



HIGH PERFORMANCE ATTICS IN NEW CALIFORNIA HOMES

Rob Hammon, Ph.D.
President



Goals and Objectives

Goal:

Provide production builders with practical, cost-effective attic design and construction practices that allow ducts in the attic by eliminating major energy losses and enhancing the durability performance of the attic.

Objectives:

- Use simulations & lab testing to resolve technical issues
- Implement & monitor test homes
- Develop builder guidelines
- Train builder partners
- Compare energy impacts in Test Homes: Typical Attic vs HP Attic
- Develop Training Course

PROJECT TEAM



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Director Building Science
Owens Corning S&T, LLC



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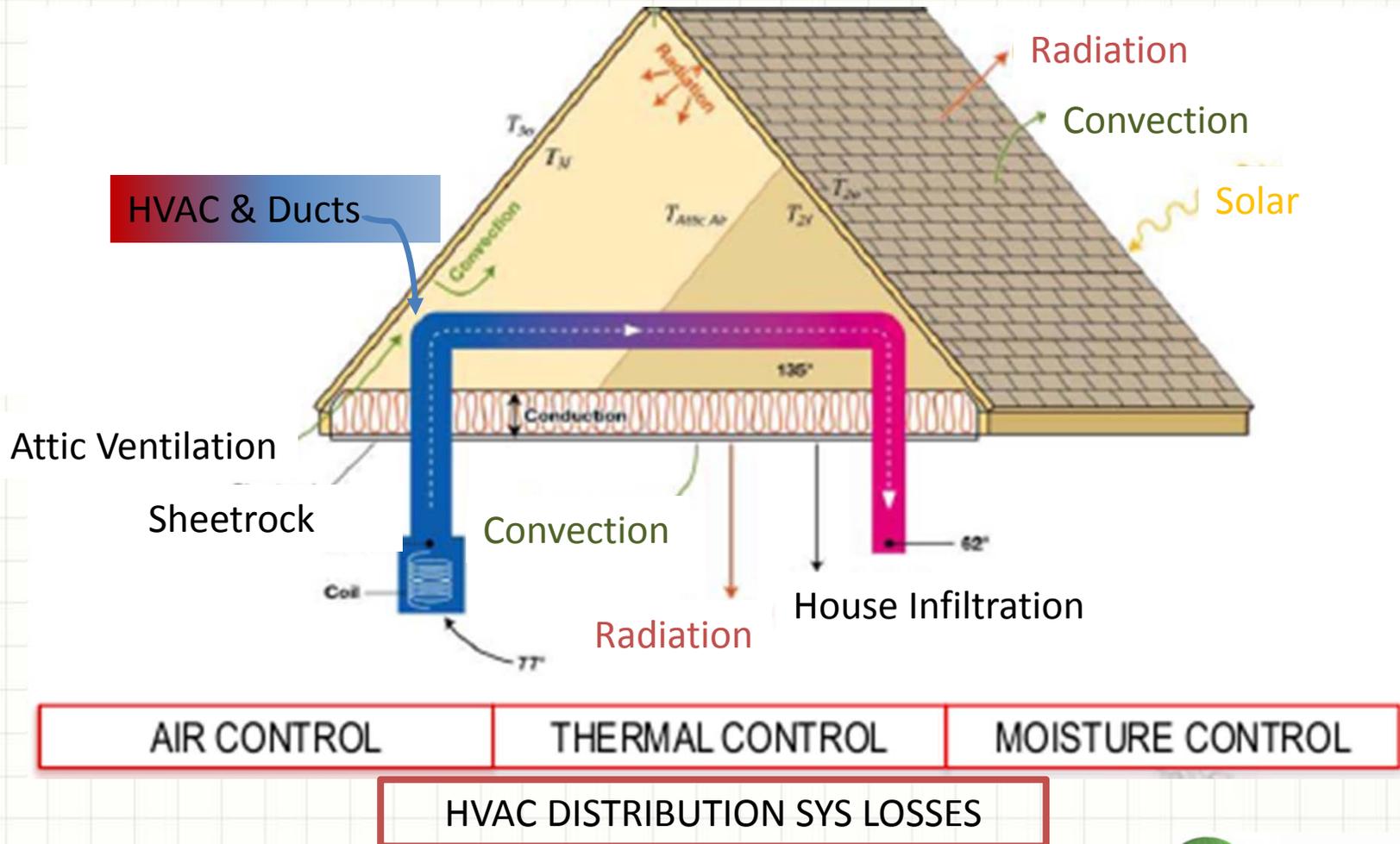


