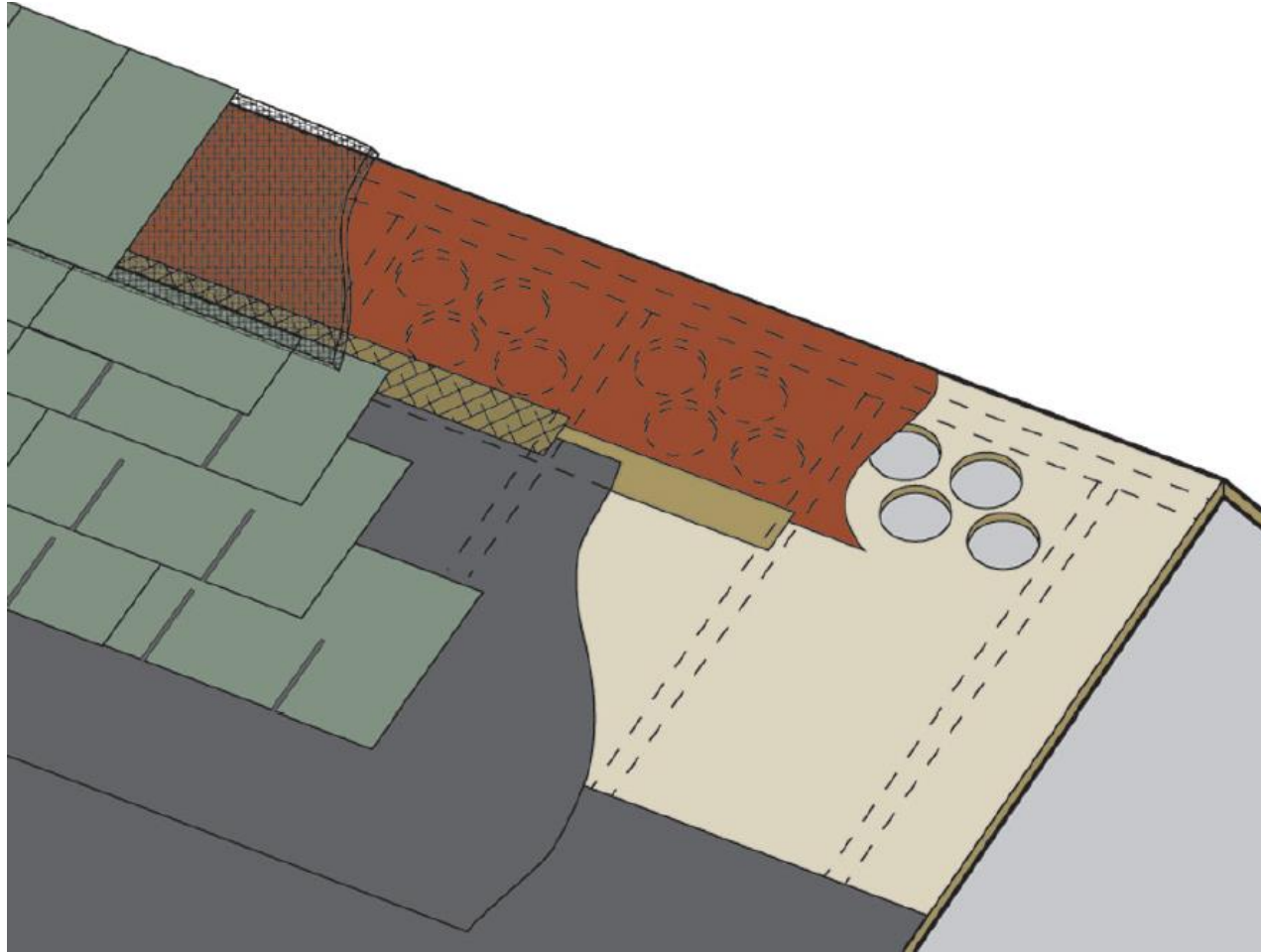


Unvented Roofs - Air Permeable Insulation

2015 Building Technologies Office Peer Review



Project Summary

Timeline:

Start date: July 2014

Planned end date: July 2015

Key Milestones

1. Instrumentation Completed; December 2014
2. Analysis Completed; July 2015

Budget:

Total DOE \$ to date: \$200,000

Total future DOE \$: none

Target Market/Audience:

Residential homebuilders

DOE Weatherization program

Key Partners:

Owens Corning	
Dupont	
Johns Manville	
David Weekley Homes	
K. Hovnanian Homes	

Project Goal:

To develop methods of constructing unvented conditioned attics using air permeable insulations such as fiberglass and cellulose. This has application in new house construction and in the weatherization of existing houses.

