WOODWORKS

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Building Enclosure Design and Detailing to Account for Wood Shrinkage

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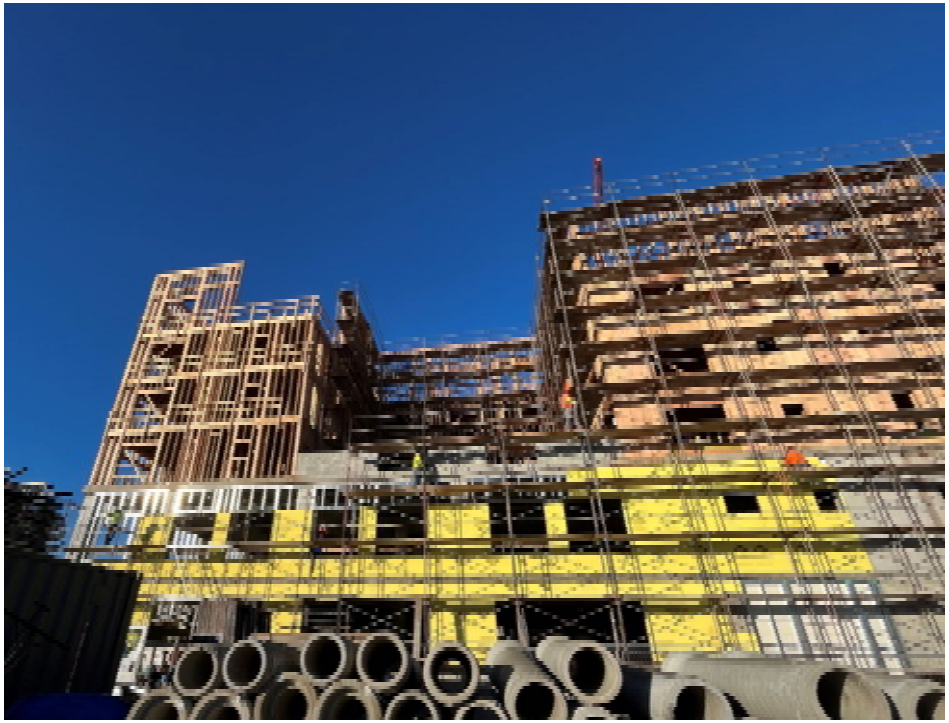
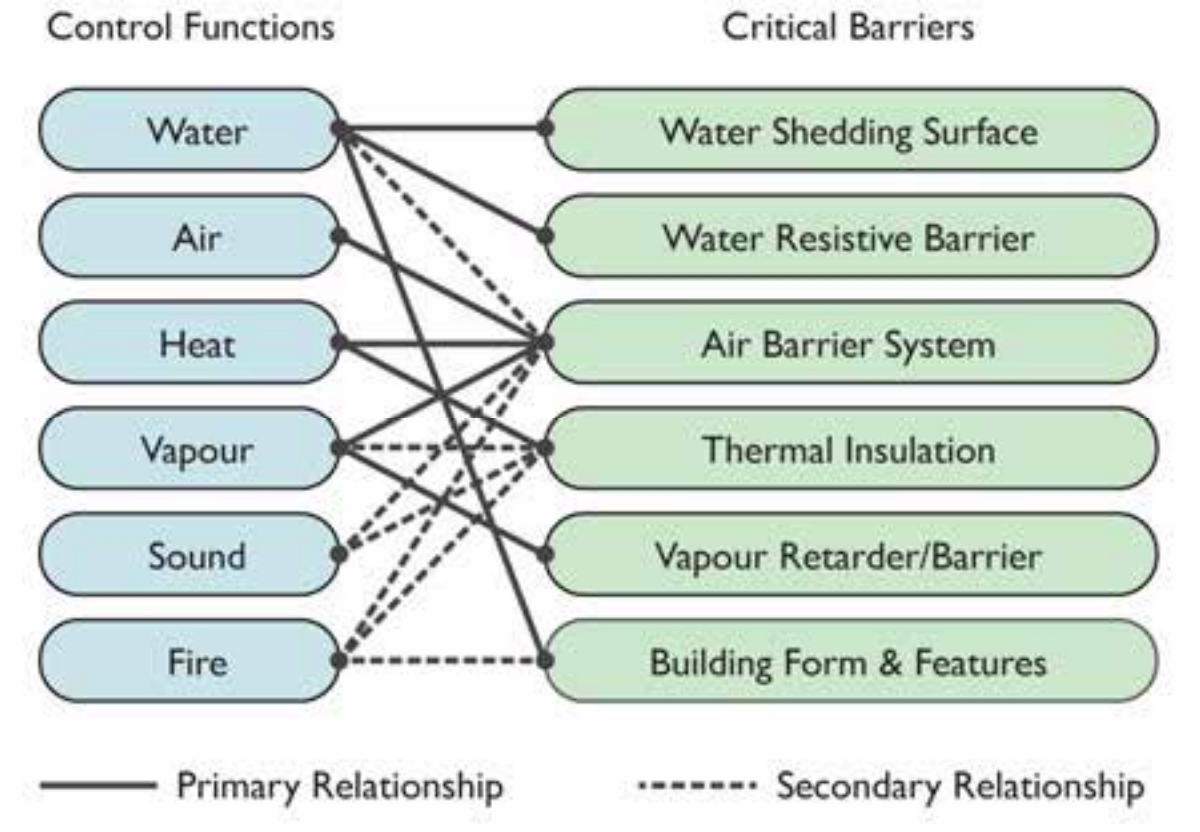
Shrinkage of Wood During Construction

- Wood-frame Shrinkage
  - Total shrinkage dependant on amount of tangential/radial grain wood and initial moisture content
  - Differential movement is a real concern when detailing, especially for taller wood-frame buildings
- Cumulative shrinkage for 6-story wood-frame building at roof eave.

Case	Estimated Shrinkage at Eave	
	(mm)	(inches)
#1 – S-GRN joists and S-GRN plates	146	5¾"
#2 – S-DRY joists and S-DRY plates	74	3"
#3 – Dried S-DRY joists and dried S-DRY plates	46	1¾"
#4 – SCL joists and S-DRY plates	42	1⅔"