Layne Marceau
President
Shea Homes



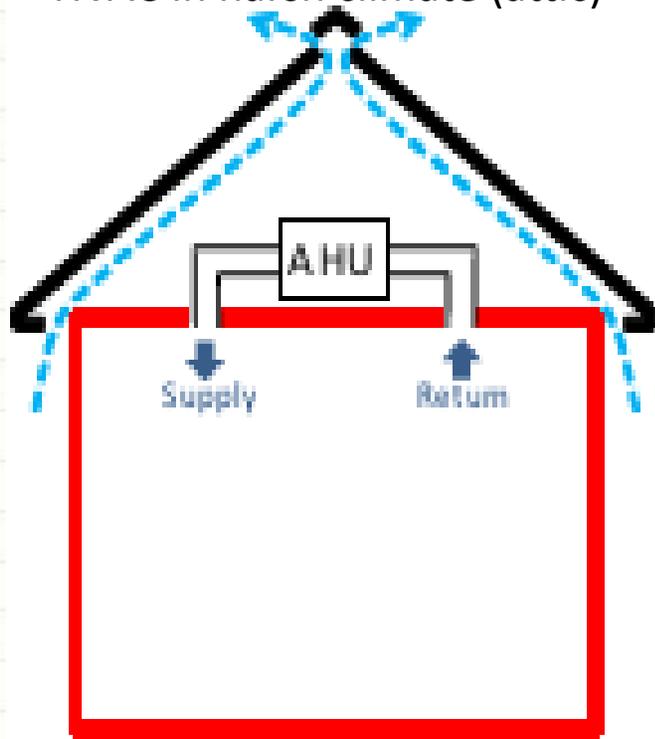
Ram
Narayanamurthy
EPRI

Why Are HP Attics Important?



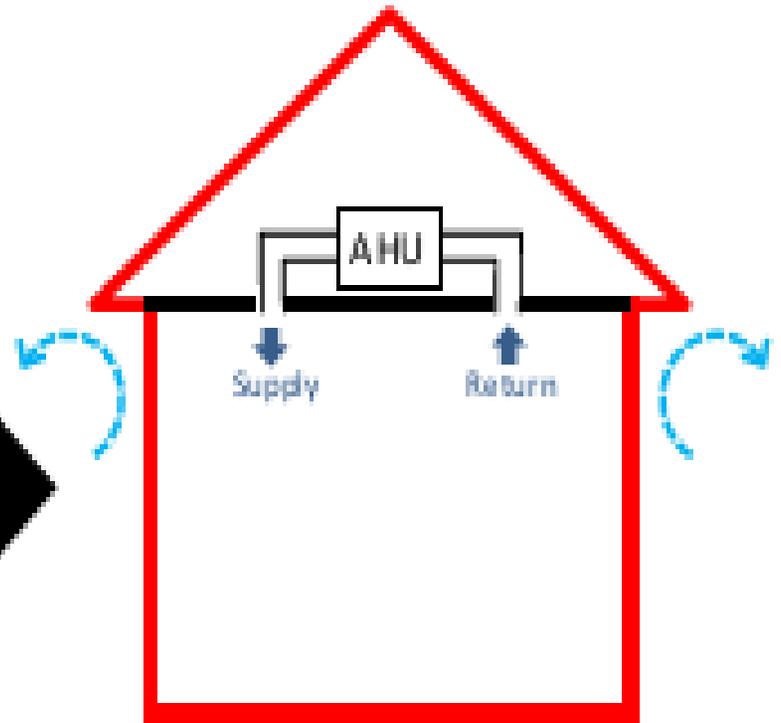
Vented or Unvented?