Purpose and Objectives

Problem Statement: In the design and construction of unvented conditioned attics spray polyurethane foam is expensive and there are environmental concerns. Dense pack cellulose is very risky in the weatherization of existing house rafter assemblies.

Target Market and Audience: This has application for new home construction and in the retrofit of existing houses.

Impact of Project: This is a potential game changer. It can reduce the construction of unvented roofs by more than 50 percent and allow the use of dense pack cellulose in retrofit applications without risk.

1. Project endpoint(s): Code change allowing use of air permeable insulation in the construction of unvented conditioned attics.
2. Impact path:
 - a. Near-term – the moisture content of the roof sheathing
 - b. Intermediate-term – adoption by IRC
 - c. Long-term – significant market penetration

Approach

Approach: Construction of test houses in Orlando and Houston with both diffusion vented and unvented attics using fiberglass and cellulose.

Key Issues: Moisture content of roof sheathing remaining below 20 percent over the service life of the assembly.

Distinctive Characteristics: Allows the use of off-the-shelf products in a unique way. Standard ridge vents are used with standard vapor open building films with standard fiberglass and cellulose insulation. No lower venting at soffits is provided. Only ridge vents are installed. The vent openings are covered with an air tight but vapor open film to allow vapor to escape but not air to escape.

Progress and Accomplishments

Lessons Learned: Roof slope is important. Vapor transmission of vent film needs to be higher than expected – greater than 50 perms. Climate limit is likely IECC Climate Zone 5 for new houses.

Accomplishments: The approach works for both cellulose and fiberglass in IECC Climate Zones 1, 2 and 3 without limitation. In IECC Climate Zones 4 and 5 some type of vapor retarder on the underside of the insulation layer is likely necessary.

Market Impact: There is no market impact at this point – too soon. However, the manufacturer partners intend to pursue the approach as a high priority.

1. The private sector is prepared to take this to market immediately.
2. The DOE Weatherization program is not aware of this work and needs to be informed of its significance with respect to reducing the risks of dense pack insulation in roof rafter assemblies.

Awards/Recognition: None.

Project Integration and Collaboration

Project Integration: Data is shared on a weekly basis. Discussions with industry R & D staff occur bi—monthly. The issue is that industry partners want to move faster than we believe the physics allows.

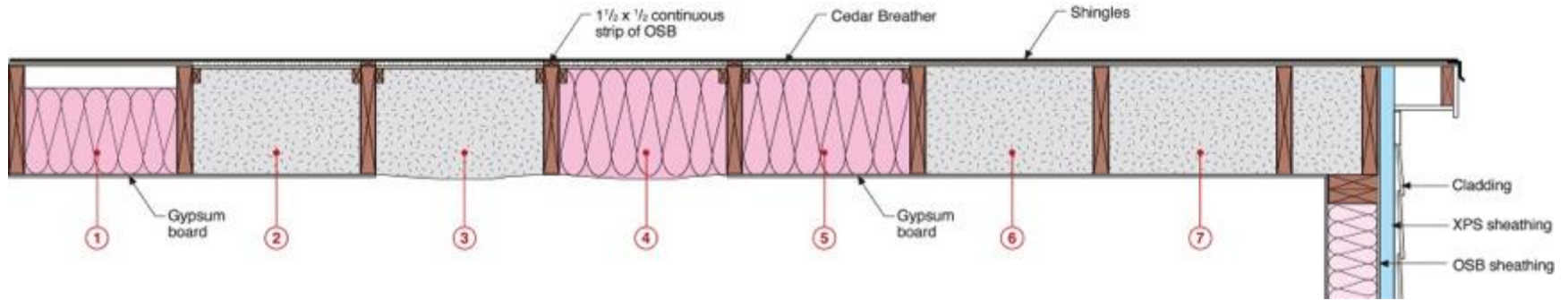
Partners, Subcontractors, and Collaborators: Manufacturing partners are Owens Corning, Johns Manville and Dupont. Builder partners are David Weekley Homes and K. Hovnanain Homes. The builder partners provided the test houses. The manufacturing partners provided the product.

