

Stuff It or Wrap It? Considerations for Super Insulated Walls & Roofs

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**Caution! Lots of
Insulation &
Innovation**

Industry Drivers & Trends towards Super Insulation

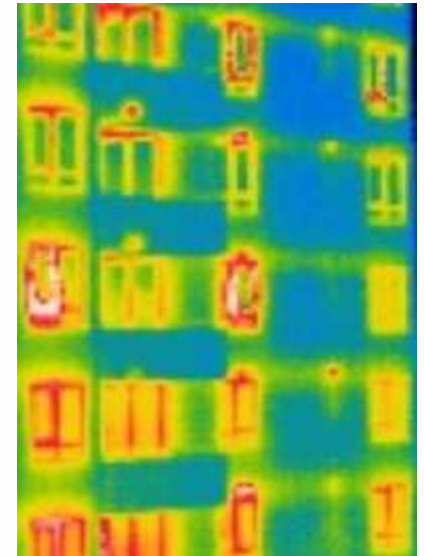


- Trend towards more efficiently insulated building enclosures due to higher energy code targets and uptake of passive design strategies
 - At a point where traditional assemblies are being replaced with new ones
 - Seeing more new building materials, enclosure assemblies and construction techniques
 - Greater attention paid to reducing thermal bridging & use of effective R-values instead of nominal insulation R-values
 - Optimization of cladding attachments for both structural and thermal performance
 - Thicker amounts of insulation – particularly in low-slope roofs



Key Building Enclosure Considerations

- “Super-Insulated” building enclosures require careful design and detailing to ensure durability
 - Art of balancing various materials, costs, and detailing considerations
 - Shift insulation to the exterior the structure to improve performance and durability
 - Minimize thermal bridging by optimizing structural connections and other components
- Well insulated buildings require balancing thermal performance of all components & airtightness
 - No point super-insulating walls or roofs if you have large thermal bridges - address the weakest links first



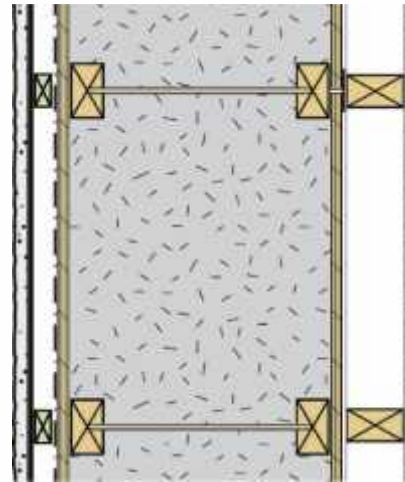
From Code Minimum to Super Insulation

- In Pacific Northwest (Climate Zones 3 – 6) minimum energy code R-value targets are in range of:
 - R-15 to R-20 effective for walls
 - R-20 to R-50 effective for roofs
 - R-2 to R-4 for windows
- Green or more energy efficient building programs including Passive House, R-value targets in range of:
 - R-25 to R-50+ effective for walls
 - R-40 to R-80+ effective for roofs
 - R-6+ for windows
- Other drivers – air-tight, thermal comfort, passive design, mold-free

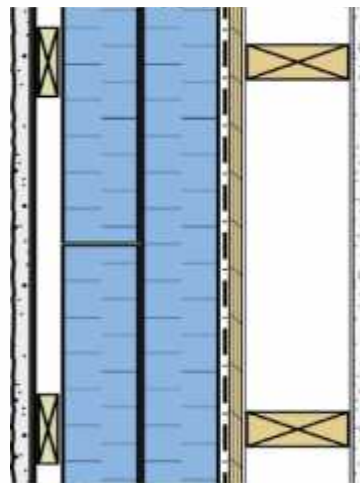


Where to Add the Insulation?

Stuff It?

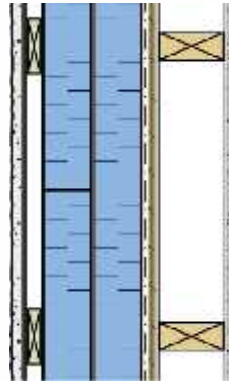
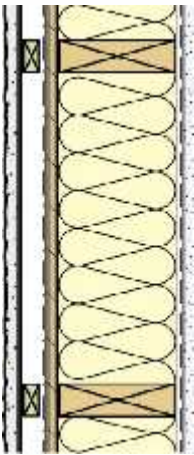


Wrap It?