Shell Sealed??
(Difficult: ceiling lights, top-plates)
HVAC in harsh climate (attic)



Vented Attic

Sealed Shell
(Difficult roof/wall junction)
HVAC "in Conditioned Space"



Unvented Attic

Key Components of an Attic System

Air Control

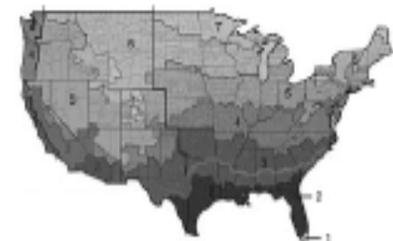
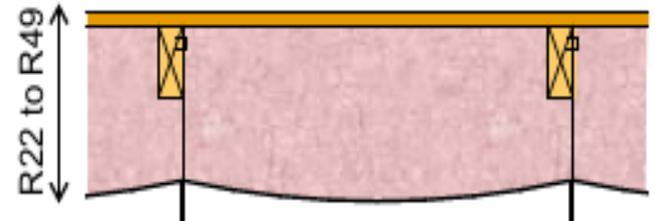
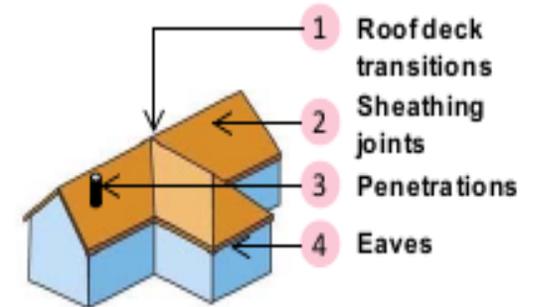
Applied only where the attic needs it

Thermal Control

Any R-value, any depth with uniform insulation that envelopes truss chords

Moisture Control

Climatically tuned by Climate Zone - addresses moisture and durability risks of other systems



Task Descriptions

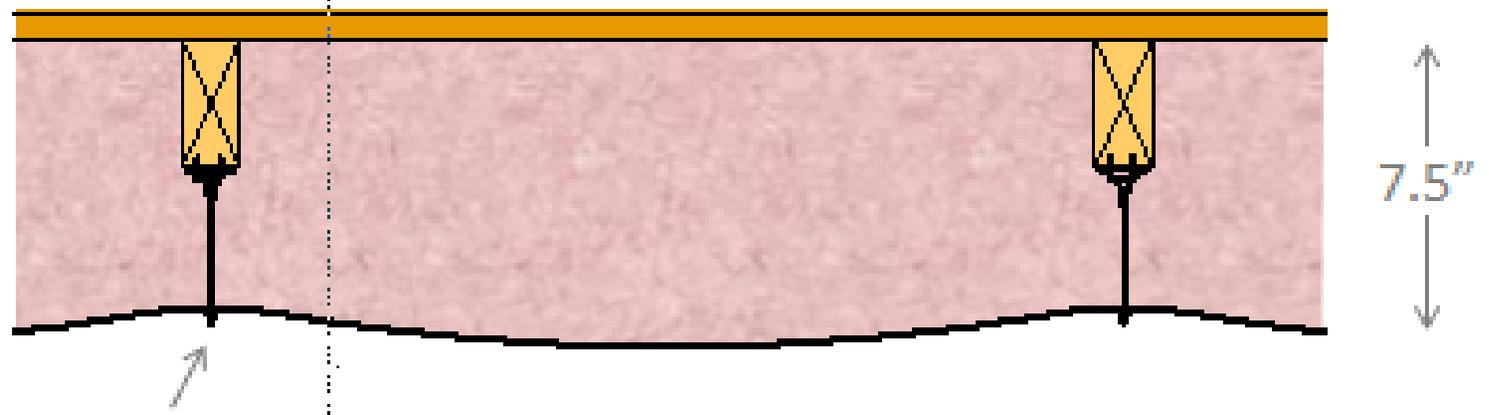
Task	Description
1.	General Project Administrative Tasks
2.	Attic Moisture Management
3.	Air Sealing Junction of Exterior Wall and Attic
4.	Netting Permeance
5.	Optimal Insulating Material(s) for “Deck Sandwich”
6.	Field Demonstration and Instrumentation of 4 Attics
7.	Field Test Attic Results, Simulations and Benchmarking
8.	Evaluation of Project Benefits
9.	Technology / Knowledge Transfer Activities