Communications: This has been presented in a DOE webinar, to the ARMA Steep Slope roofing technical committee and at the Passive House conference.

Next Steps and Future Plans

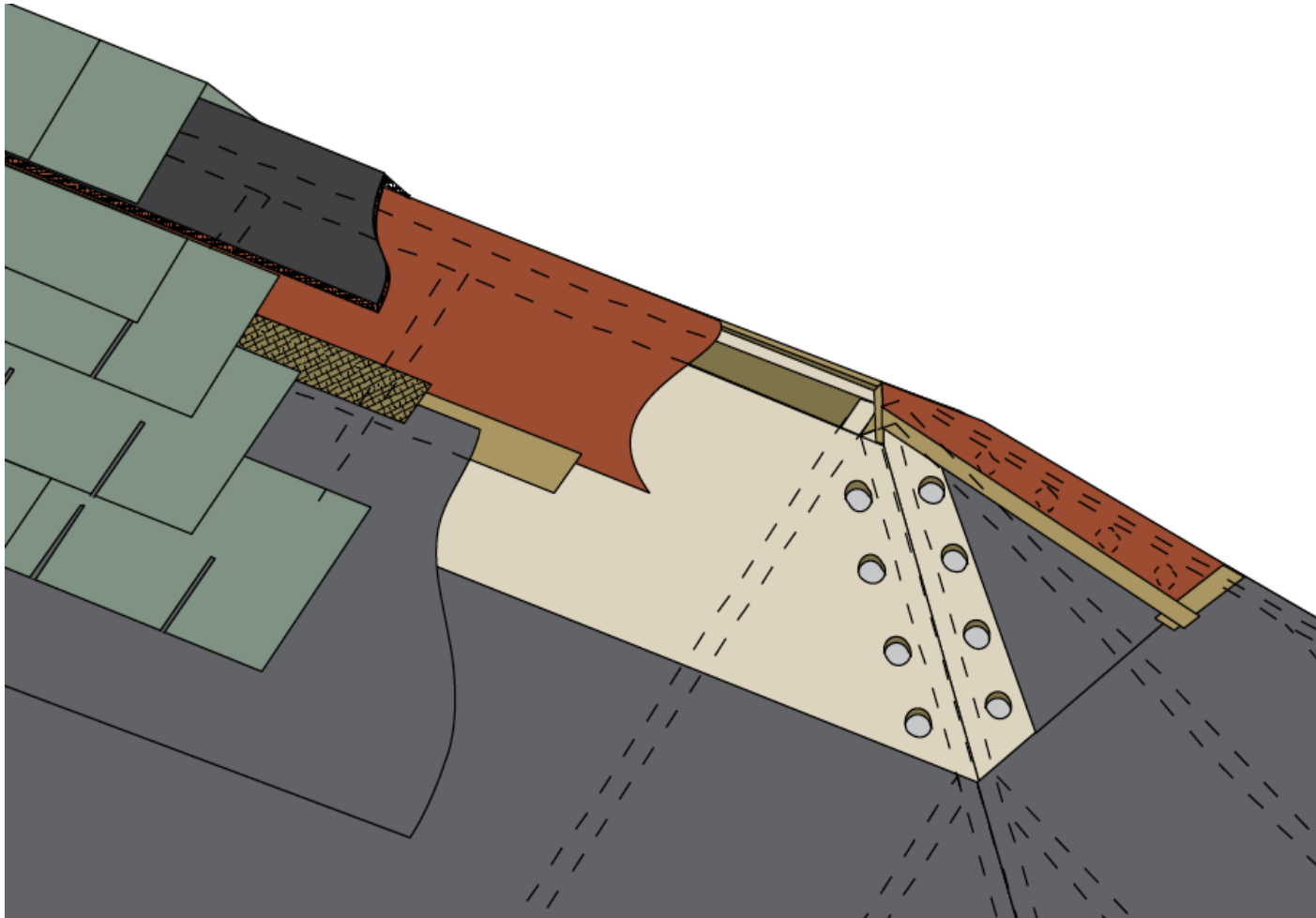
Next Steps and Future Plans: We plan to write it up as a conference peer reviewed paper. The private sector intends on providing the next level funding and intends on bringing the technology to market. We plan to introduce code language for the next round of code changes to allow the implementation of the technology.





