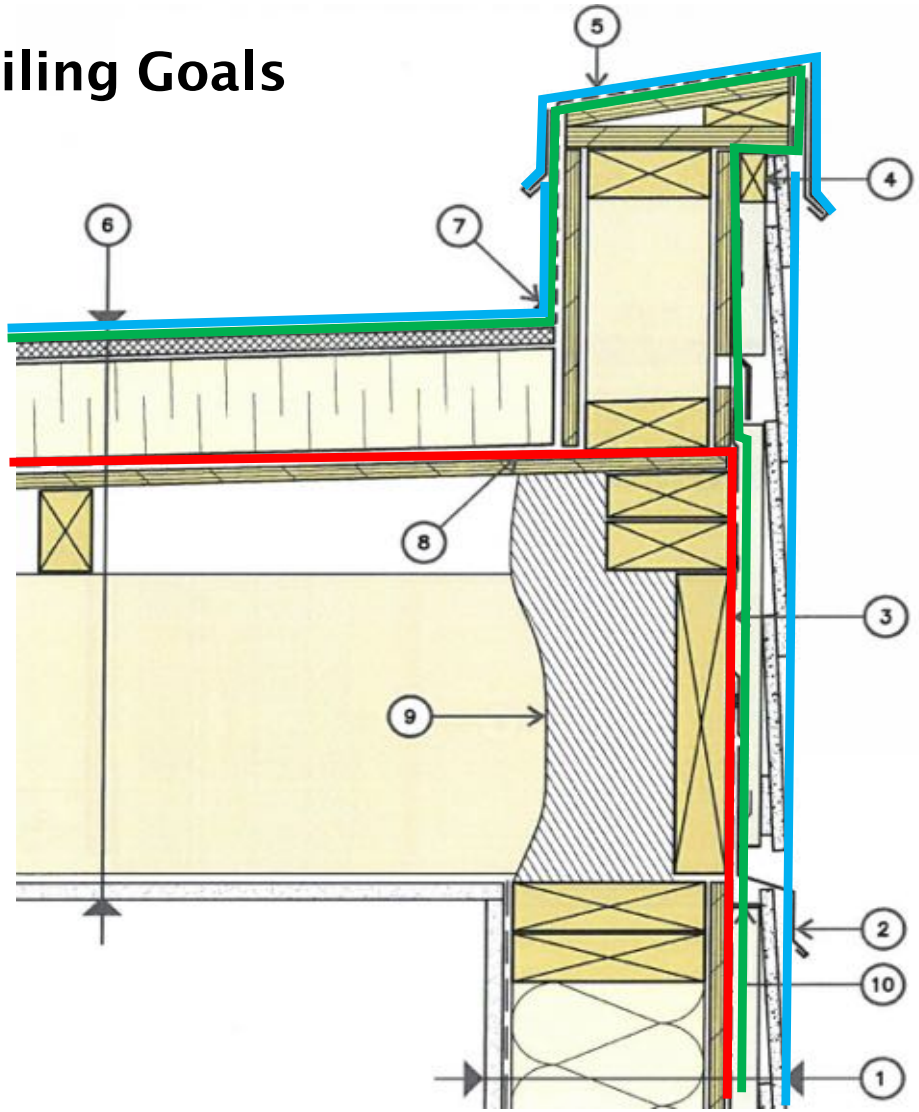


Building Enclosure Detailing – Control Functions and Critical Barriers

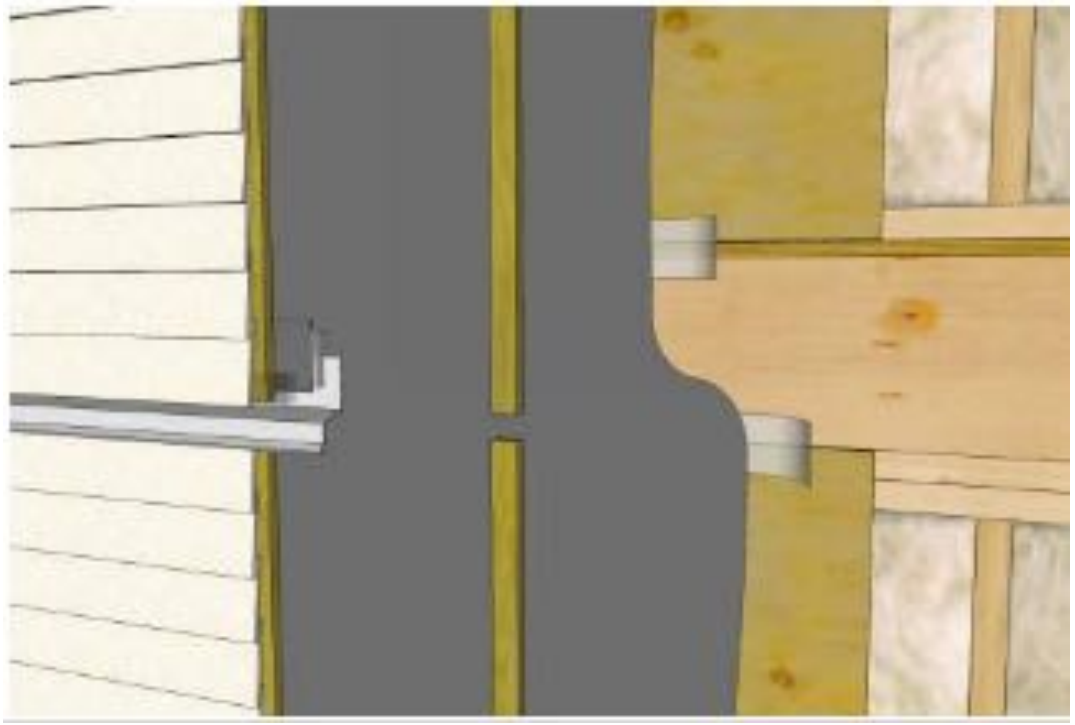


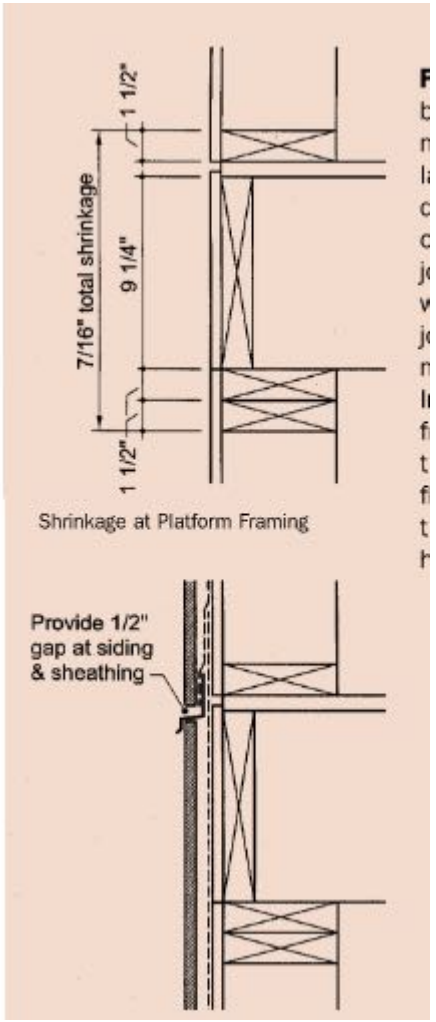
Building Enclosure Design and Detailing Goals

- Continuity of control layers within and between assemblies:
  - Water shedding surface
  - Water resistive barrier (WRB)
  - Air barrier
  - Thermal layer
  - Vapor barrier (if appropriate)
- Allowing for movement, maintaining fireproofing, accommodating structural requirements and aesthetics