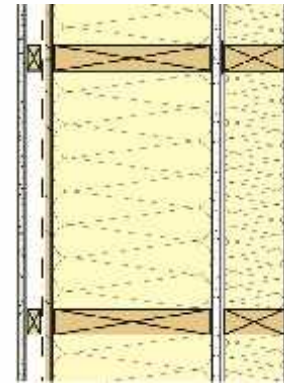
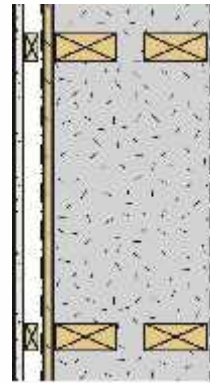
Getting to Super Insulation Levels in Walls

Baseline
2x6 w/ R-22
batts = **R-16**
effective



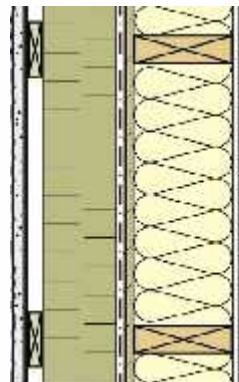
Exterior Insulation: **R-20 to R-40+ effective**

- Constraints: cladding attachment, wall thickness
- Good for wood/steel/concrete



Deep/Double Stud:
R-20 to R-40+ effective

- Constraints wall thickness
- Good for wood, wasted for steel



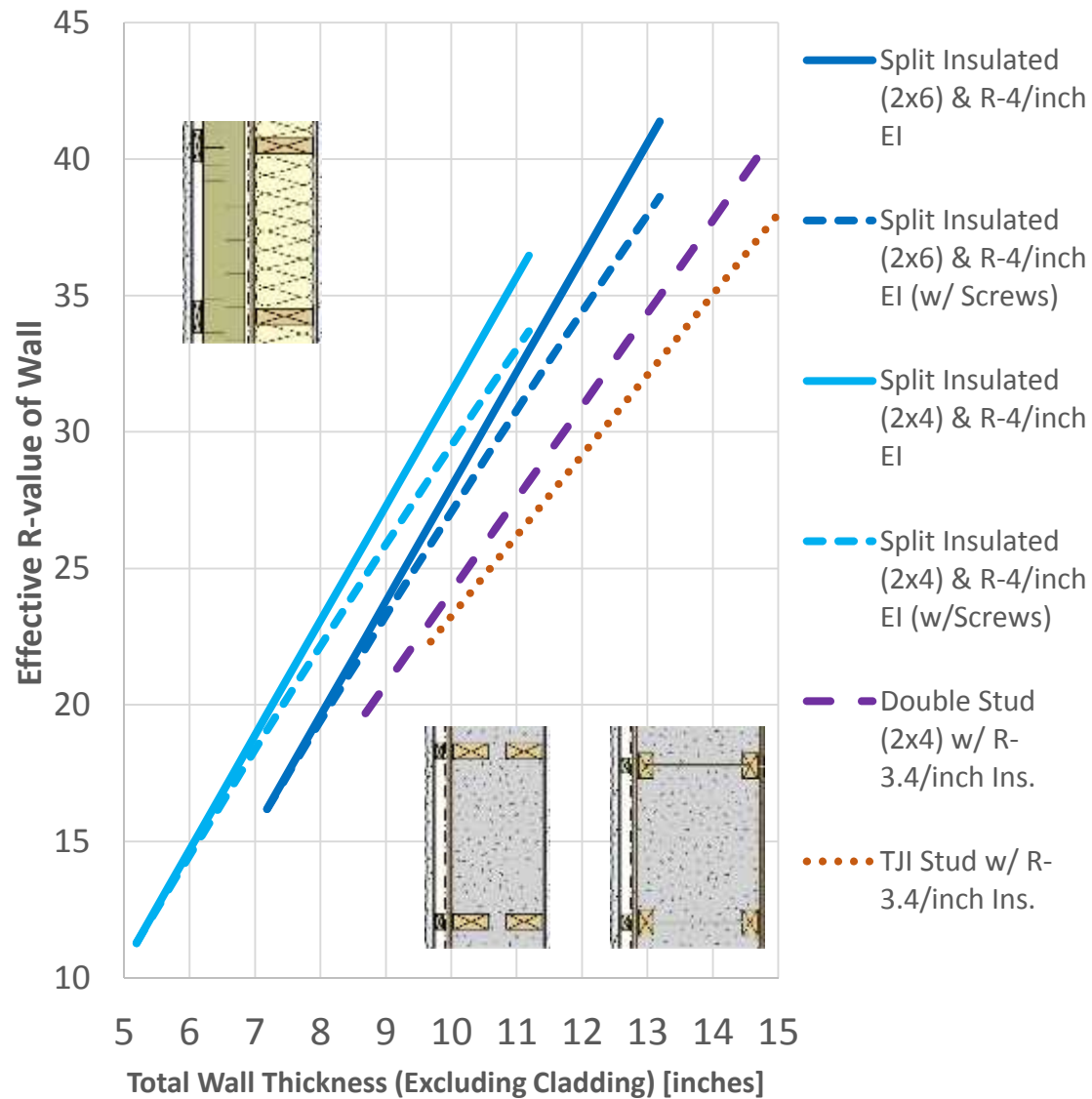
Split Insulation:
R-20 to R-40+ effective

