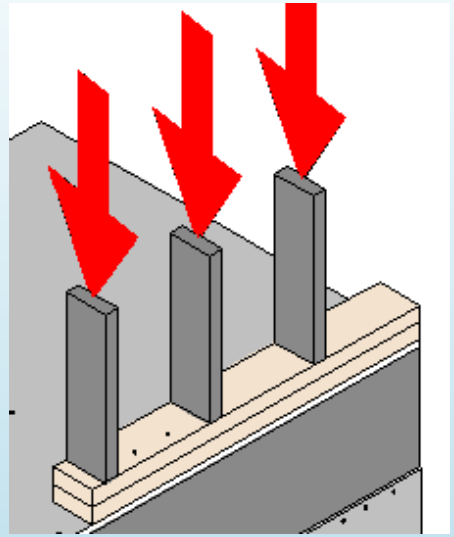
3-4” commonly specified; 2” in SPF occasionally

For Engineered Lumber: 1.5E LSL or greater is often needed

<u>Beware of substitution</u>

Wall Plates – Vertical Loads





Higher vertical load capacities with LSL plates

- ASTM D5456 now allows F_{cp} determination for SCL based on « proportional limit »

Wall Plates

Effect of LSL plates (1.5E) on wall capacity:

		Estimated Wall Load Capacity Increase using LSL wall plates		
		1.5E LSL (Plates only)		
	Width	8' Wall	9' Wall	10' Wall
No.1/No.2 SPF	2x4	0%	0%	0%
	2x6	28%	17%	4%
	2x8	41%	34%	26%

Choosing Wall Plates

Key Considerations:

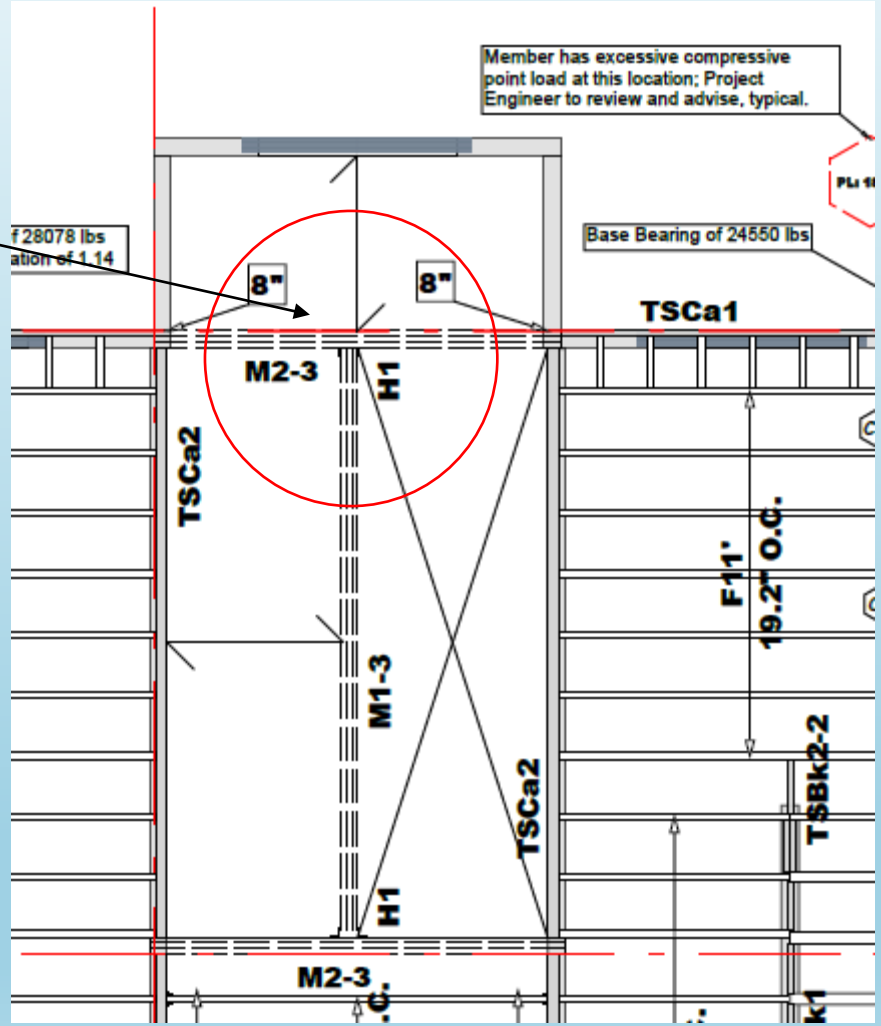
- *Consider 1.5E LSL Wall Plates for high load & nailing capacity*

