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Lateral Load Path Basics
Tracing a Wind Load Through a Wood Framed Structure



Cathy Scarince, P.E. – Engineered Wood Specialist


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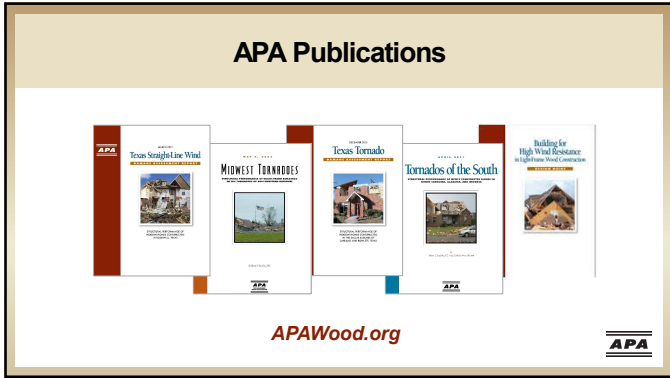
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<https://www.apawood.org/lateral-load-path-basics-survey>

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Learning Objectives

- Understand the complete lateral load path
- Identify common framing errors within this path
- Understand the consequences of an incomplete path
- Discuss and evaluate code requirements for critical details

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Agenda

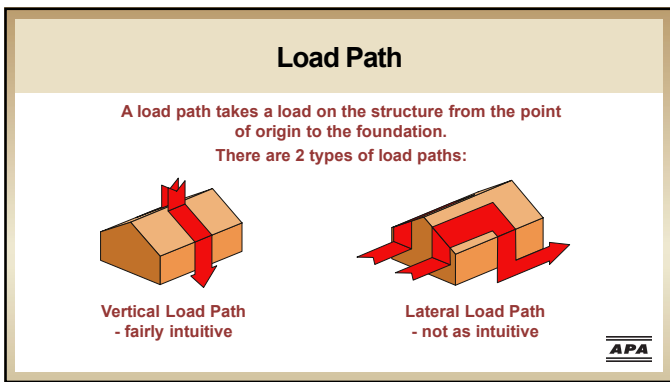
- Basics – Load Path and Braced Walls
- Whole House Effects of Lateral Load Path Failures
- Lateral Load Path – Big Picture
- Lateral Load Path – Detailed Review

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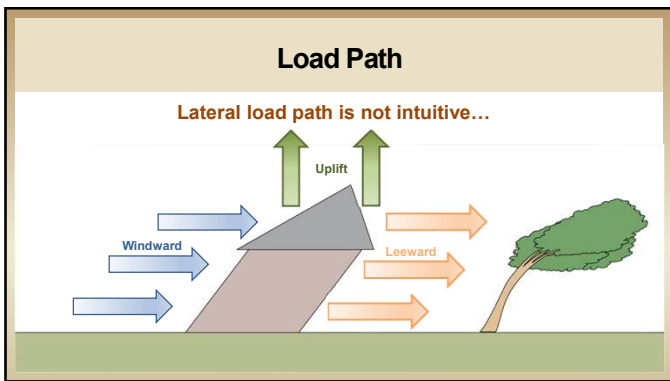
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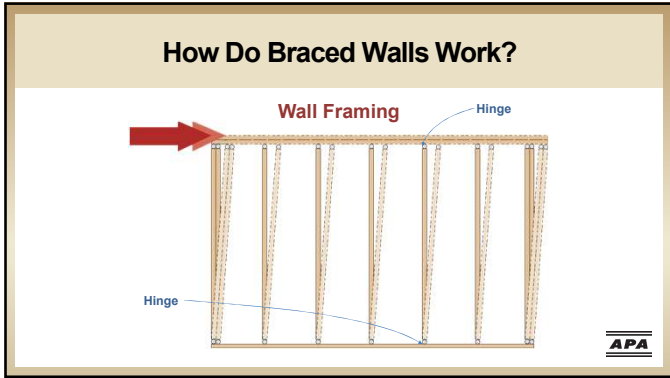
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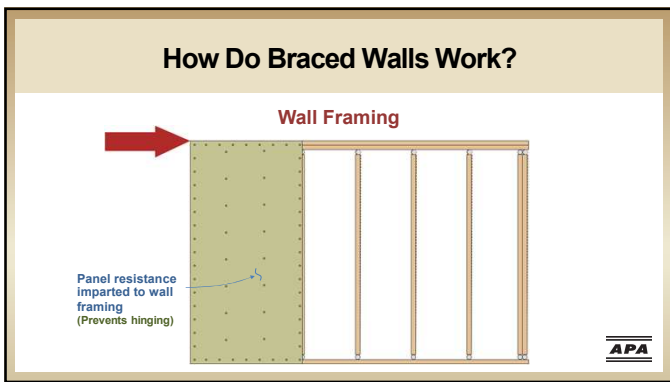
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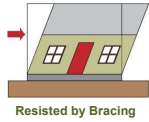
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Whole House Effects of Lateral Load Path Failures