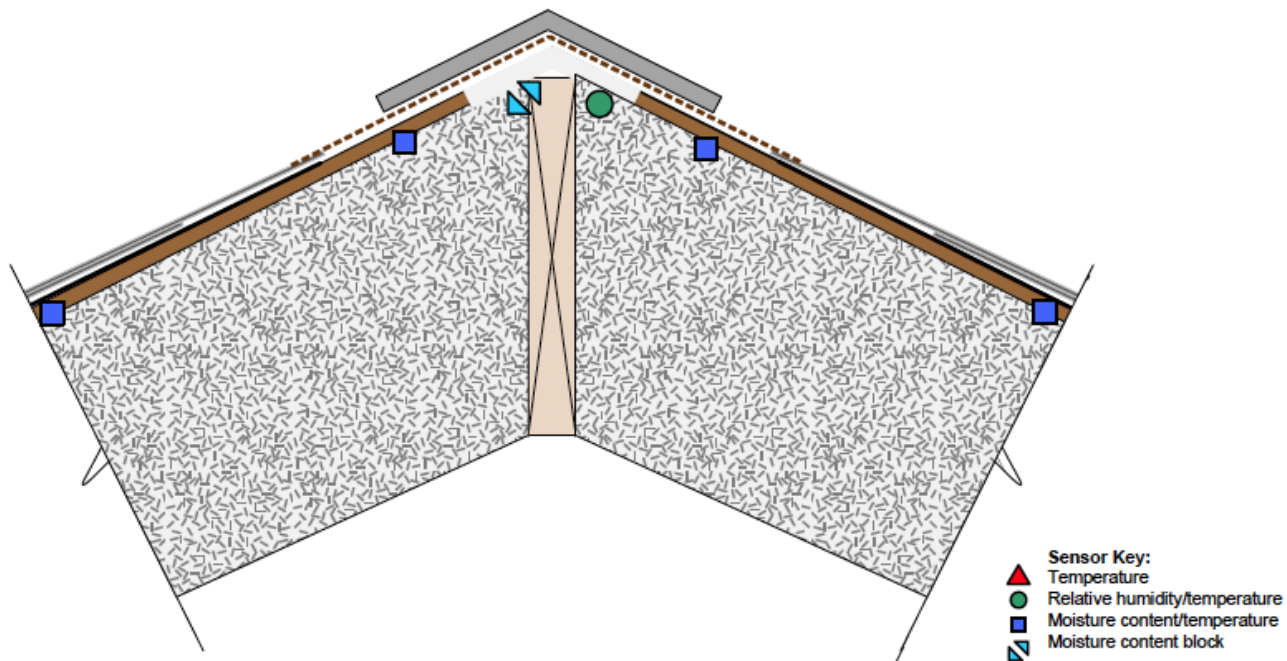


Figure 114: Ridge monitoring “package” (sensors at ridge and hip peaks)

