Exploring a variety of Retrofit SIP products to improve energy efficiency

Bill Wachtler
Executive Director
Structural Insulated Panel Association
Outline

- What are Structural Insulated Panels (SIPs)?
- What are Retrofit Insulated Panels?
- Example projects
- Wall application details
- Roof application details
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WHAT ARE SIPS?

- Structural Insulated Panels (SIPs)
- Rigid Foam Insulation
- Structural Facings
- Structural Adhesive
- Optional Electrical Chases
Retrofit Insulated Panels

• 7/16” OSB sheathing laminated to EPS

• Available 4’ x 8’, 4’ x 12’ and larger

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Retrofit Insulated Panels

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R-values

<table>
<thead>
<tr>
<th>Thickness</th>
<th>2”</th>
<th>3”</th>
<th>4”</th>
<th>5”</th>
<th>6”</th>
<th>8.25”</th>
<th>10.25”</th>
<th>12.25”</th>
</tr>
</thead>
<tbody>
<tr>
<td>EPS R-value</td>
<td>R-6</td>
<td>R-10</td>
<td>R-13</td>
<td>R-17</td>
<td>R-20</td>
<td>R-31</td>
<td>R-38</td>
<td>R-49</td>
</tr>
<tr>
<td>Neopor® R-value</td>
<td>R-8</td>
<td>R-12</td>
<td>R-17</td>
<td>R-22</td>
<td>R-27</td>
<td>R-39</td>
<td>R-45</td>
<td>R-58</td>
</tr>
</tbody>
</table>
Focus on a Tight Building Envelope

• Full home energy assessment such as a BPI rater – every house is different
• Added roof insulation
• Added wall insulation
• Whole-house air sealing
• Added ventilation
Ventilation

- Increase in air tightness can cause IAQ issues if ventilation not addressed
- Added volume of enclosed attic
- Ventilate to ASHRAE 62.2
- Non-sealed combustion appliances require combustion air and exhaust
- *Guide to Attic Air Sealing* by Joe Lstiburek
- *Building Science Insight-035: We Need to do it Different This Time* by Joe Lstiburek
  - Available at www.buildingscience.com
Energy Savings

2,900 sq. ft. home in Oak Harbor, WA

BEFORE Remodel

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Energy Savings

2,900 sq. ft. home in Oak Harbor, WA

- R-13 retrofit panels on existing walls
- R-49 attic insulation
- R-39 floor insulation
- High performance windows
- Ductless mini-split heat pump

83% reduction in heating and cooling
Retrofit Insulated Panels

- Easy sealing
- Fabricated onsite
- Insulation and complete air barrier

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Wall Applications

- Remove existing siding
- No vapor barrier required
- New windows and trim
- Weather resistant barrier and new siding

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Energy Savings

2,900 sq. ft. home in Coupville, WA

AFTER Remodel

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Air Sealing – Box Spline

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- PANEL SCREW
- 7/6" OSB
- 3 5/8" FOAM (VARIES)
- CONTINUOUS 1/2" PANEL SEALANT
- EXISTING SHEETING
Air Sealing – Surface Spline

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Wall Applications

- Eliminates thermal bridging
- 9’ retrofit insulated panels extend over rim joist
- Airtight construction
- Fewer trips around the house
- Done entirely from the outside

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Interior Trim

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Fastening Pattern

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Wall to Roof Connection

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Roof Applications

Attention required to sealing wall-to-roof connection with spray foam

Now you are converting the attic from a vented space to a conditioned space

Added volume must be accounted for in the HVAC load
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Wall to Roof Connection

- Retrofit Insulated Panel
  - 1/4" OSB
  - 7 3/8" Foam (Varies)

Pocket for Rafter Tails

Rafter Tails

Nailer between Existing Trusses

Cut off tails on existing rafters flush w/ outside of existing walls

Cut foam to pitch. Spray foam in joint connection.

Existing wall with siding removed

Retrofit Insulated Panel:
- 1/4" OSB
- 3 3/8" Foam (Varies)

Existing Rim Joist

Note: When panels are used for walls and roof, the attic area needs to be vented to inside of conditioned space
Roof Applications

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## Energy Modeling

1,500 sq. ft. ranch house  Minneapolis, MN

<table>
<thead>
<tr>
<th></th>
<th>Old House</th>
<th>Walls + insulation</th>
<th>Walls + insulation + mechanicals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attic</td>
<td>R-19</td>
<td>R-19 + R-19 blow in</td>
<td>R-38 Retrofit Panel</td>
</tr>
<tr>
<td>Walls</td>
<td>R-11</td>
<td>R-25</td>
<td>R-25</td>
</tr>
<tr>
<td>Floor</td>
<td>Un-insulated</td>
<td>R-38</td>
<td>R-38</td>
</tr>
<tr>
<td>Windows</td>
<td>Double pane</td>
<td>Same</td>
<td>Low e U=.30/.30</td>
</tr>
<tr>
<td>Mech. Vent.</td>
<td>63 CFM</td>
<td>Same</td>
<td></td>
</tr>
<tr>
<td>Furnace</td>
<td>80kBTU 78%</td>
<td>Same</td>
<td>64kBTU 94%</td>
</tr>
<tr>
<td>Electric water heater</td>
<td>.90 EF</td>
<td>Same</td>
<td>Same</td>
</tr>
<tr>
<td>Cooling</td>
<td>3.5ton 7 SEER</td>
<td>Same</td>
<td>2.5 ton 13 SEER</td>
</tr>
<tr>
<td>HERS</td>
<td>105</td>
<td>64</td>
<td>55</td>
</tr>
<tr>
<td>Infiltration</td>
<td>6 ACH@50 pa</td>
<td>2 ACH@50 pa</td>
<td>2 ACH @50 pa</td>
</tr>
<tr>
<td>Monthly Bill</td>
<td>$255</td>
<td>$153</td>
<td>$141</td>
</tr>
</tbody>
</table>

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Summary

• Retrofit Insulated Panels provide a tight building envelope
  – Reduces thermal bridging
  – Reduces/eliminates air leakage

• A tight building envelope provides the greatest energy-efficiency improvement

• Easily integrated with other insulation systems

• Easier to get a perfect installation from the outside than the inside

• Many sizes and thickness available

• Provides something to fasten siding to
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