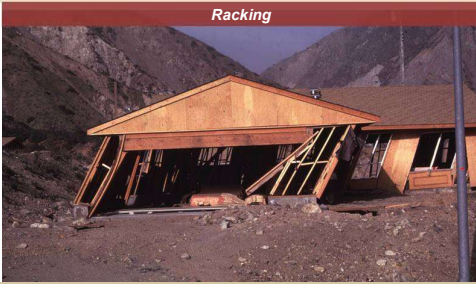
Racking



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Whole House Effects of Lateral Load Path Failures

Racking



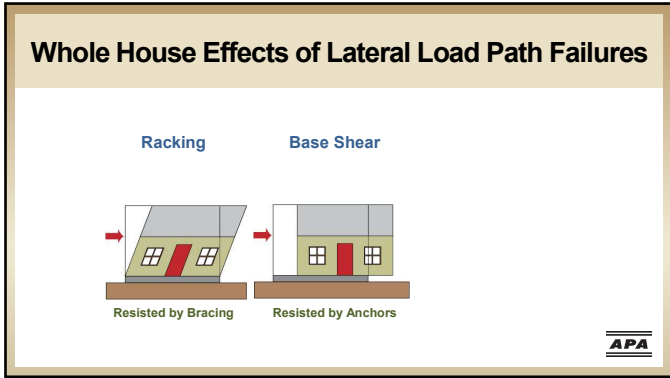
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Whole House Effects of Lateral Load Path Failures