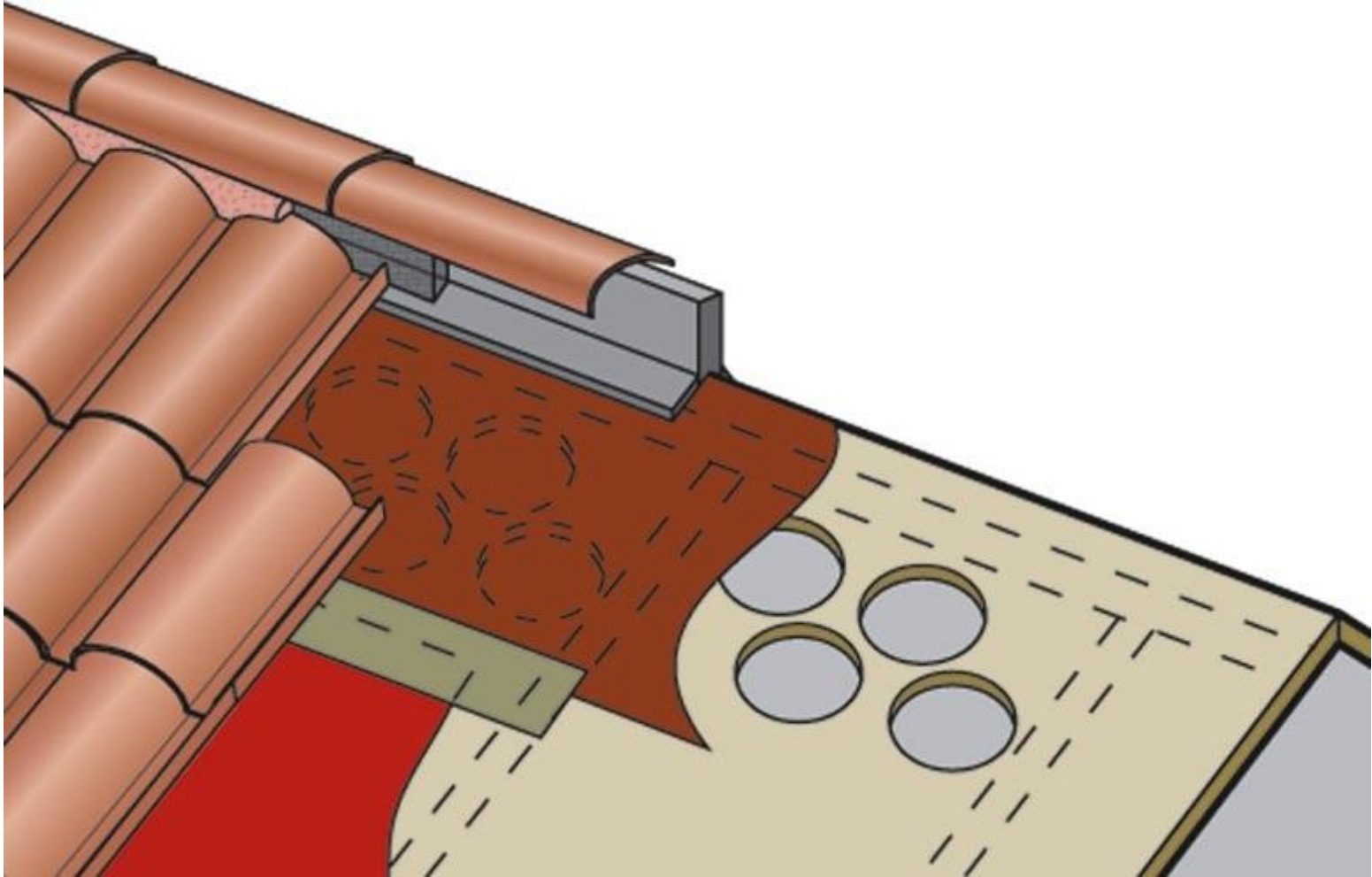


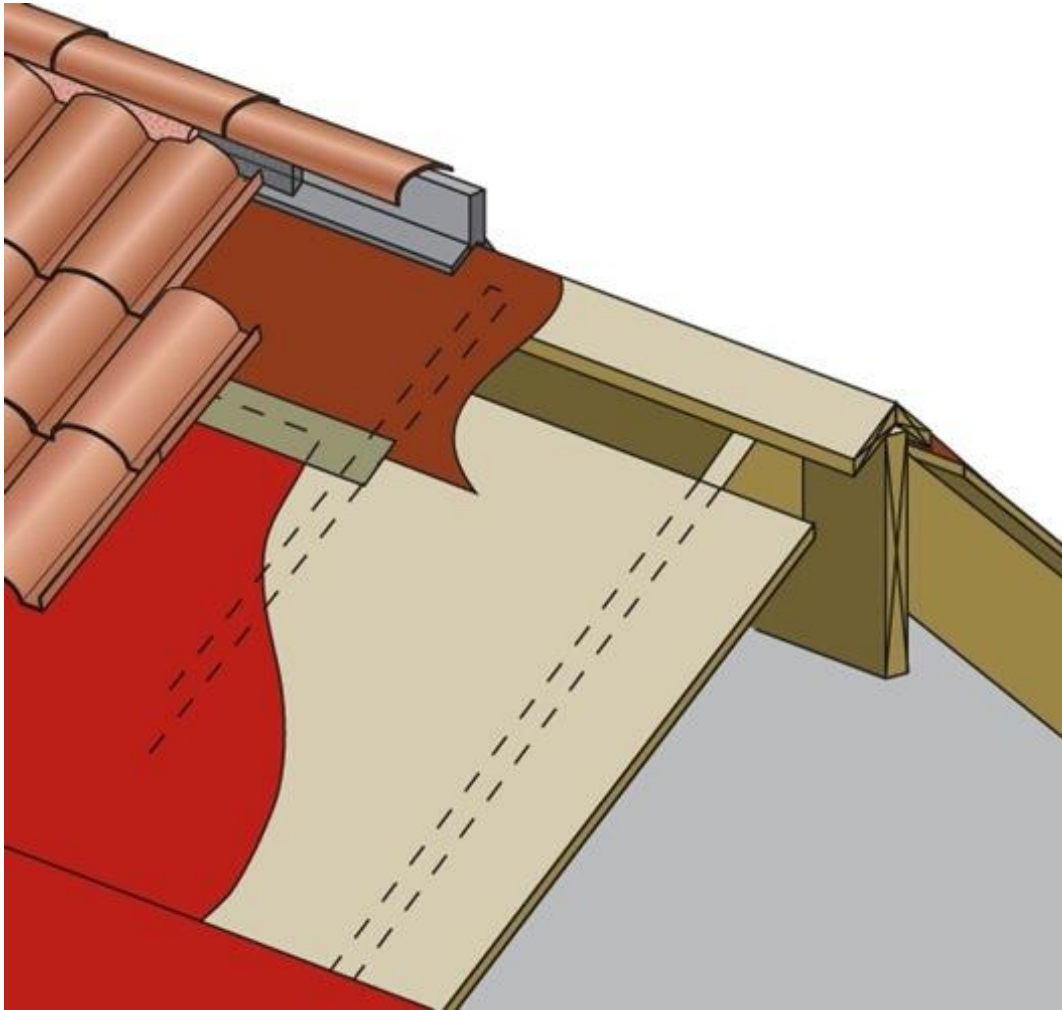
Figure 116: Typical ridge monitoring package, with sensors highlighted