- Constraints: cladding attachment
- Good for wood, palatable for steel

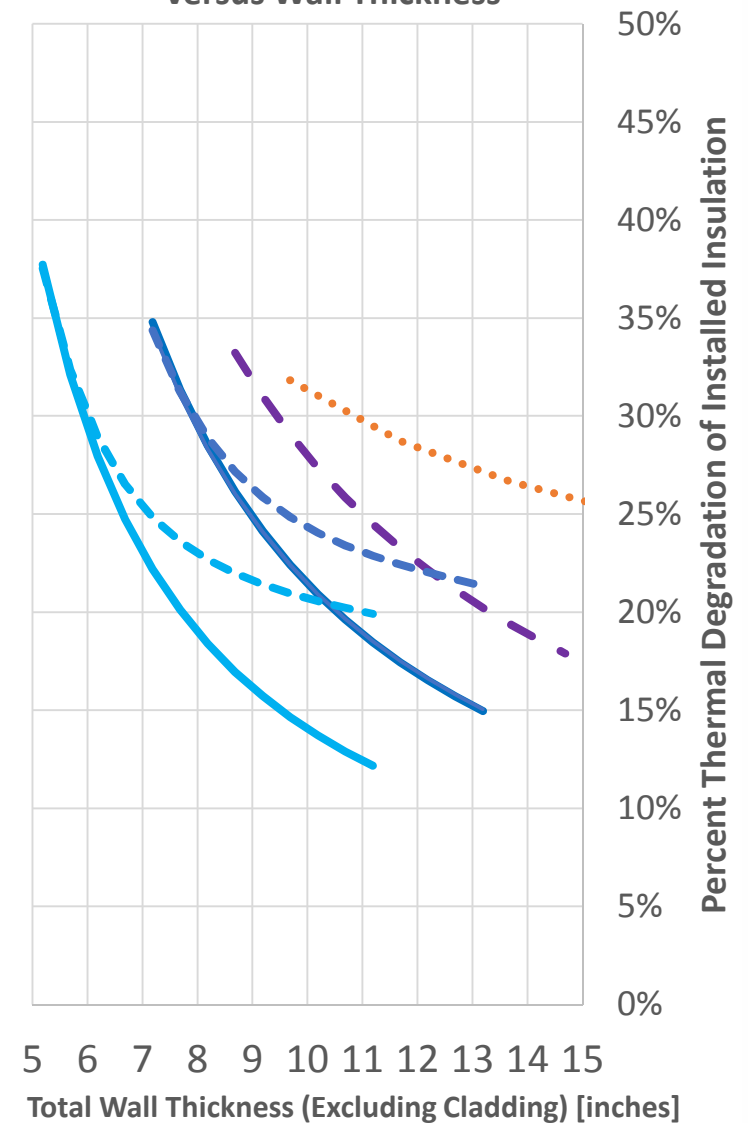
Insulation Approach & Wood-frame Wall Thickness