“Bolt-Free” Beams vs “Multi-Ply” Beams

“Bolt-Free” Beams

Large “side loads” invite potential issues

- Correct connection pattern?
- Installed beam correctly?



“Bolt-Free” Beams vs “Multi-Ply” Beams

It takes time and extra materials to assemble a multi-ply beam

A quicker, more reliable installation process:

- 1-piece PSL, LVL or LSL
- Glulam beams can also be a solution, just watch that dimensions match other components.

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Engineered Lumber Tools & Services

There is a Range of Products and Services out there

"Supply–only"
Attractive price
Limited support

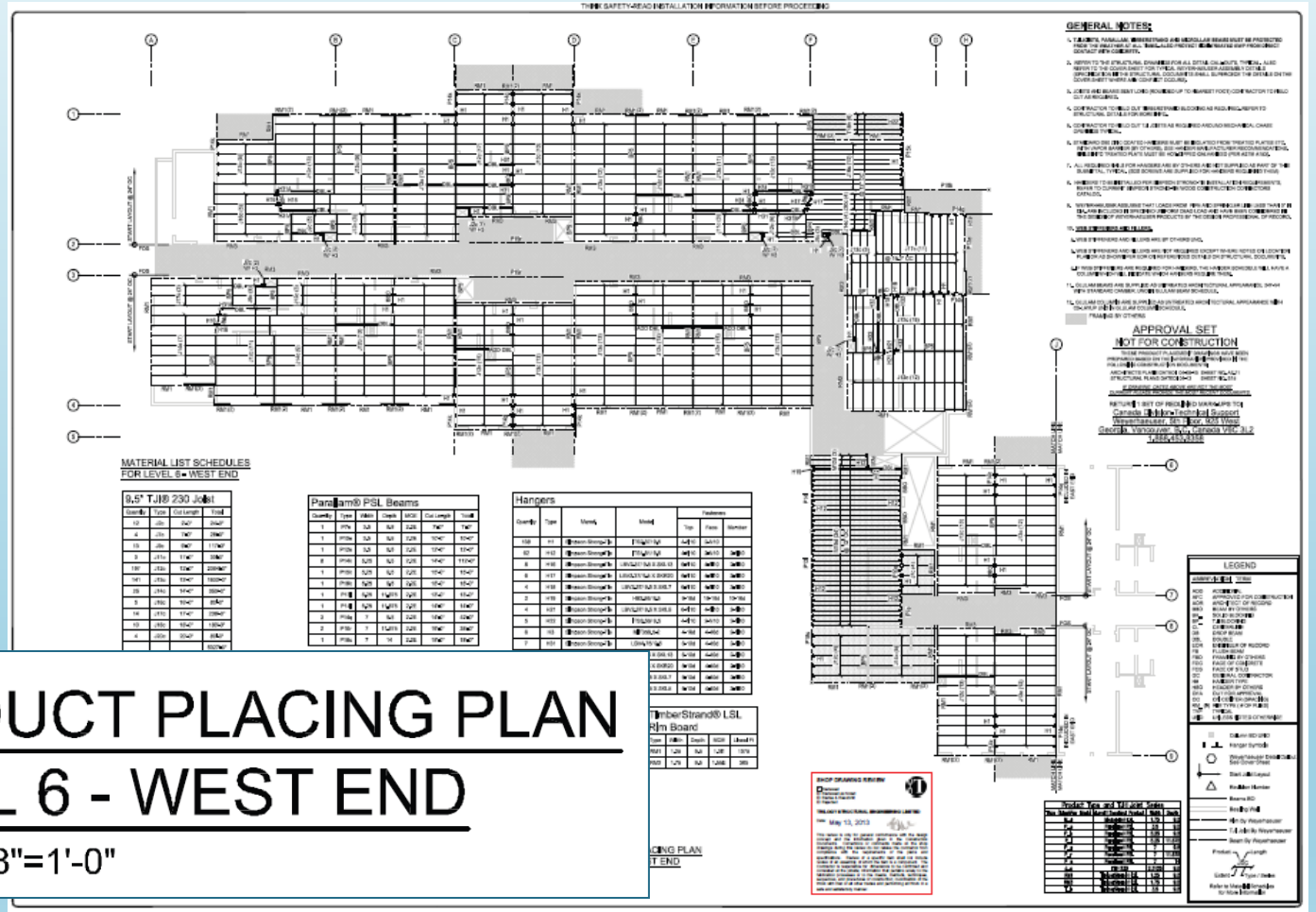
SF design services

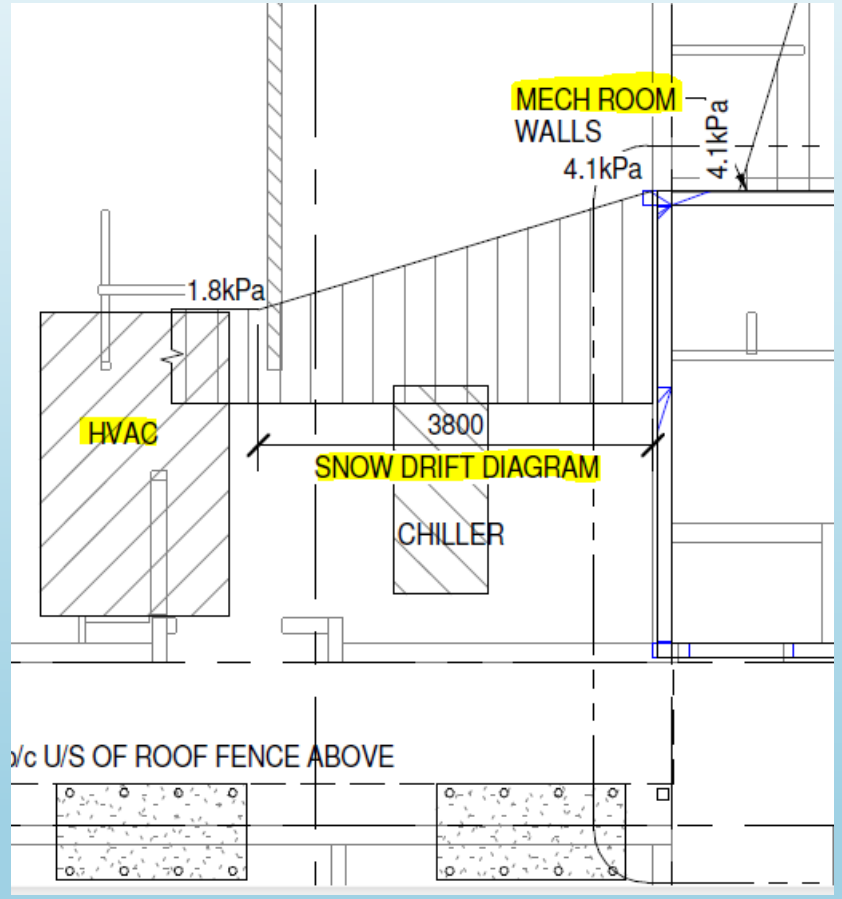
MF expertise

- Higher material cost
- *Experience required in Wind uplift, Snowdrift, RTU support, Anchorage, Fire, Shearwalls, etc*

- Consultation & Potential Savings in overall project

Services: Placement Plan? Design? Fabrication?





Questions to ask about your ELP supplier

Key Considerations:

- *Can they demonstrate the expertise to offer design service appropriate for large multi-family structures? (References, examples)*
- *What services are offered: Supply only? Or committed to resolve project issues up front at quote /design stage?*
- *Responsiveness to changes as the project progresses?*
- *Will they switch products without consultation, or honour your specification?*

Thank You! Questions?