

## Siding & Roofing System Recommendations

There is no one correct wall or roof build-up for SIPs. The interactions between the building design, desired finish, and climate vary too much for one solution to work everywhere. The best practices outlined here are based on a combination of our experience and our best understanding of building science. Because most of Foard Panel's experience and customer base is in the northeast, these recommendations should be taken as guidelines and only directly applied in areas with roughly similar climate and weather.

We've learned that some amount of liquid water will always infiltrate a building's envelope/weather-protection assembly. The sources of water vary from extreme wind driven rain, condensing fog, imperfections in flashing details, vapor drive from inside to outside, and many other sources.

In conventional/pre-IECC construction, there is plenty of air infiltration and exfiltration through sheathing to help remove water from the sheathing. Additionally, during winter, low- and moderate-performance buildings have substantial heat flow from inside-to-outside. This provides energy to drive the water's phase change from liquid to gas, allowing it to pass through vapor-open building-wraps easily.

When the envelope is much higher performance, like SIPs, the "drying dynamics" change dramatically. SIPs have greatly reduced air infiltration, slowing the drying process. Also, the huge reduction in thermal bridging and effect of full-thickness "continuous insulation" reduce the heat flow (BTU/sqft/hr) through the wall/roof assembly. This greatly reduces the available energy to evaporate water in or near the sheathing; allowing the wood sheathing/panel-skin to stay wet longer. "Liquid-tight/vapor-open" (hydrophobic) membranes exacerbate this effect by retaining liquid water at the sheathing level.

For these reasons, Foard recommends weather protection by traditional #15 or #30 felt paper (also called tar paper or asphalt impregnated organic felt) instead of synthetic building-wraps or roofing underlayments. We have evaluated the properties of many house wrap and roofing underlayments suggested by our customers. Comparing these properties with our on-site investigations and other evidence, we expect the best of the synthetic building-wraps may approach the protection and durability provided by tar paper.

From our analysis of all of the site visit information and consultations with well-respected building science engineers, we've been able to amass the following list of key points and recommendations:

- All sheathing eventually gets wet. Encouraging it to dry rapidly is the key to durability.
- Liquid water can reach the sheathing either from the outside or the inside, but outdoor water penetration is most common by far.
- Liquid water management is more important than water vapor management.
- To reduce wetting the sheathing from the inside, the most effective air and vapor control layers must be on the warm side of the envelope. Everything to the cold side of these retarders should be of increasing permeance.
- Use the most proven and durable flashing details, use "rain-screen" wall and vented or "cold" roof designs, reduce water concentration as much as possible, and understand that large overhangs are cheap insurance.

- Use house wrap and roofing underlayments that allow water vapor **AND** liquid water to slowly pass through.
- Provide a 1/4" or greater vent-space/capillary-break between the roofing or siding and the sheathing. This is among the most effective durability enhancements we've found. Capillary breaks can be made with strapping or furring strips or with a super-porous mesh product like Slicker Classic® or Cedar Breather® by Benjamin Obdyke.

We've yet to document a felt paper covered SIP envelope with a building-wrap-driven durability problem. On the other hand, we get a tragically high number of calls and emails each year from owners of both SIP and other wood based low-heat-loss systems wrapped in synthetic/hydrophobic underlayments.

The following picture illustrates one of the best ways to create a vented roof, felt paper and strapping.



If instead of felt paper the SIPs are covered with a hydrophobic underlayment, then you have a much higher chance of causing wood deterioration. The situation is especially bad if the underlayment is hydrophobic and has permeance that is lower than about 0.2 perm which is the perm rating of SIPs. The difficulty is caused by having a lower permeance than the total permeance of everything inboard of it and it being located on the cold side of the assembly. Because of the difference in partial pressure of water vapor between indoors and outside, water vapor always diffuses outward during New England winters. The hydrophobic membrane or underlayment stops the outward diffusion of water vapor and, being on the cold-side of the assembly, condenses the vapor into liquid water at the wood sheathing. Because the water has no ability to migrate anywhere else, it stays in wood sheathing. This diffusion rate is slow but, over time, the moisture content of the wood can rise to the level where it supports fungal growth. This can happen even if there are no other defects that allow outdoor water to get in. If there is also a flashing problem, siding nail holes, or other defect in the weather barrier, then the problem is multiplied.

The following is a list of siding and roofing layups that have proven to be among the most durable:

Wall:

- Clapboard siding:  
SIP, #15 felt paper, 1x4 or 2x4 vertical strapping, clapboard -or-  
SIP, #15 felt paper, Slicker Classic® or equal, clapboard.
- Traditional shingle, shake, or vertical board & batten or ship-lap:  
SIP, #15 felt paper, 1x4 or 2x4 horizontal strapping, shingle -or-  
SIP, #15 felt paper, Slicker Classic® or equal, shingle.
- Stucco, brick, stone, or fake-stone veneer siding:  
SIP, #15 felt paper, 2x4 strapping/furring, PT plywood or fiber-cement panel, masonry finish,  
functioning top and bottom vents.

Roof:

- Asphalt shingle roofing:  
SIP, #30 felt paper, 1x4 or 2x4 strapping/furring, T&G sheathing, any roof underlayment, asphalt shingles
- Standing seam metal roofing:  
SIP, felt paper, standing seam metal roofing -or-  
SIP, felt paper, standing seam metal roofing w/ vertical spacers between each seam to create a vent space
- Wood shingle roofing:  
SIP, felt paper, Cedar Breather® or equal, wood shingles -or-  
SIP, felt paper, horizontal wood furring strips, wood shingles
- Pre-formed, ribbed metal roofing panels:  
SIP, felt paper, steel roofing panels
- For other siding and roofing types, please contact your Foard Panel project manager or Foard Panel technical support.

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