Effective Wall R-value versus Wall Thickness

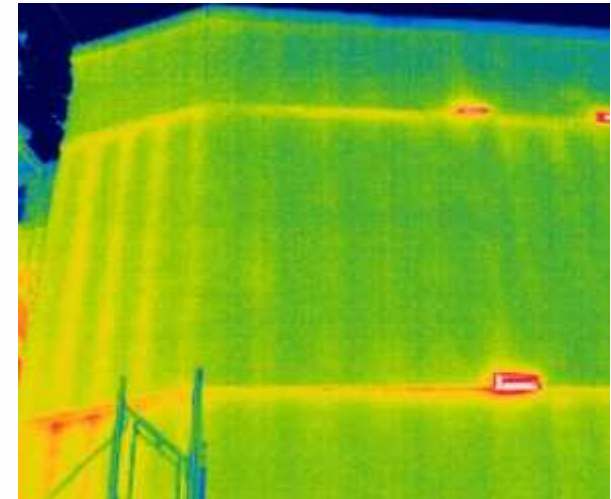


Thermal Degradation of Insulation versus Wall Thickness

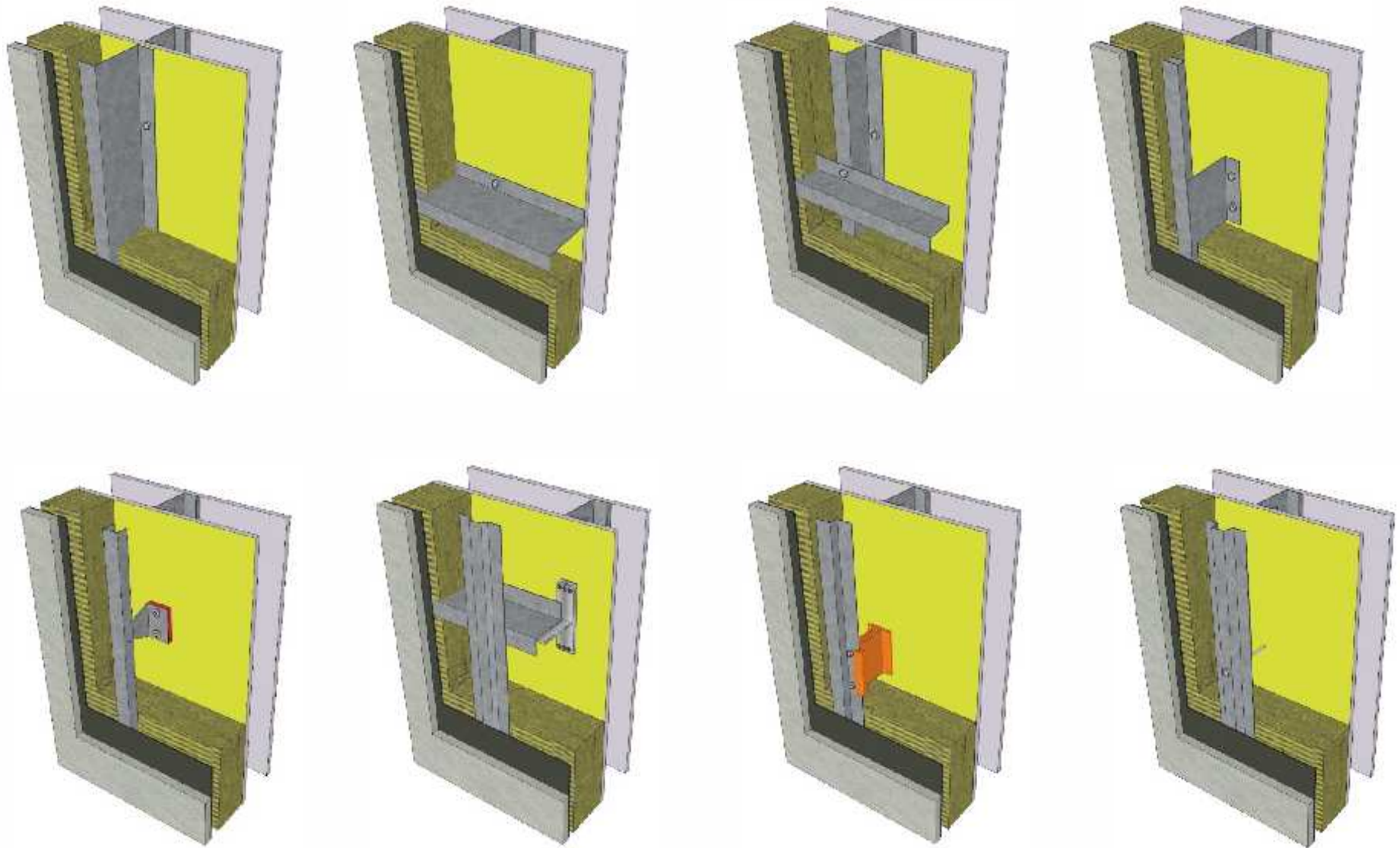


Cladding Attachment & Exterior Insulation

- Exterior insulation is only as good as the cladding attachment strategy
- How to achieve true continuous insulation (ci) performance?
- What attachment systems work best?
- What types of insulation?