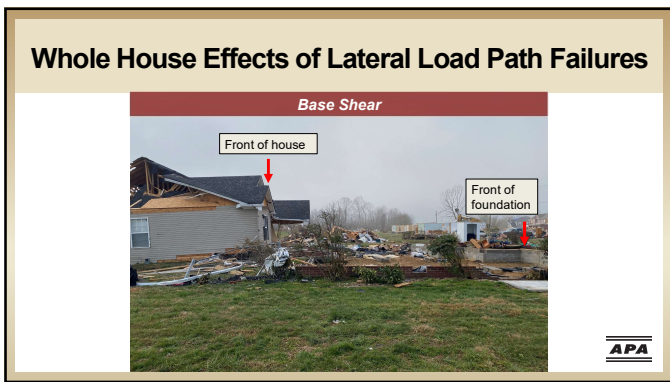
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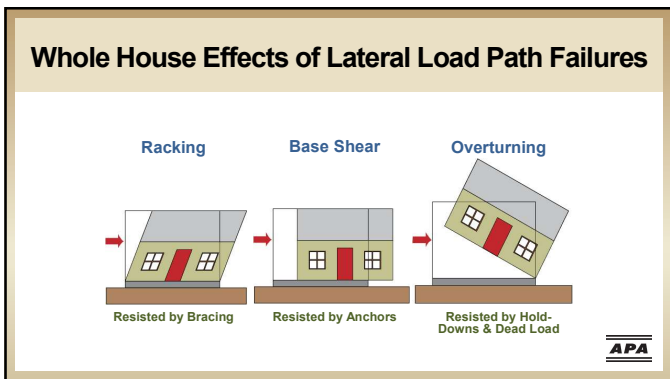
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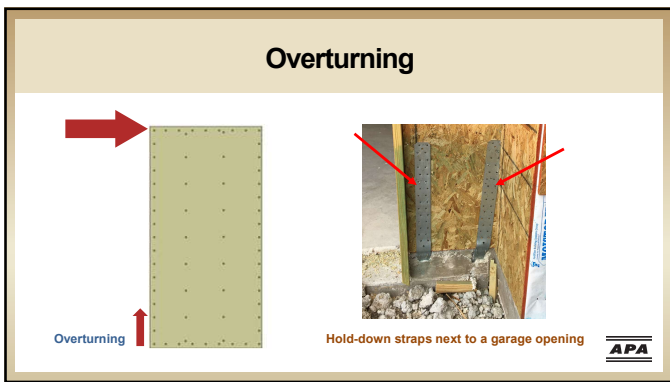
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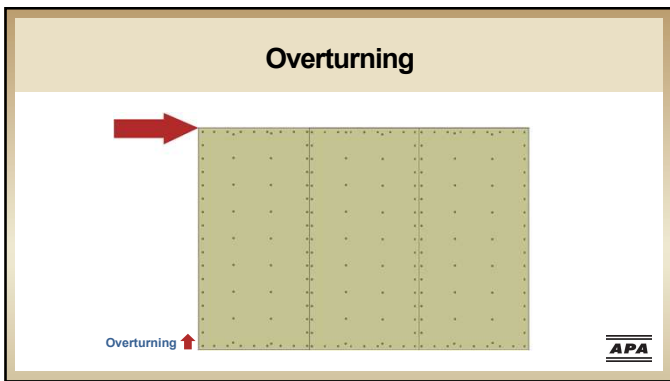
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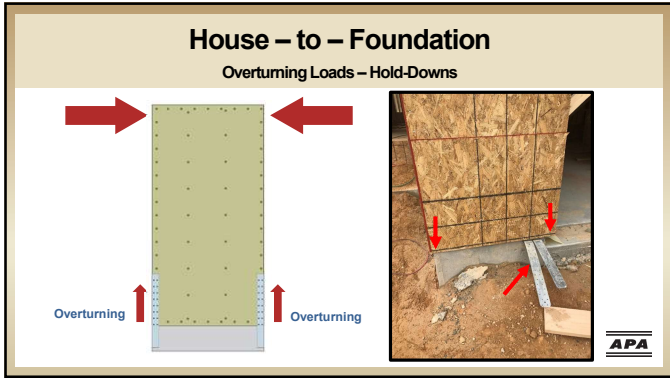
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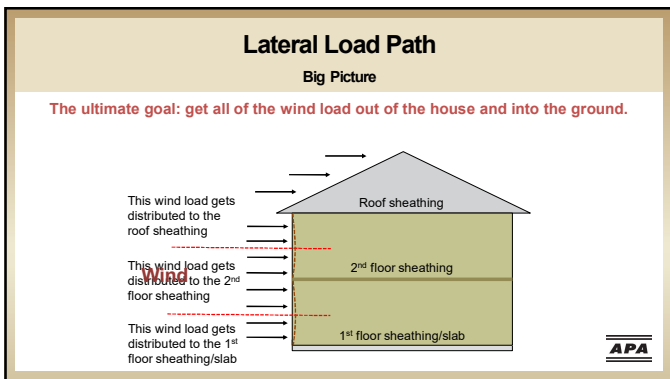
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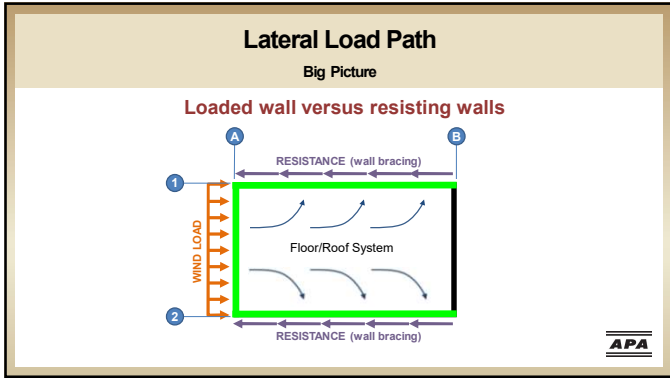
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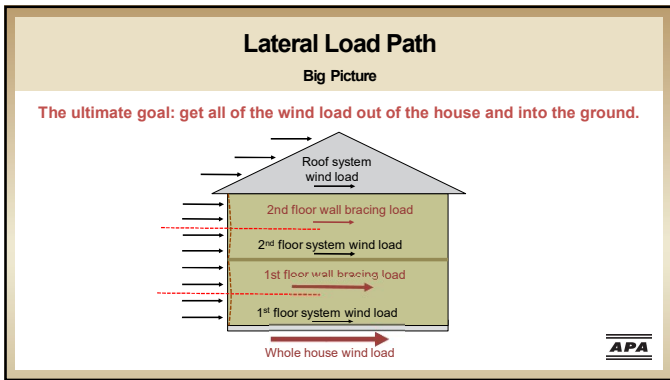
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Critical Connections for Lateral Loads