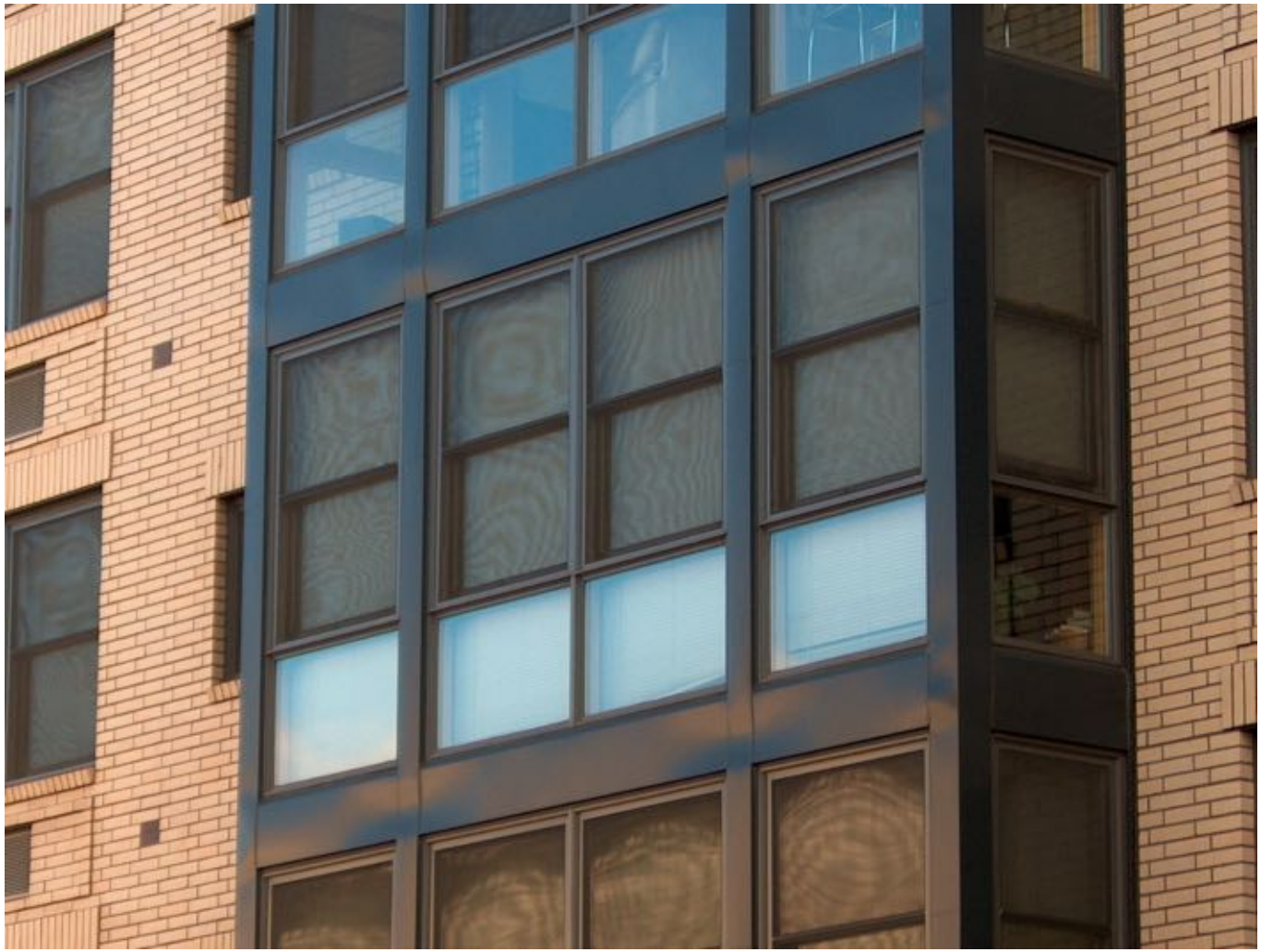
Allowing for Wood-Frame Shrinkage



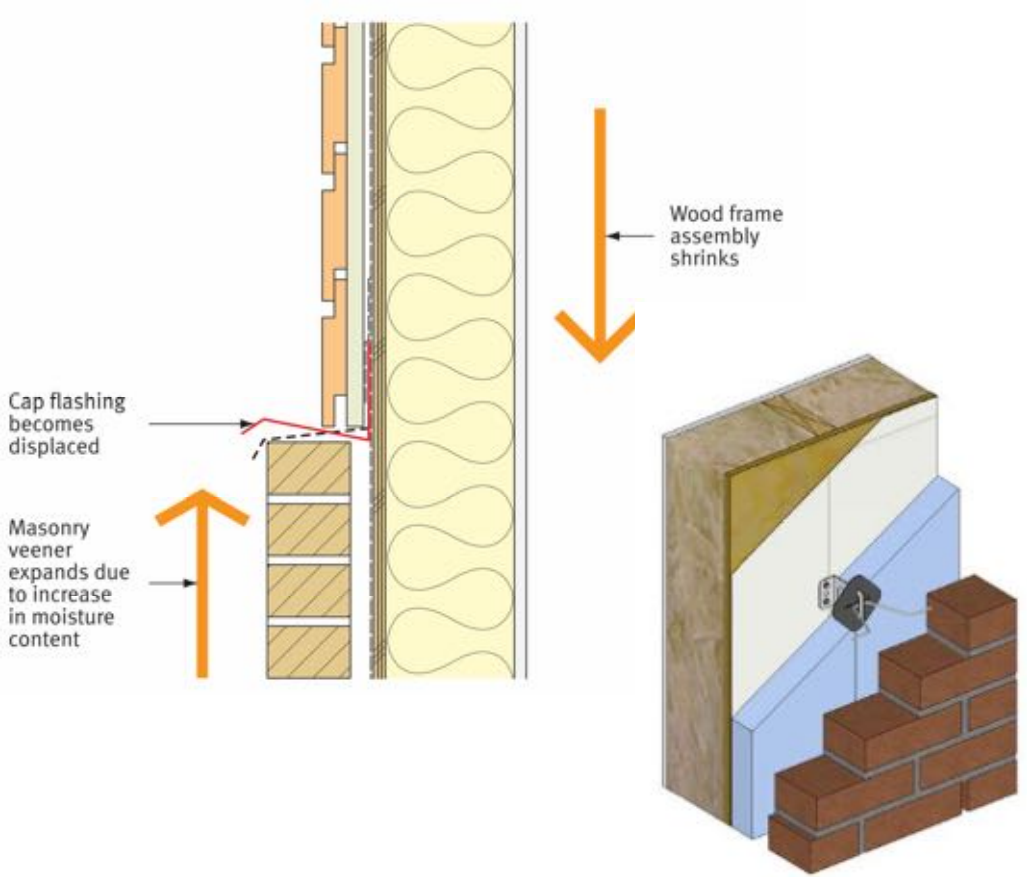


Canadian Wood Council – Moisture and Wood-Frame Buildings

Allowing for Wood-frame Shrinkage

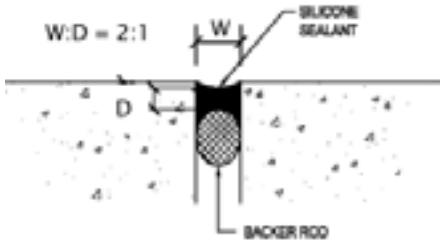


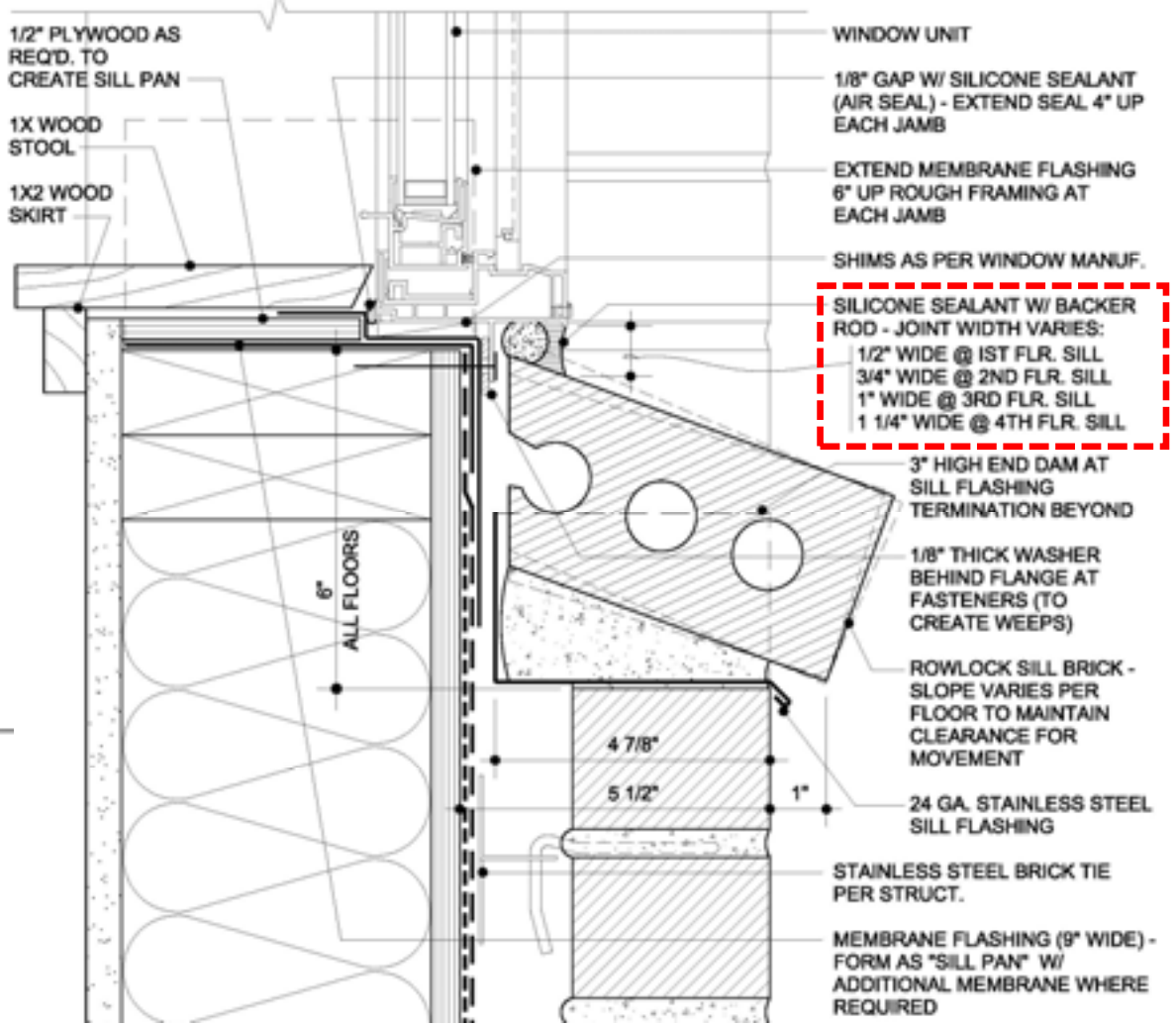
Detailing for Differential Shrinkage



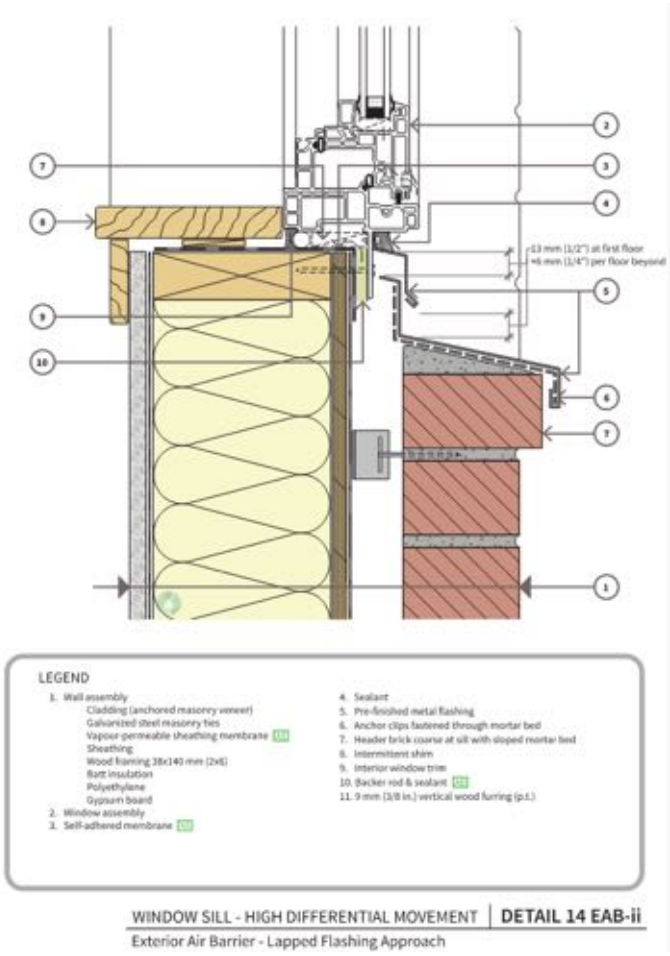
Lessons Learned from Wood-frame Shrinkage

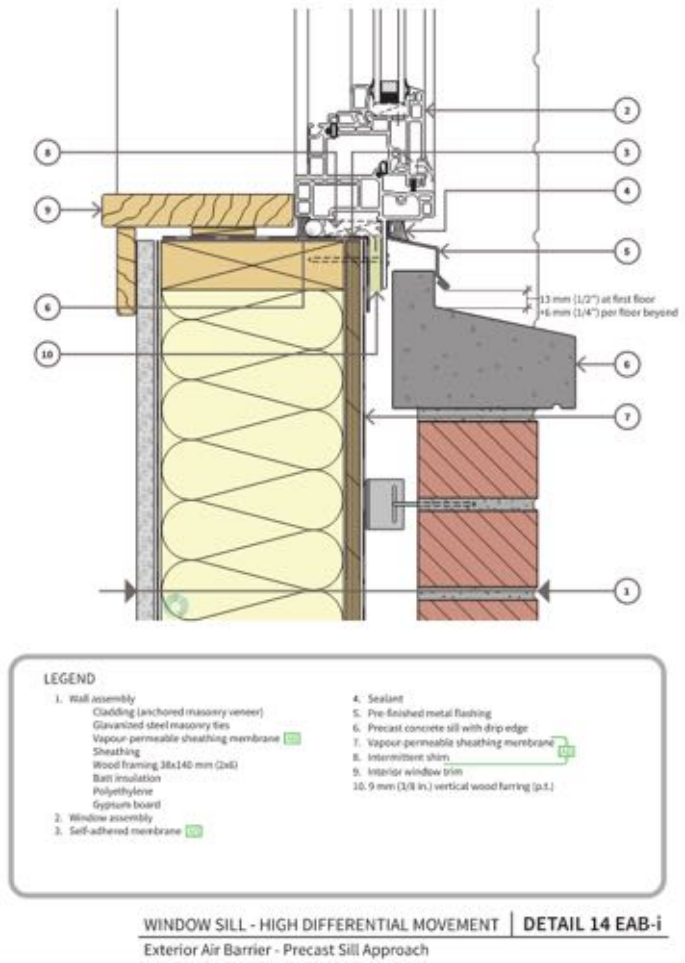
Window Sill Detail – Sealant Joint Method