Many Alternate Attachment Options & Counting



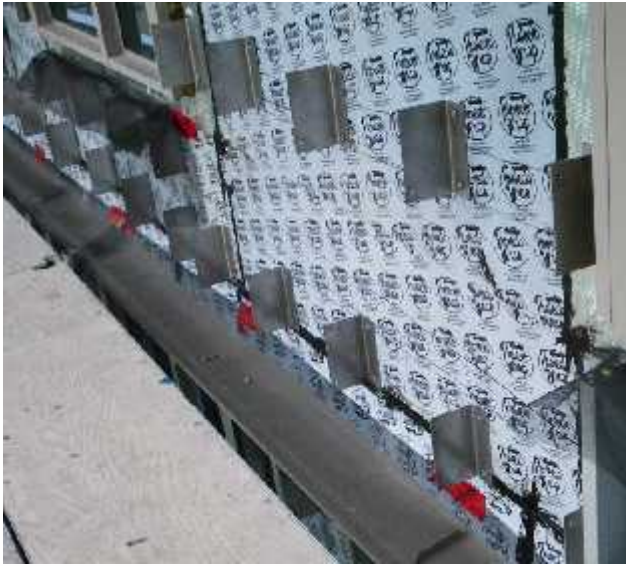
Continuous Metal Girts – Not Super Insulated

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Metal Clip & Rail – Getting Better