- Studs – to – floor/roof
- Roof sheathing – to – roof rafters/trusses
- Roof rafter/trusses – to – top plates
- Top plate – to – wall sheathing
- Wall sheathing – to – framing
- Second story wall sheathing – to – first story wall sheathing
- Floor system – to – wall sheathing
- Wall sheathing – to – sill plate
- House – to – foundation



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Critical Connections for Lateral Loads

- Studs – to – floor/roof
– Lateral loads

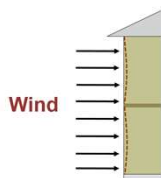


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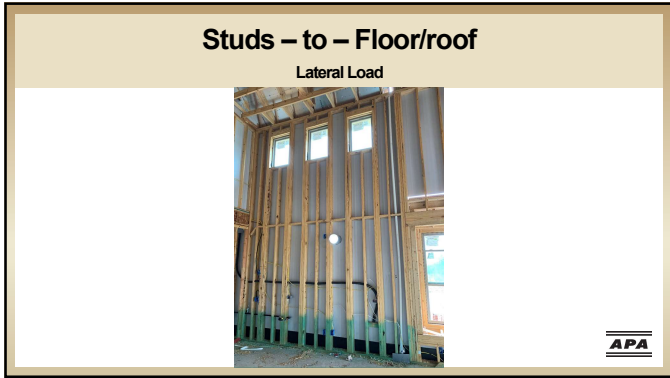
Studs – to – Floor/roof

Lateral Load

Studs must span from floor-to-floor or floor-to-roof



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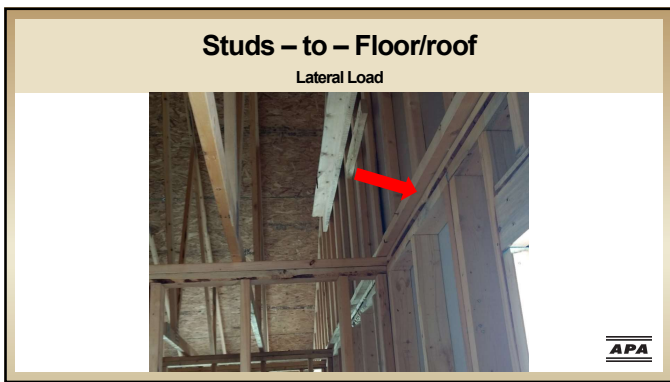
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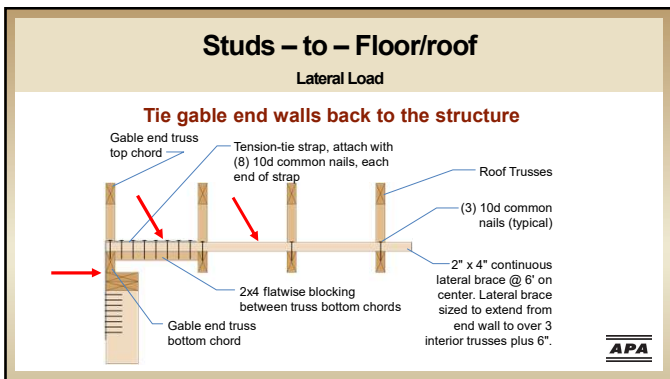
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Critical Connections for Lateral Loads

- Studs – to – floor/roof
- Roof sheathing – to – roof rafters/trusses
 - Uplift loads

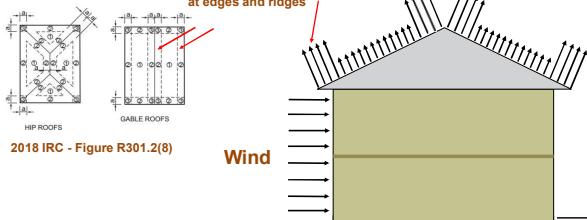


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Roof Sheathing - to - Roof Rafters/Trusses