Window Sill Detail – Two-Piece Flashing Method

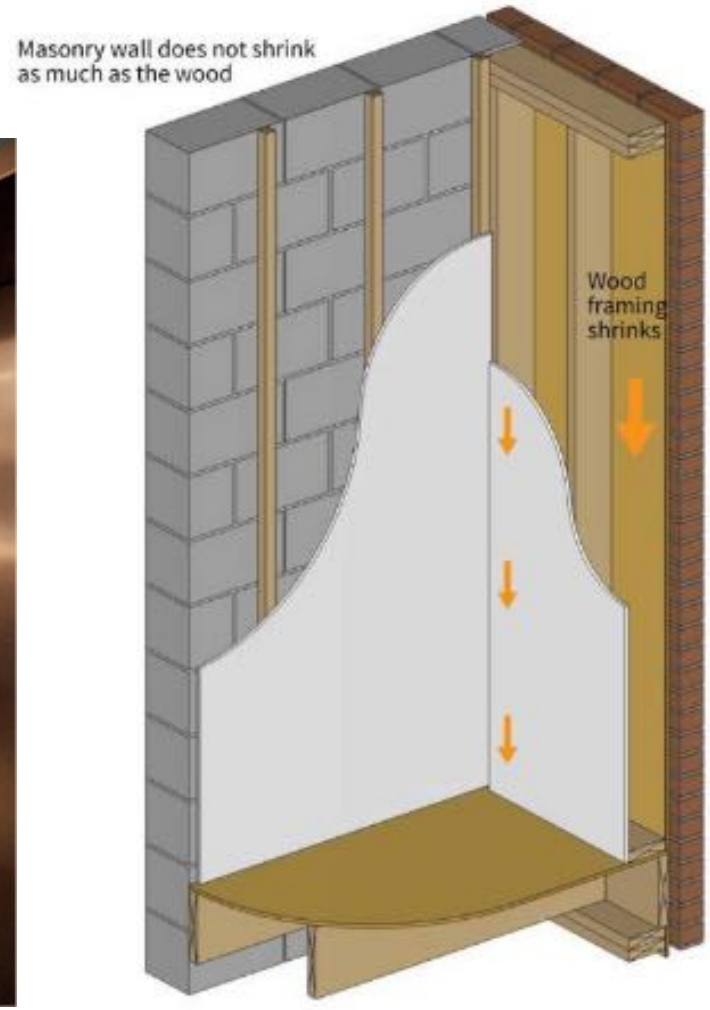




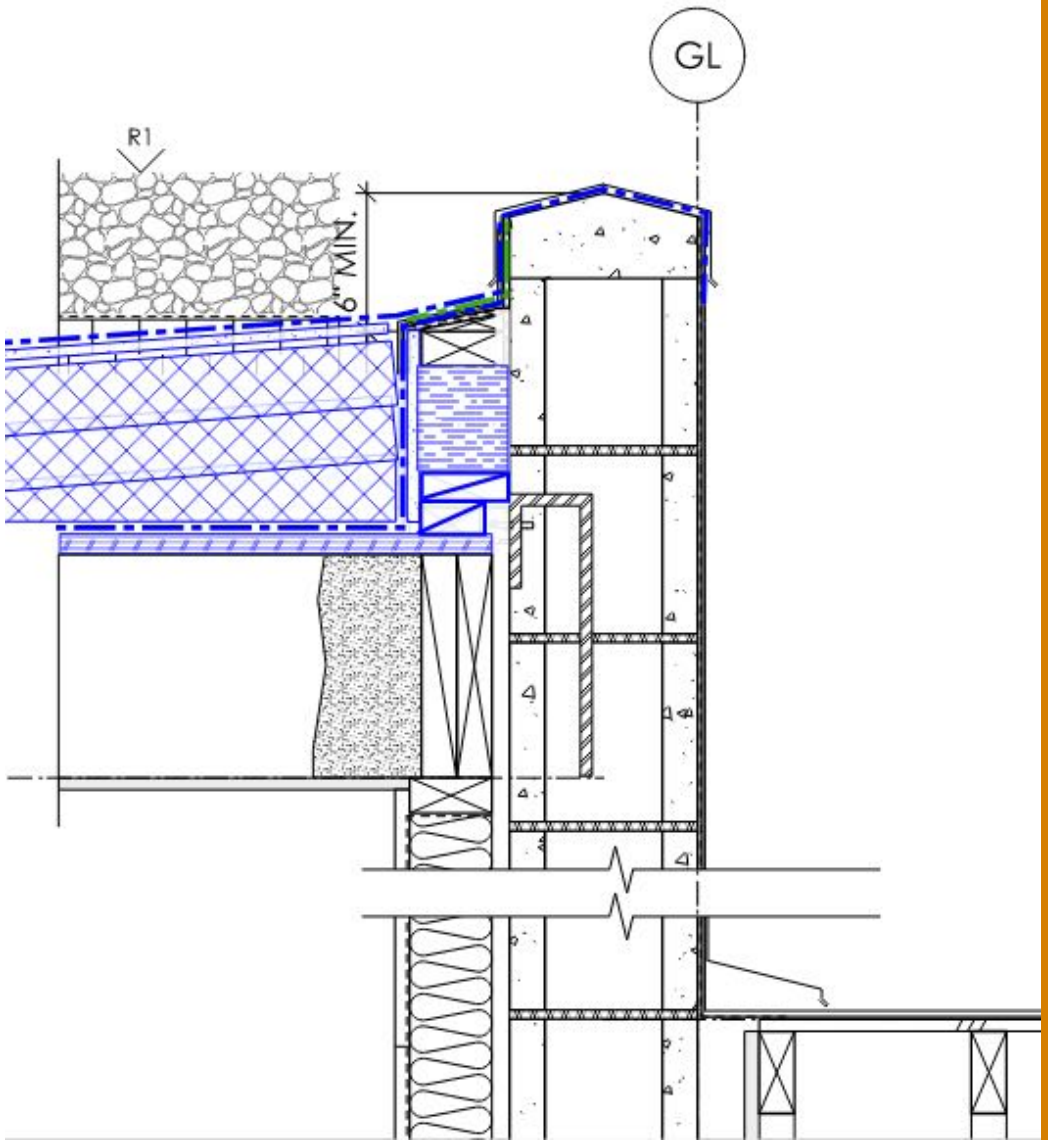
Window Sill Detail – Sliding Flashing Method

Masonry Wall Interfaces

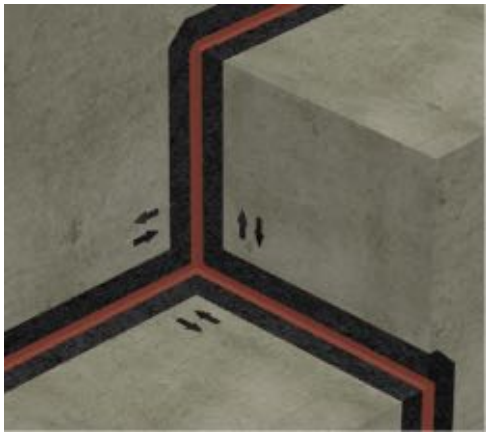
- Elevator walls
- Fire walls
- Zero lot line walls
- Chimneys