RDH



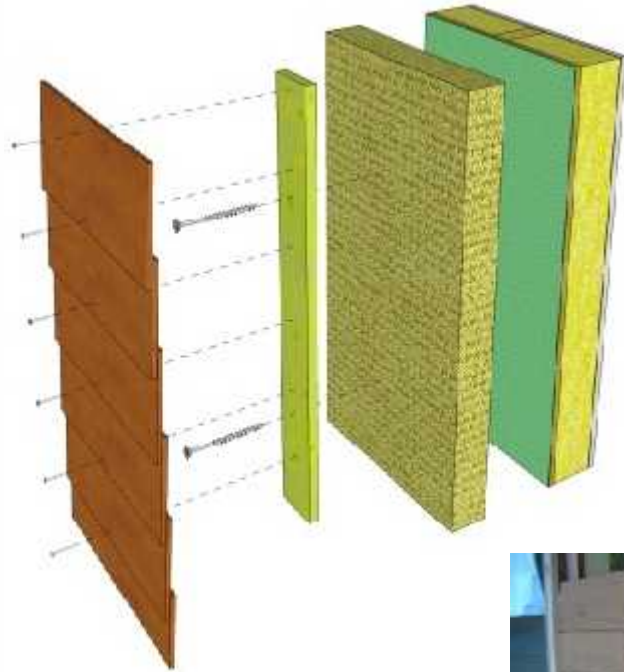
Thermally Improved Clip & Rail Systems

RDH



Screws through Exterior Insulation

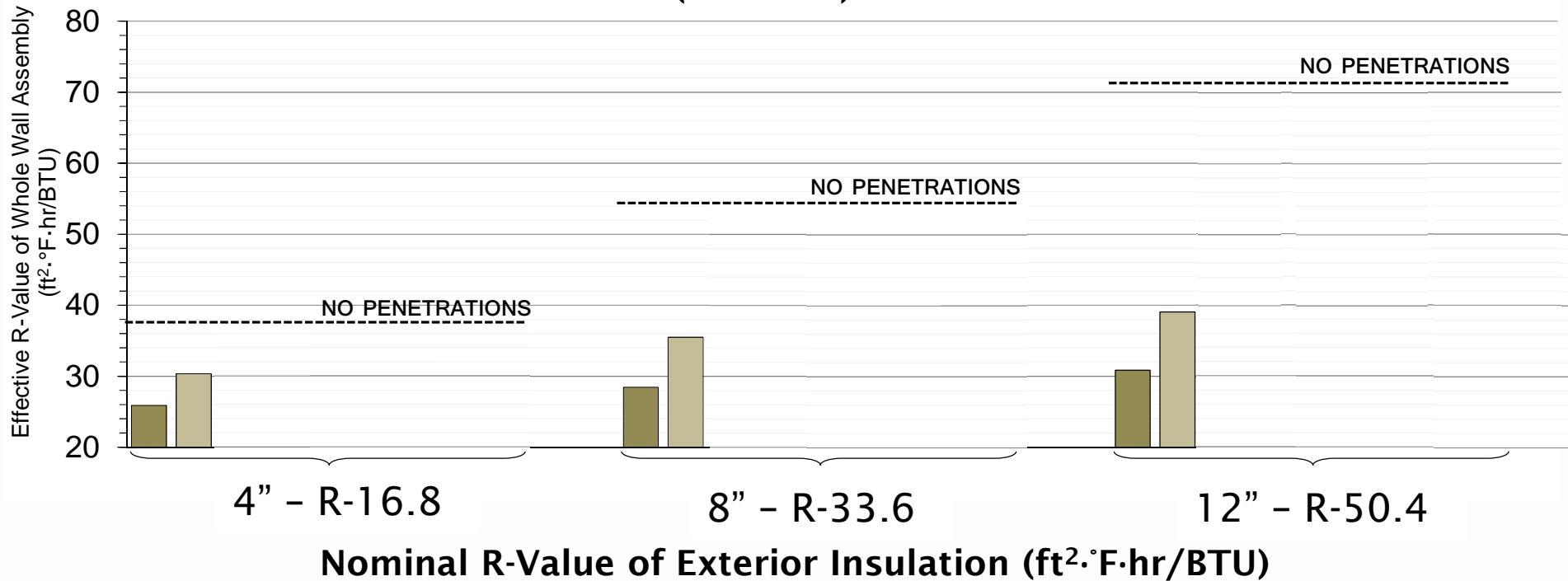
RDH



Cladding Attachment Matters – Effective R-values



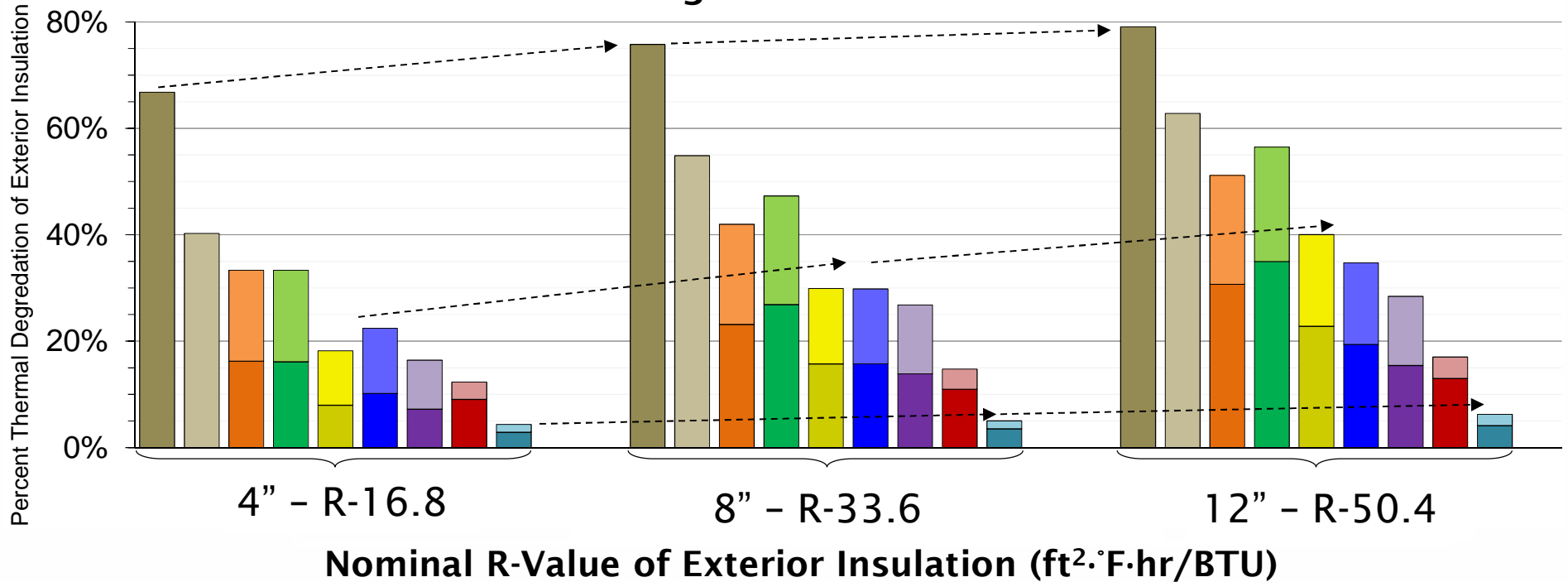
Effective R-Value of 2x6 Wall (R-20 batt) + Exterior Insulation as Indicated