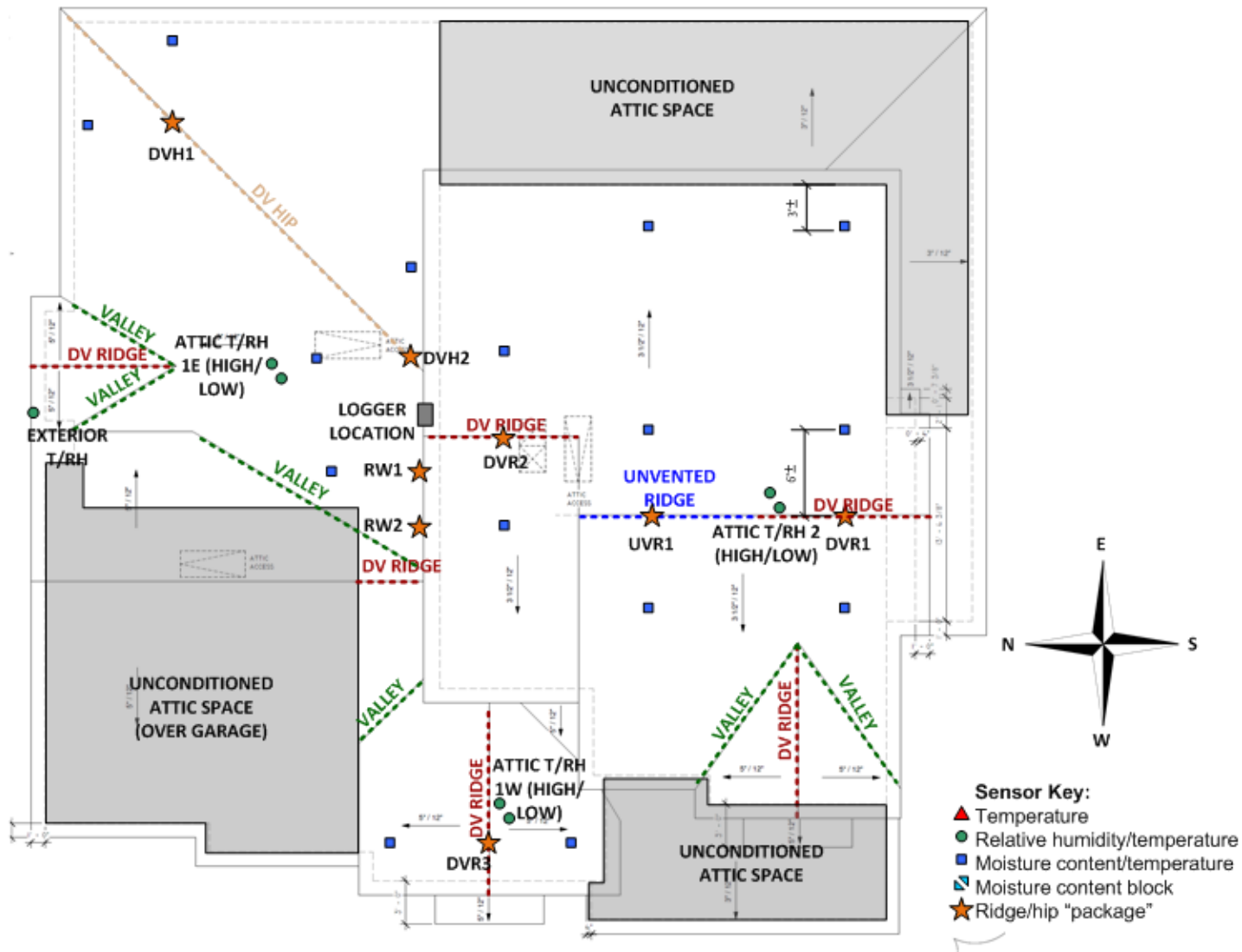
Figure 117: Ridge sheathing T/MCs and T/RH (L); ridge T/MC and wafer sensor (R)