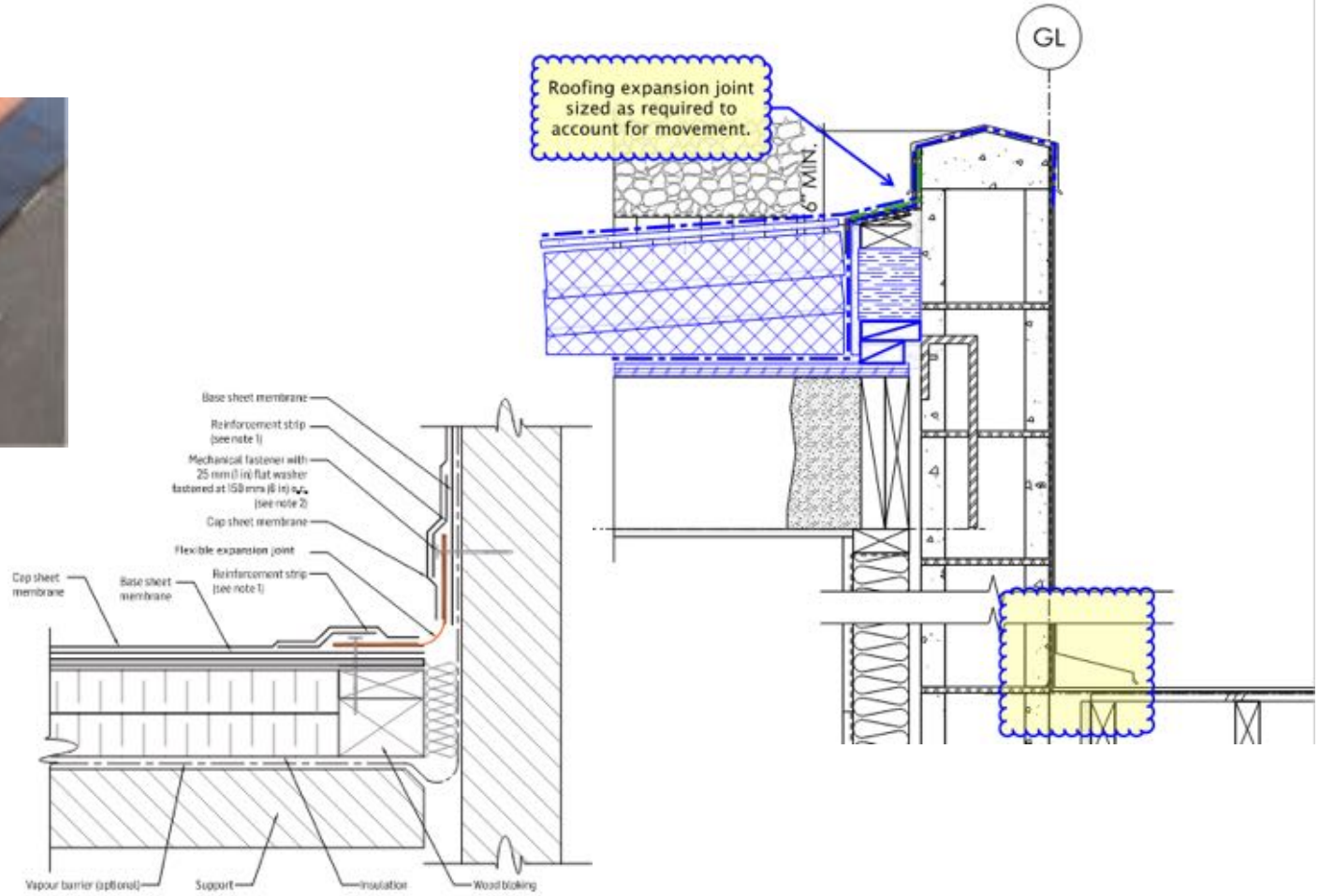


Masonry Walls



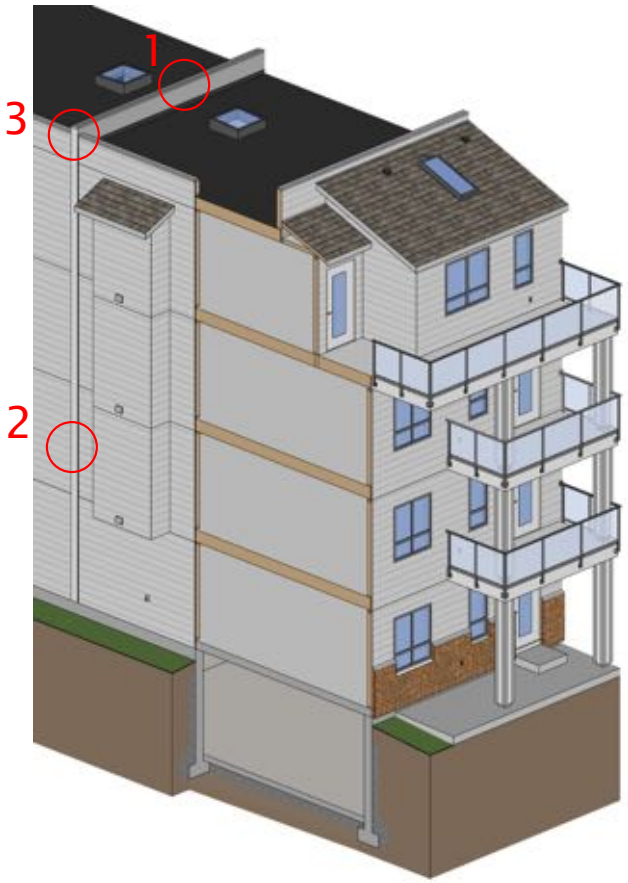
Masonry Walls



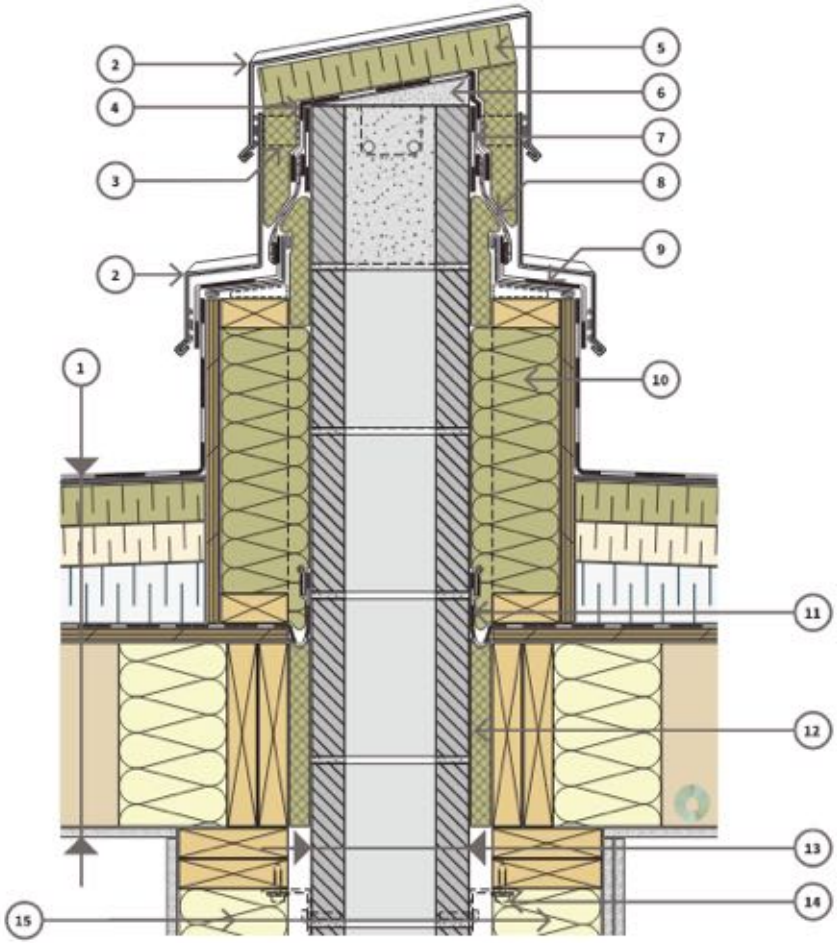


Firewall Detail Locations

1. Roof at firewall parapet
2. Exterior wall perpendicular to firewall
3. Interface between these two

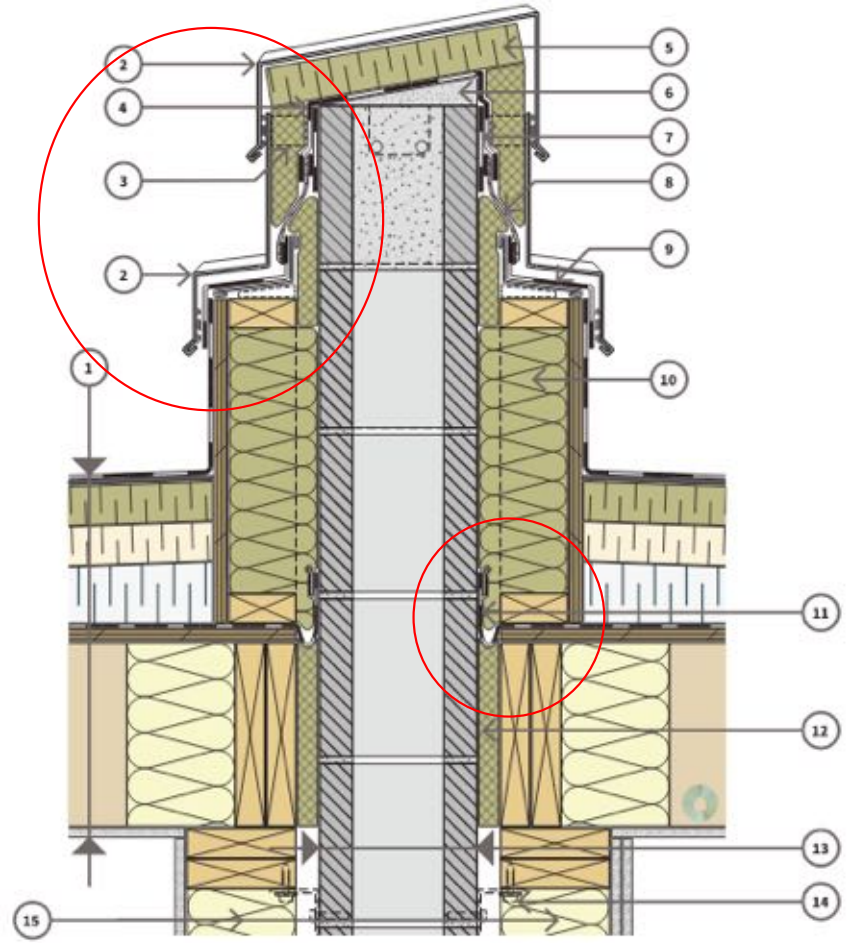


CMU Firewall Example Detail - Roof



1. Roof assembly
   - Roof membrane
   - Protection board
   - 2 layers 50 mm (2 in.) rigid insulation
   - Tapered rigid insulation to provide slope
   - Self-adhered membrane AB
   - Sheathing
   - Wood roof framing
   - Gypsum board
2. Pre-finished metal flashing with standing seam joints & hook strips
3. Intermittent flashing attachment clips
4. Liquid-applied noncombustible waterproof coating over top of firewall & onto transition membrane/strip
5. Rigid insulation under cap flashing
6. Mortar to provide slope
7. Foil-faced self-adhered transition membrane
8. Pre-cured flexible silicone transition strip sealed at top & bottom edge to foil-faced membranes
9. Foil-faced self-adhered transition membrane on sloped metal support flashing
10. Batt insulation in framed roof curb
11. Termination bar on self-adhered membrane on firewall with excess membrane draped below AB
12. Semi-rigid mineral wool insulation
13. Firewall as required
14. Vertically sliding breakaway firewall anchor
15. Structural wall as required with insulation 600 mm (24 in.) down from top of wall & as required acoustically