Uplift Load

Higher uplift loads occur at edges and ridges



2018 IRC - Figure R301.2(8)

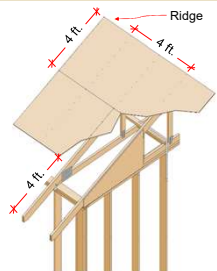


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Roof Sheathing - to - Roof Rafters/Trusses

Uplift Load

2018 IRC - Table R602.3(1), Footnote 'f' – requires tighter fastener spacing at edges, ridges, and gable ends.



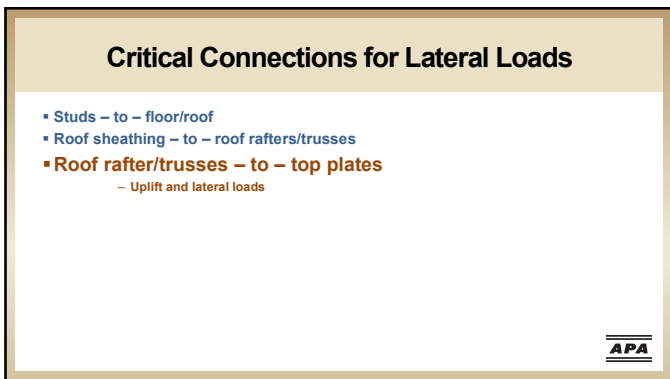
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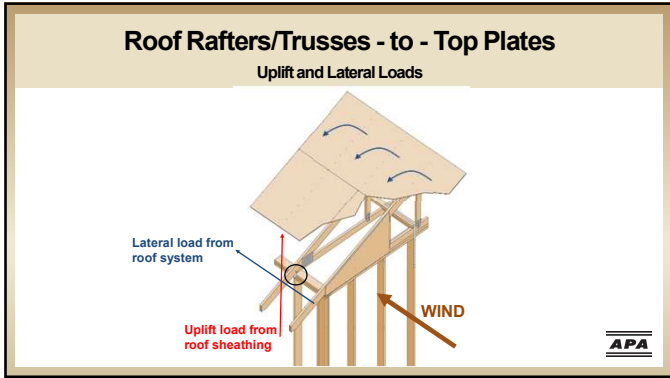
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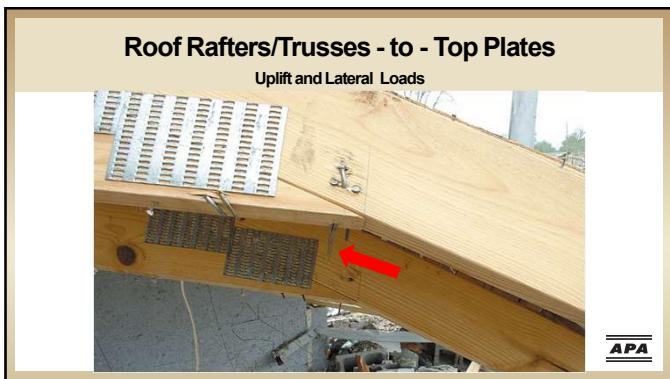
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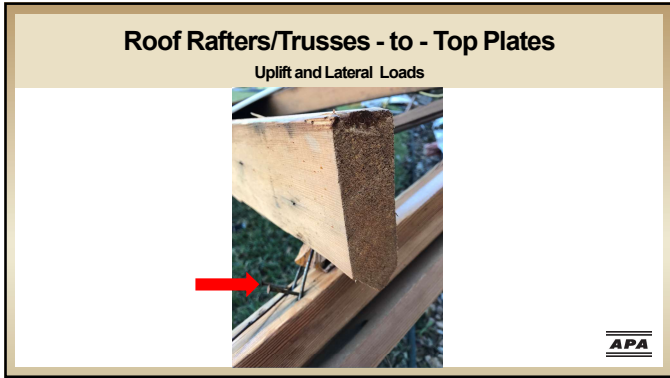
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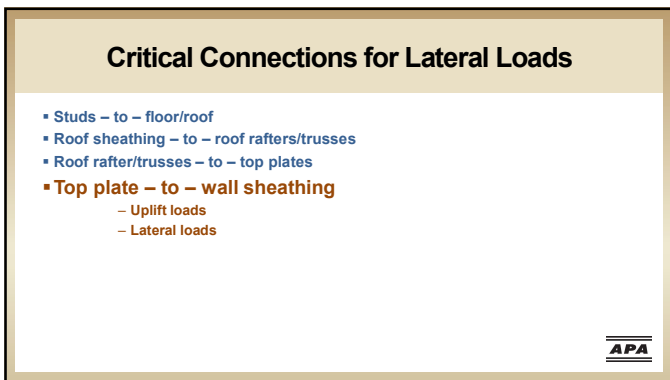
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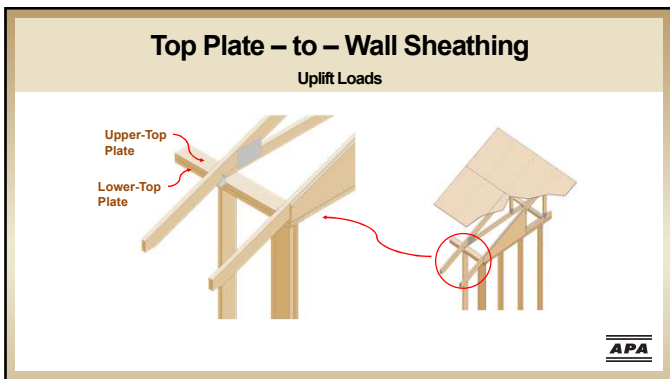
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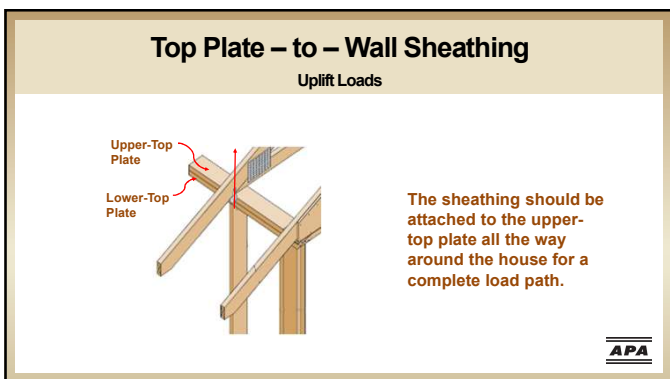
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Top Plate – to – Wall Sheathing