- Continuous Vertical Z-Girt - 16" OC
- Continuous Horizontal Z-Girt - 24" OC

Towards Super Insulation with Exterior Insulation RDH

Percent Thermal Degradation of Exterior Insulation

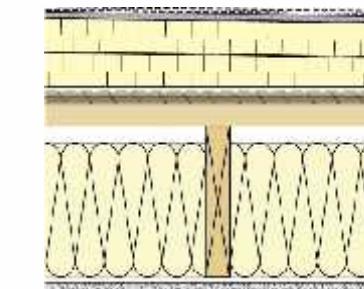
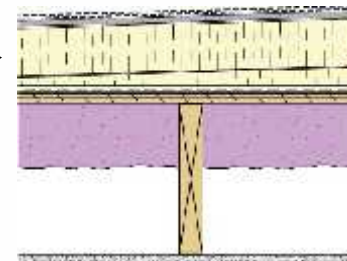
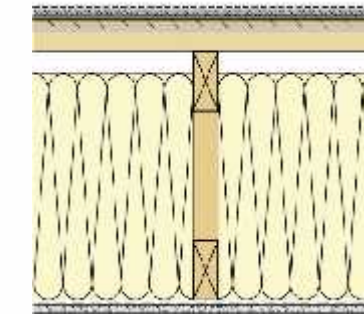
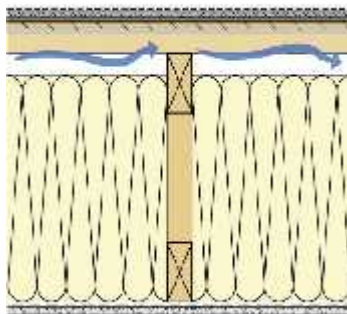
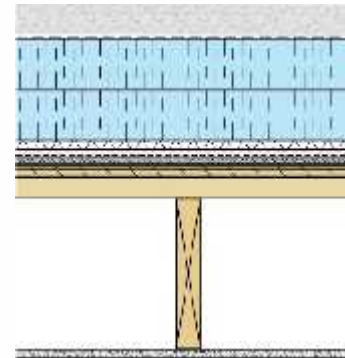
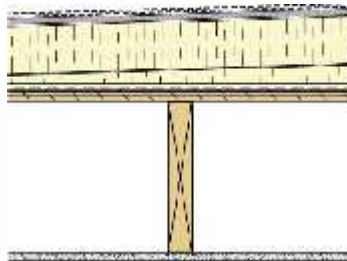
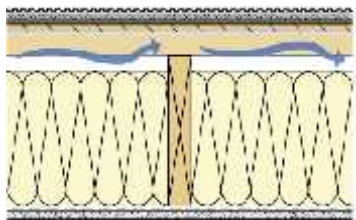


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|--|--------------------------------------|-------------------------------|
| Continuous Vertical Z-Girt - 16" OC | Isolated Galvanized Clip - 16" x 48" | Galvanized Screws - 16" x 16" |
| Continuous Horizontal Z-Girt - 24" OC | Isolated Galvanized Clip - 16" x 24" | Galvanized Screws - 16" x 12" |
| Aluminium T-Clip - 16" x 48" | Intermittent SS Z-Girt - 16" x 48" | SS Screws - 16" x 16" |
| Aluminium T-Clip - 16" x 24" | Intermittent SS Z-Girt - 16" x 24" | SS Screws - 16" x 12" |
| Intermittent Galvanized Z-Girt - 16" x 48" | Fiberglass Clip - 16" x 48" | |
| Intermittent Galvanized Z-Girt - 16" x 24" | Fiberglass Clip - 16" x 24" | |