CMU Firewall Example Detail - Roof



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   - Roof membrane
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   - Self-adhered membrane AB
   - Sheathing
   - Wood roof framing
   - Gypsum board
2. Pre-finished metal flashing with standing seam joints & hook strips
3. Intermittent flashing attachment clips
4. Liquid-applied noncombustible waterproof coating over top of firewall & onto transition membrane/strip
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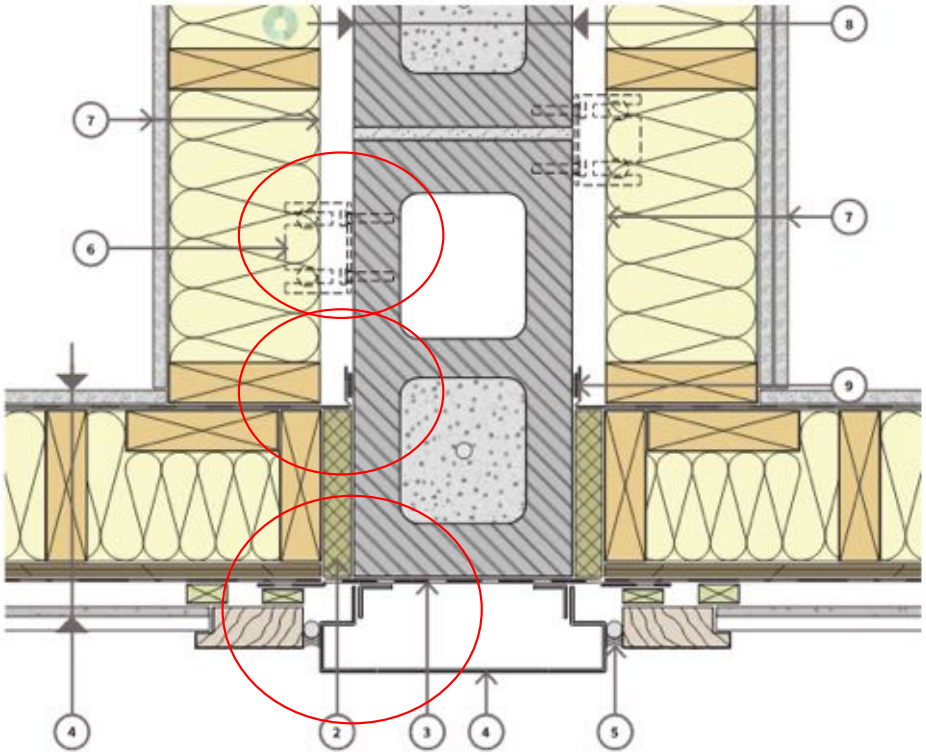
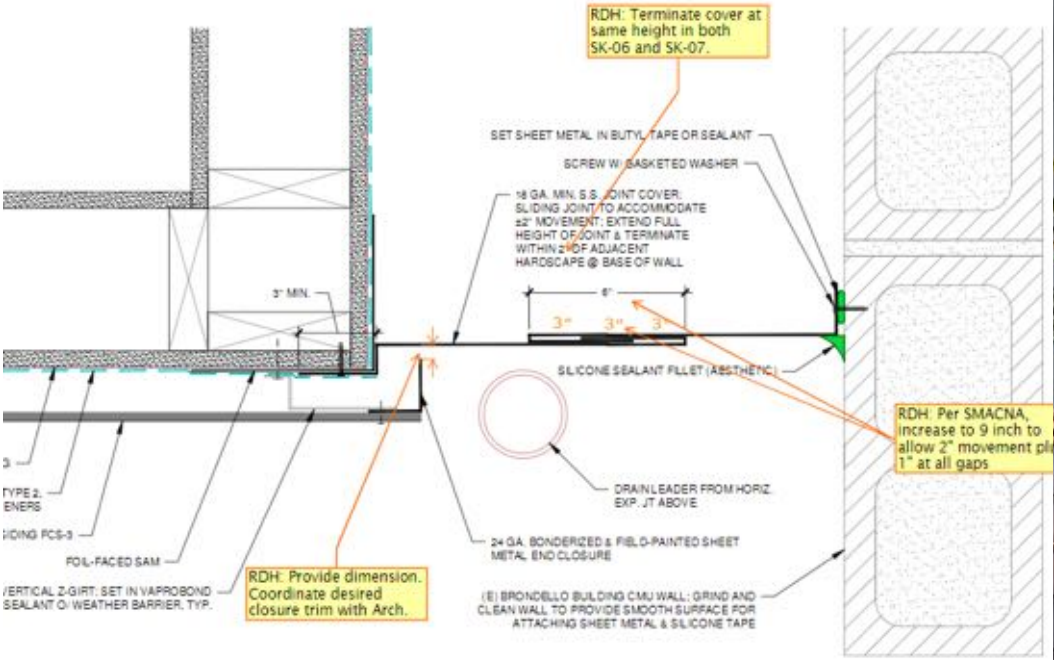
14. Vertically sliding breakaway firewall anchor
15. Structural wall as required with insulation 600 mm (24 in.) down from top of wall & as required acoustically

CMU Firewall Example Detail - Wall



1. Wall Assembly
   - Cladding (fibre cement siding)
   - 19mm (3/4") wood furring (p.t.)
   - Vapour permeable sheathing membrane
   - Sheathing
   - Wood framing 38x140mm (2x6)
   - Batt insulation
   - Polyethylene
   - Gypsum board
2. Semi-rigid mineral wool insulation
3. Flexible noncombustible membrane
4. Metal breakshape cover
   (or other non-combustible cladding)
5. Backer rod & sealant
6. Vertically sliding breakaway firewall anchor
7. Structural interior wall as required with insulation minimum 600mm (24") in from exterior face of exterior wall
8. Firewall as required
9. Polyethylene sealed to face of firewall

Zero Lot Line Construction - Vertical Joint



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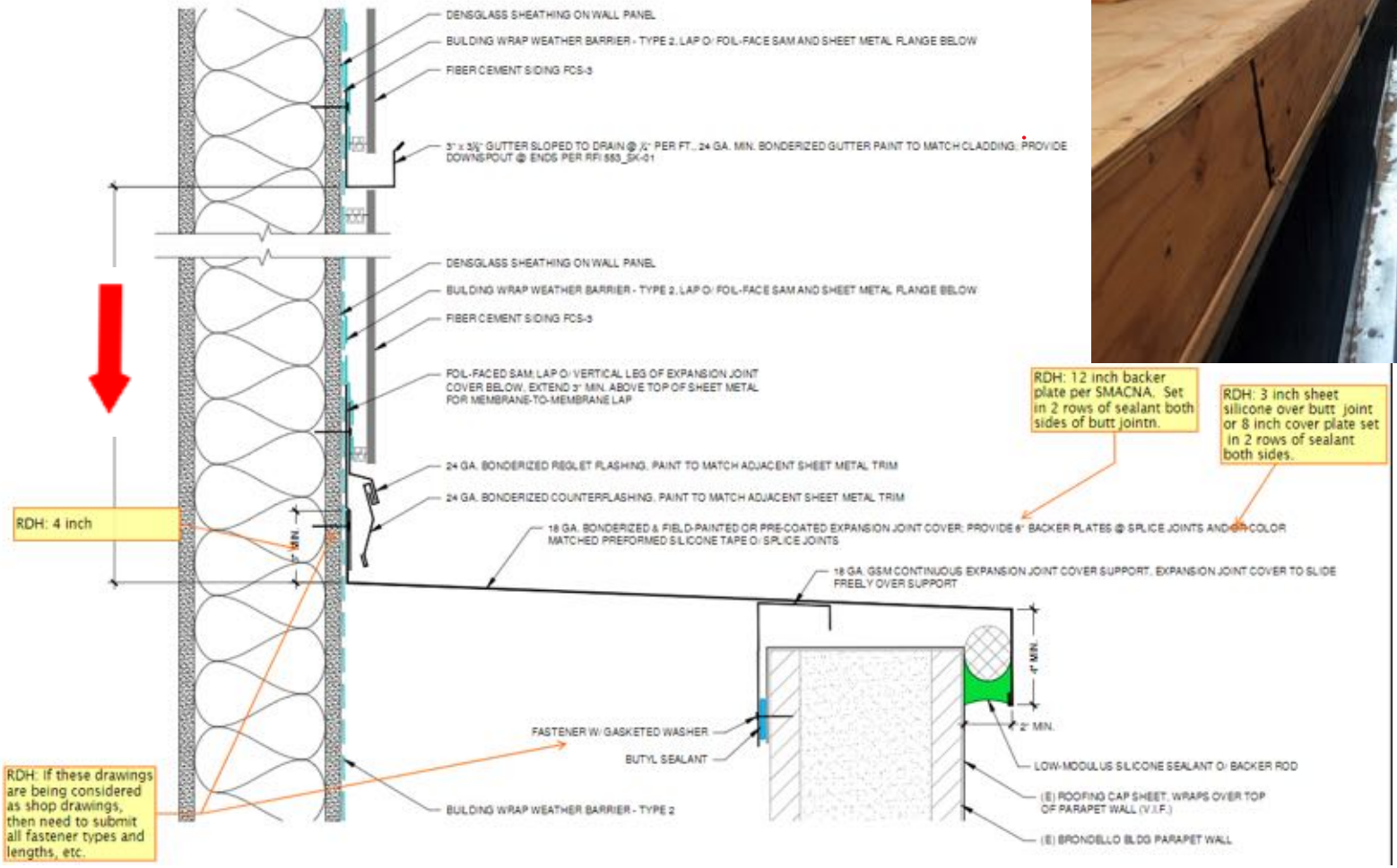
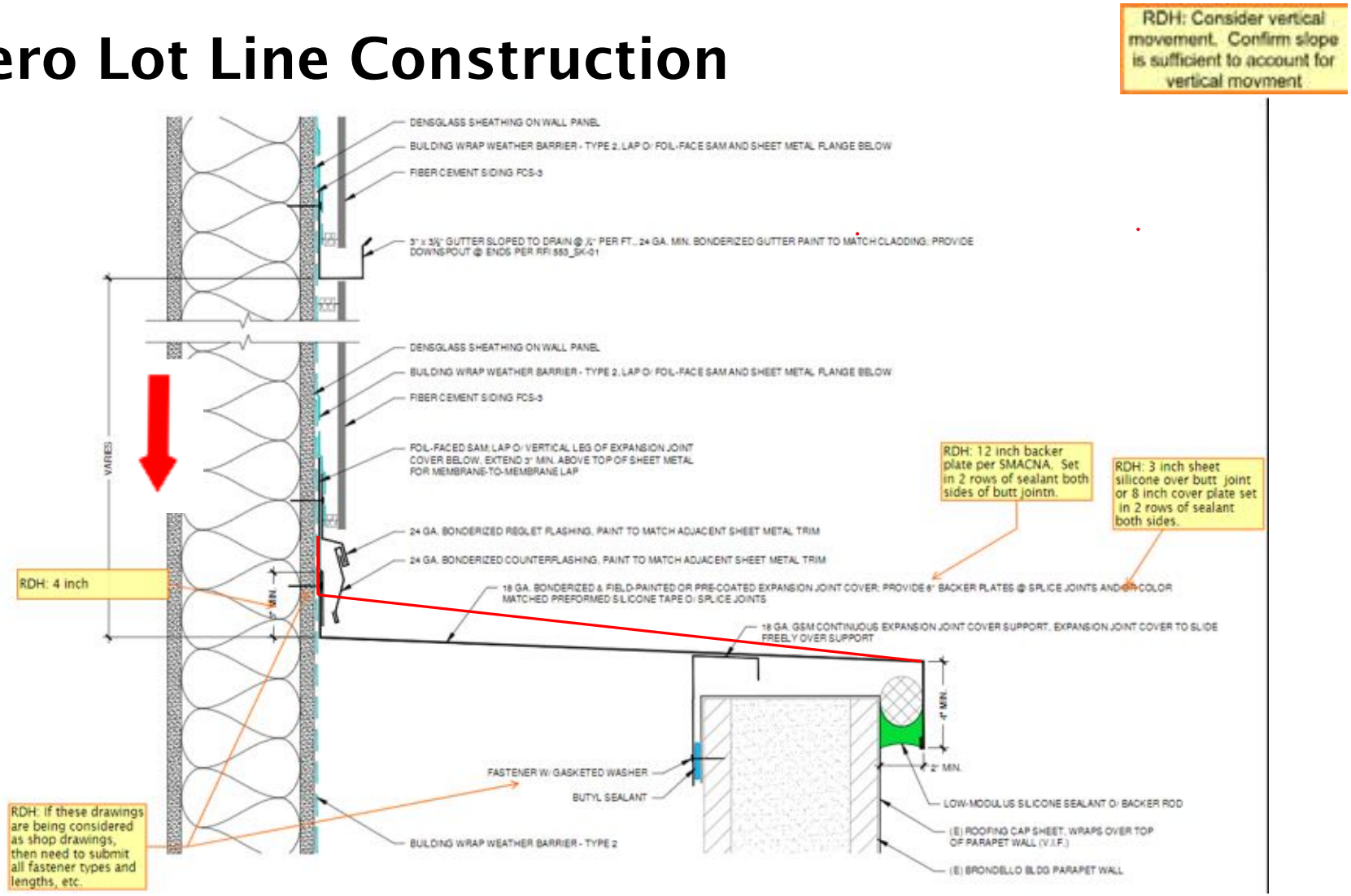
Zero Lot Line Construction