Lateral Loads

The lateral load is only transferred to the wall sheathing at bracing locations.

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Critical Connections for Lateral Loads

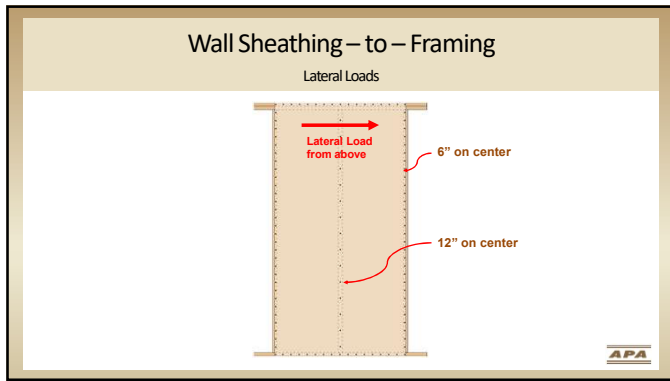
- Studs – to – structure
- Roof sheathing – to – roof rafters/trusses
- Roof rafter/trusses – to – top plates
- Top plate – to – wall – sheathing
- Wall sheathing – to – framing
 - Uplift loads
 - Lateral loads

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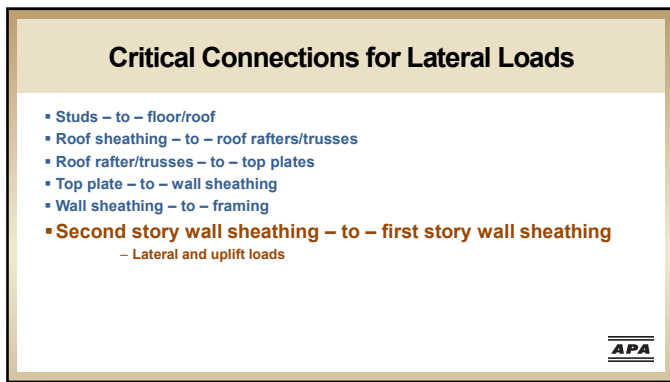
Wall Sheathing – to – Framing