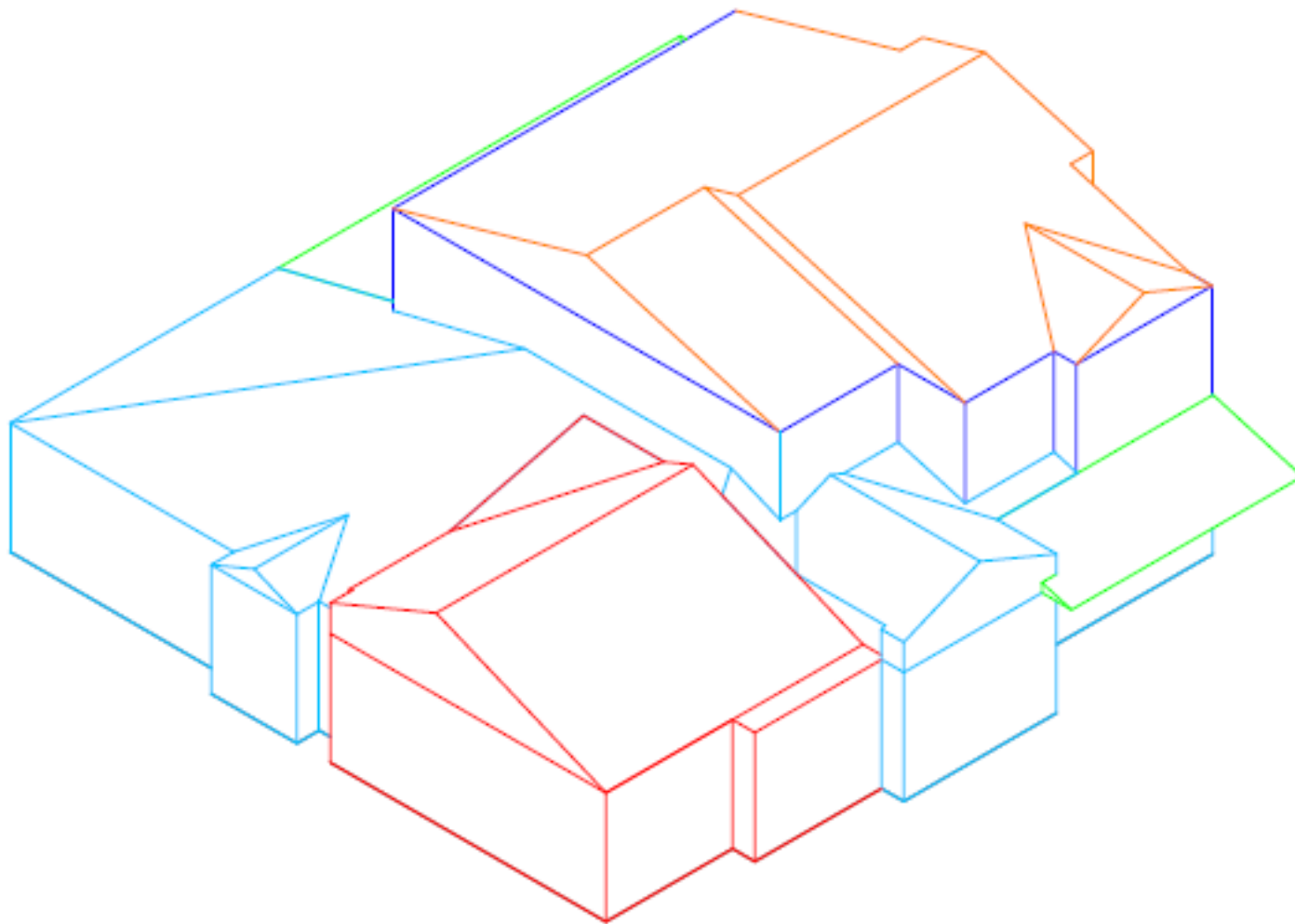


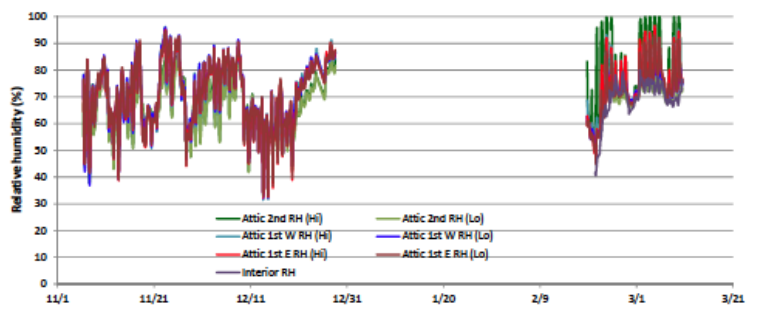
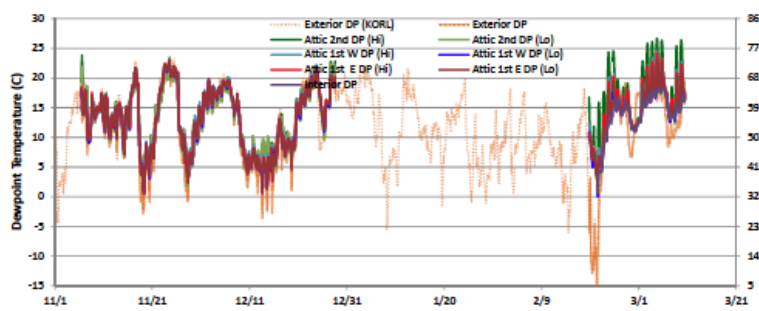
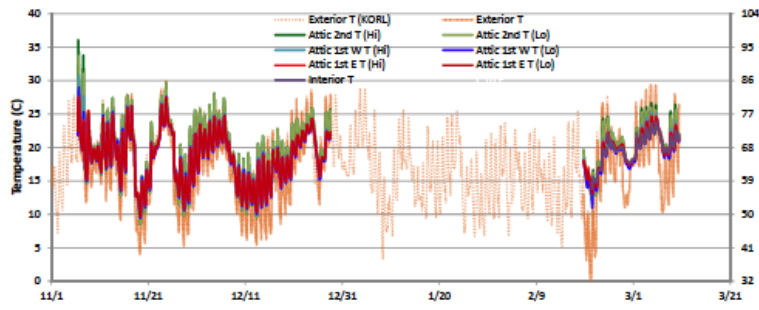


















Project Budget

Project Budget: \$200,000.

Variances: No variances.

Cost to Date: Total budget has been spent.

Additional Funding: None at this point. However, manufacturing partners intend on proceeding with the technology and intend to bring it to market.

Budget History

July - FY2014 (\$200,000)		FY2015 (none)		FY2016 (none)	
DOE	Cost-share	DOE	Cost-share	DOE	Cost-share
\$200,000	\$50,000	n/a	n/a	n/a	n/a

Project Plan and Schedule

- Project original initiation date: July 2014
- Project planned completion date: July 2015
- Schedule: Instrumentation completed December 2014
- Schedule: Analysis expected to be completed July 2015
- Go/no-go decision points: Moisture contents above 20 percent
- Current and future work: No future work planned with the DOE on this technology. The private sector intends to take the technology to market.