Zero Lot Line Construction



Steel Columns

→ Horizontal wood members shrink while vertical members do not.

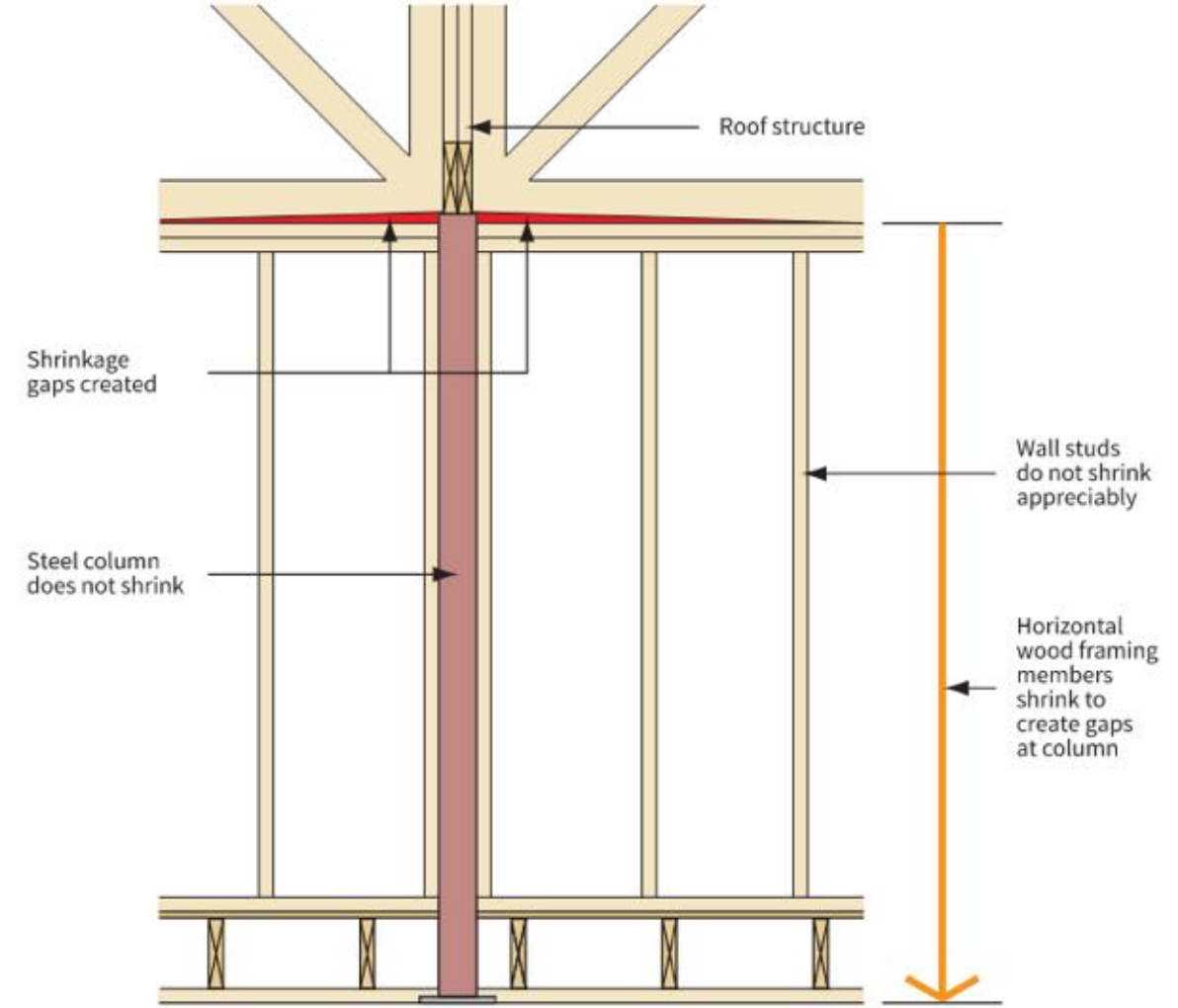


Figure 2-17 Steel-column-related differential shrinkage

Steel Columns

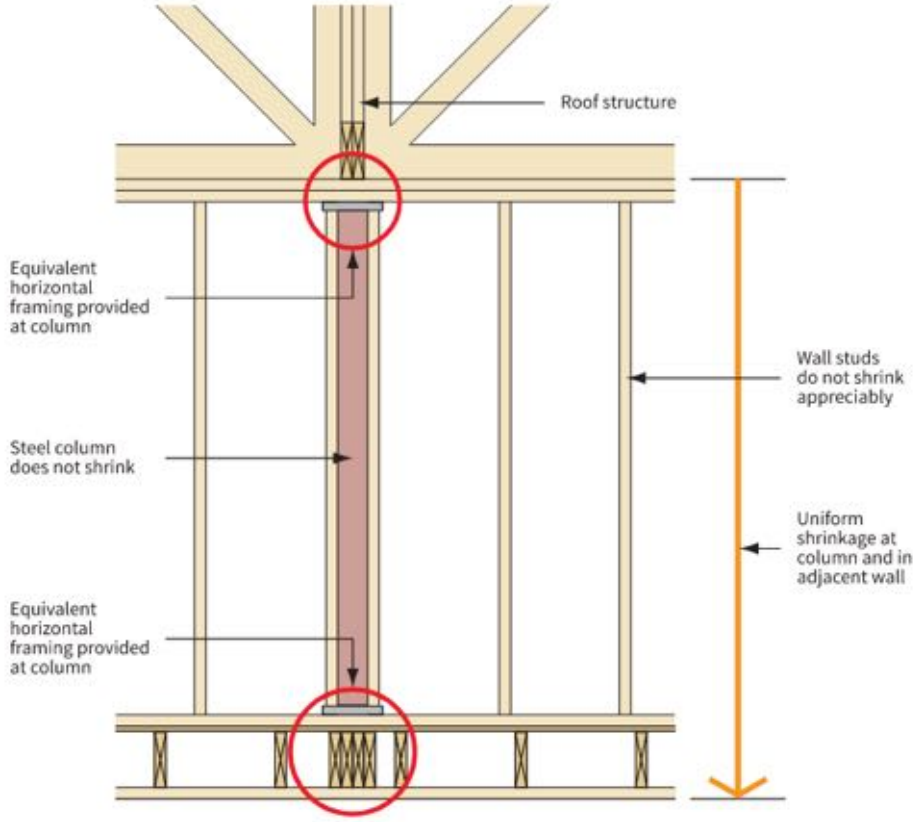


Figure 2-18 Mitigated steel-column-related differential shrinkage

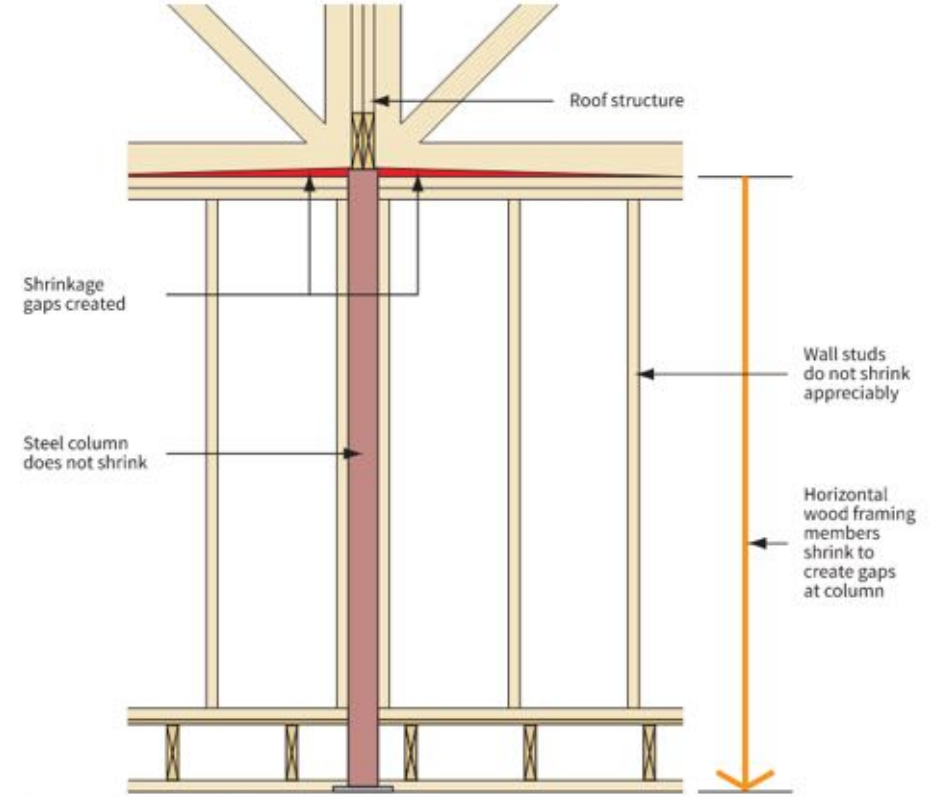
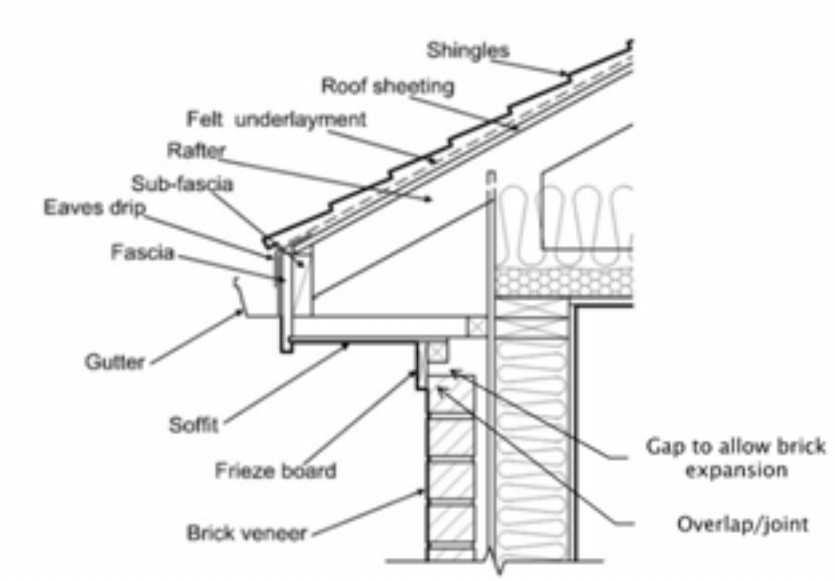


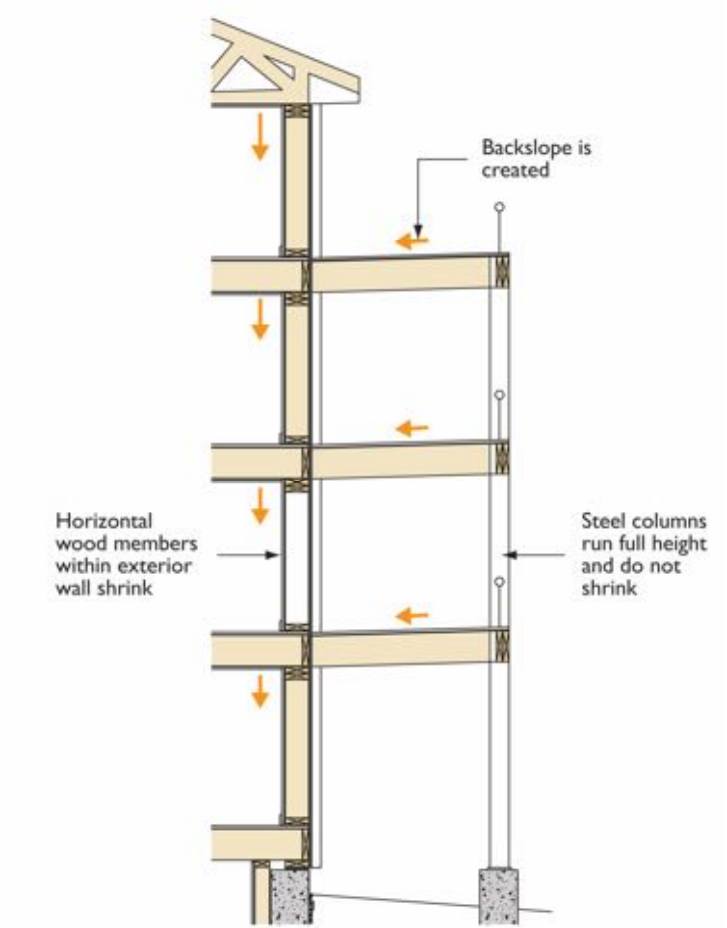
Figure 2-17 Steel-column-related differential shrinkage

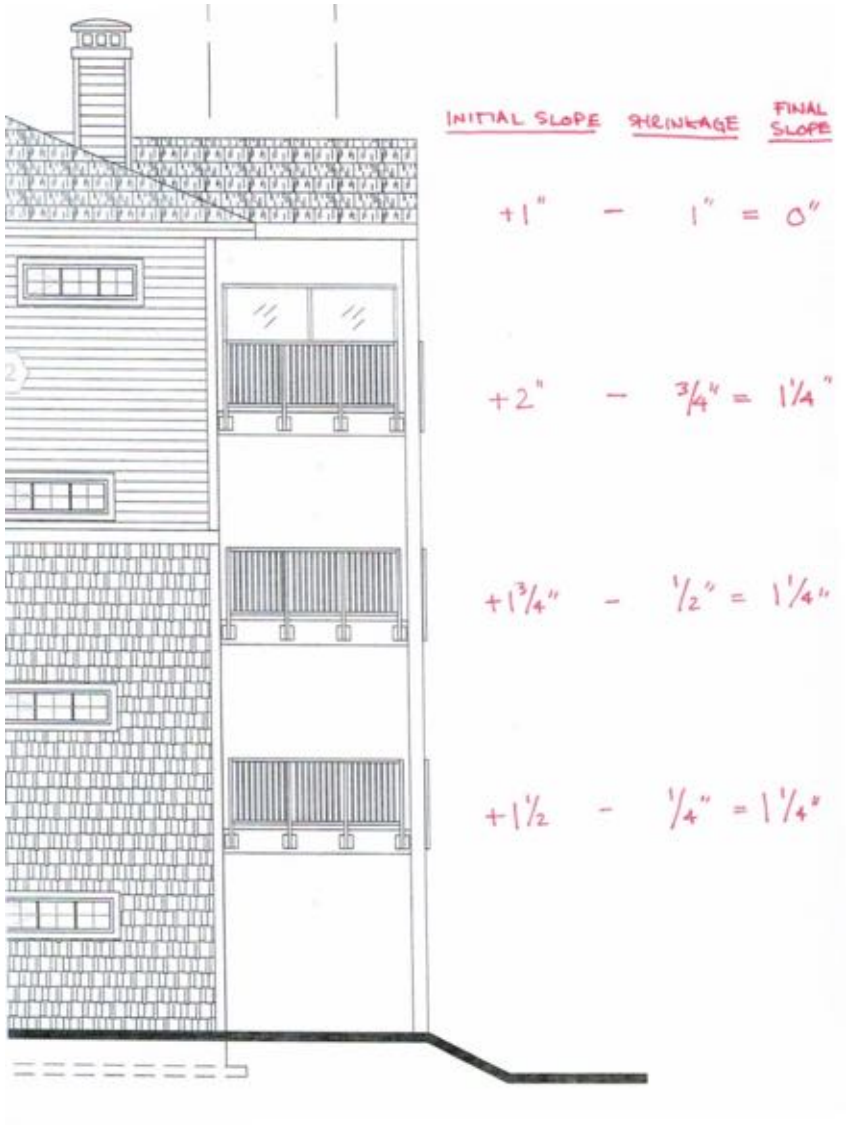
Strategies to Accommodate Wood Shrinkage

- Size sealant joints appropriately
- Lap metal flashings for movement
- Provide bellows in air/water barrier membranes
- Include elastic membranes that can accommodate movement
- Provide additional slope at horizontal flashings to account for shrinkage
- Leave space for movement of materials



Balconies & Slope





Strategies for Balconies

- Match the balcony construction with that of the building for uniform shrinkage
- Increase the initial slope to account for shrinkage
- Cantilevered balconies
- Bolt-on balconies - architectural component, but not part of building enclosure
  - Simplifies detailing – no saddles
  - Continuous water, air, thermal layers

BUILDING ENCLOSURE DESIGN AND DETAILING TO ACCOUNT FOR WOOD SHRINKAGE

Discussion + Questions

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