Uplift Loads

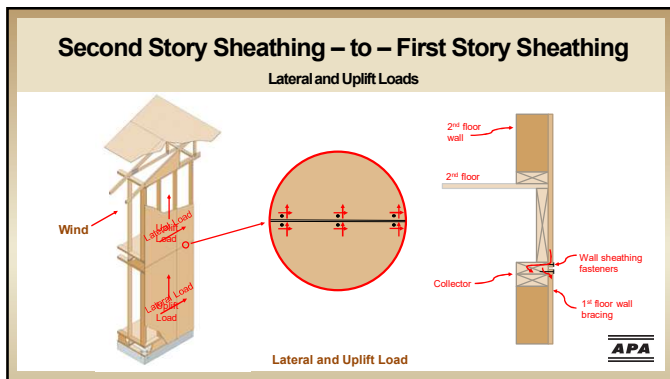
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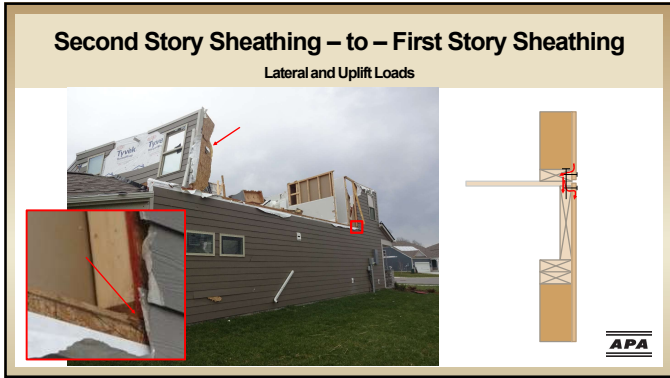
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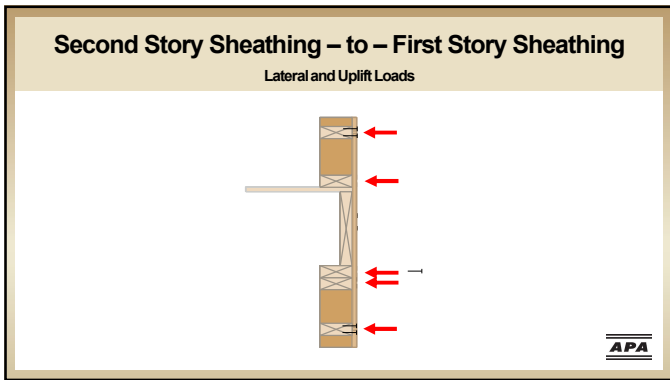
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Critical Connections for Lateral Loads

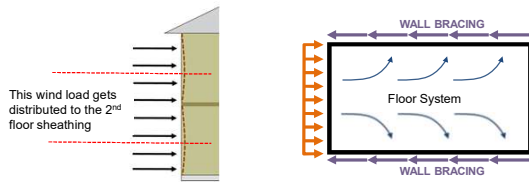
- Studs – to – floor/roof
- Roof sheathing – to – roof rafters/trusses
- Roof rafter/trusses – to – top plates
- Top plate – to – wall sheathing
- Wall sheathing – to – framing
- Second story wall sheathing – to – first story wall sheathing
- **Floor system – to – wall sheathing**
 - Lateral loads



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Floor System – to – Wall Sheathing

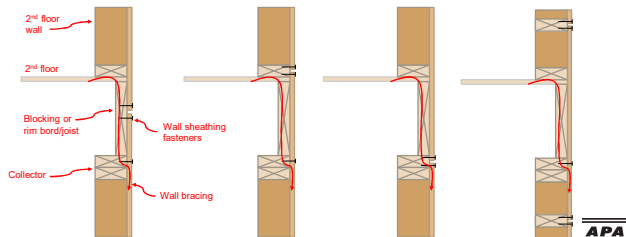
Lateral Loads



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Floor System – to – Wall Sheathing