Getting to Super Insulation Levels in Low-Slope Roofs



Baseline (Vented Roof) ~R-30



Exterior Insulated (Conventional or PMR Roof)

- Best durability but most expensive
- Some challenges with more layers of insulation & detailing
- Simple design

Deeper Joist/Truss – (Vented or Unvented Roofs)

- Least durable but least expensive
- Simple design
- Standard details with deeper structure

Split Insulated (Unvented Roof)

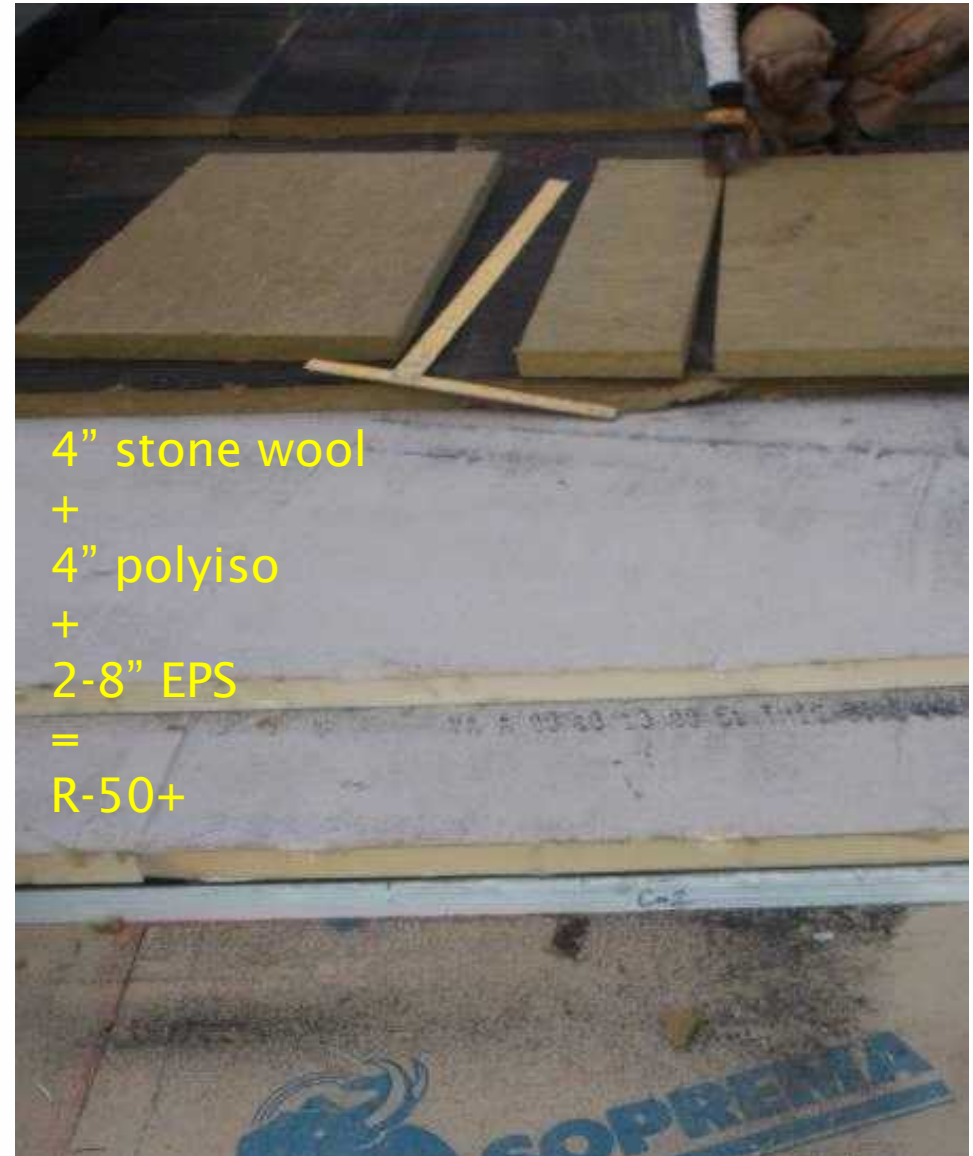
- Decent durability
- Moderate cost
- More complex design

Some Considerations for Super Insulated Roofs

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Some Considerations for Super Insulated Roofs



4" stone wool
+
4" polyiso
+
2-8" EPS
=
R-50+

Discussion

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