Lateral Loads



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Critical Connections for Lateral Loads

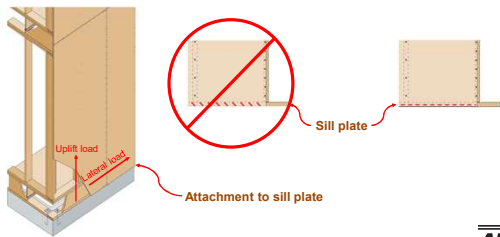
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- Top plate – to – wall sheathing
- Wall sheathing – to – framing
- Second story wall sheathing – to – first story wall sheathing
- Floor system – to – wall sheathing
- **Wall sheathing – to – sill plate**
 - Uplift and lateral loads



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Wall Sheathing – to – Sill Plate

Uplift and Lateral Loads



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Wall Sheathing – to – Sill Plate

Uplift and Lateral Loads



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Wall Sheathing – to – Sill Plate


Uplift and Lateral Loads



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Critical Connections for Lateral Loads

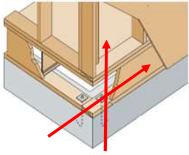
- Studs – to – floor/roof
- Roof sheathing – to – roof rafters/trusses
- Roof rafter/trusses – to – top plates
- Top plate – to – wall sheathing
- Wall sheathing – to – framing
- Second story wall sheathing – to – first story wall sheathing
- Floor system – to – wall sheathing
- Wall sheathing – to – sill plate
- **House – to – foundation**
 - Lateral and uplift loads
 - Overturning loads




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House – to – Foundation

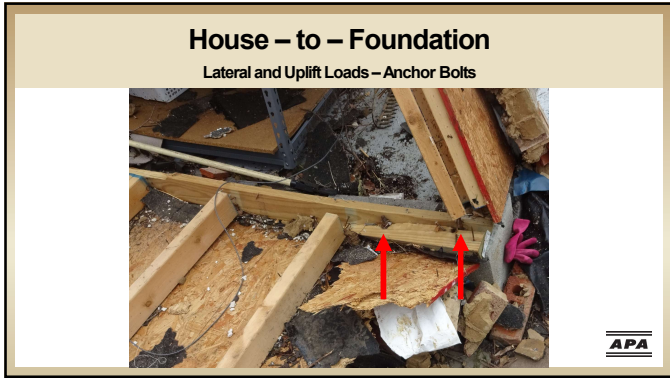
Lateral and Uplift Loads – Anchor Bolts



2018 IRC requires anchor bolts at maximum 6' on center with at least (2) bolts per sill plate.



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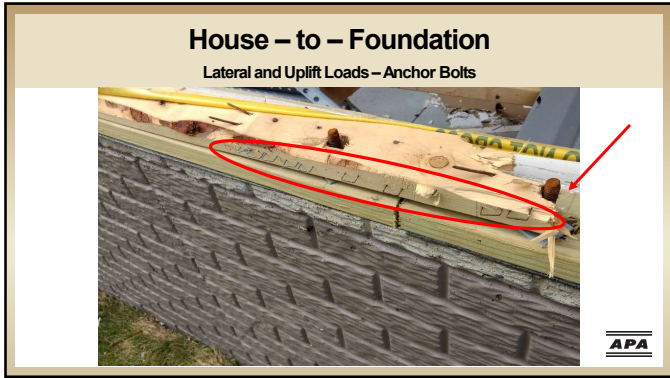
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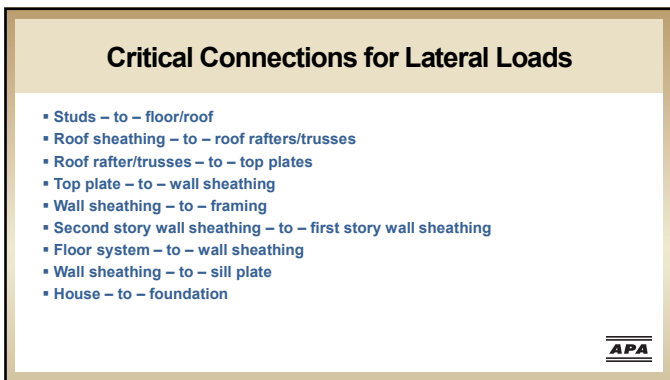
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