Field Test Configurations

Ducts in Attics for All Test Configurations

1. **Current practice, control-attic:** vented attic with insulation on the attic floor. Extreme attic temperatures surrounding HVAC
2. **Sealed insulated attic:** e.g., Owens Corning Box Netting. HVAC in attic: “ducts in Conditioned Space” Attic temperature tracks interior temperature.
3. **Sealed, double-insulated attic.** Sealed attic, insulation on attic floor and attached to underside of the roof deck. HVAC in moderated attic, ducts sealed and insulated.
4. **Hybrid insulated vented-attic.** Vented attic, insulation on attic floor and insulation applied to the top of the roof-deck. HVAC in moderated attic, ducts sealed and insulated.

Sealed Attic, Insulation Under Roof-Deck Owens Corning Box-Netting



Netting is stapled
at adjoining bays:

Field-Test Homes: Baseline Data

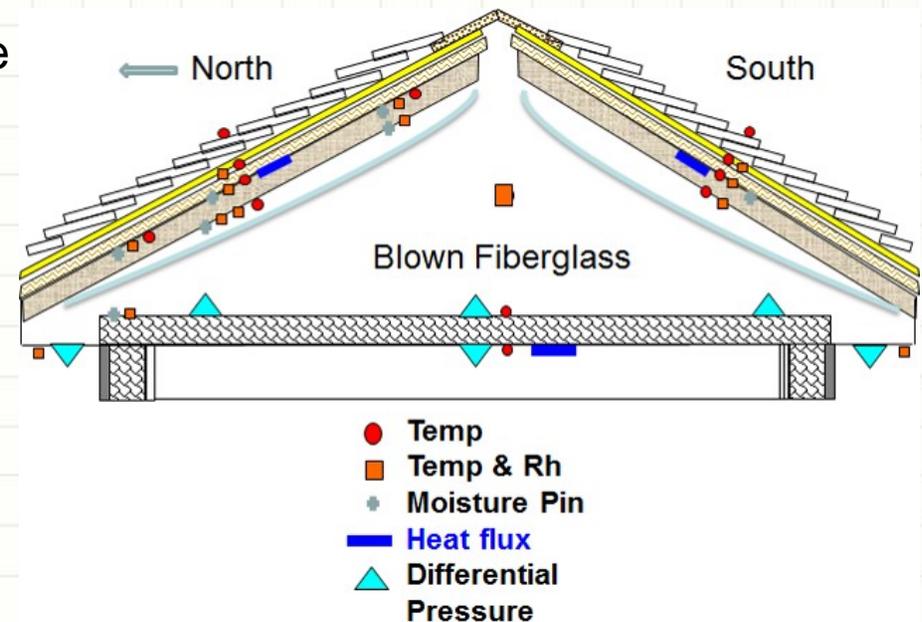
Four Test Homes – Nearby and As Similar as Possible

- Solar reflectance and thermal emittance of roof covering.
- Wall, roof and duct insulation levels.
- Envelope characteristics, features and descriptors (e.g., areas, orientations, colors, finish)
- Duct design, including diameters, branches and lengths
- Air tightness of the duct system verified by duct-pressurization tests.
- Air tightness of ceiling verified by blower-door testing.
- Fenestration areas by orientation, window U-values, the daylight transmittance, the solar heat gain coefficient, the number of layers of glass, the composition of gas in air space.

Monitor & Analyze Field Test Homes

Continuously Monitored Conditions:

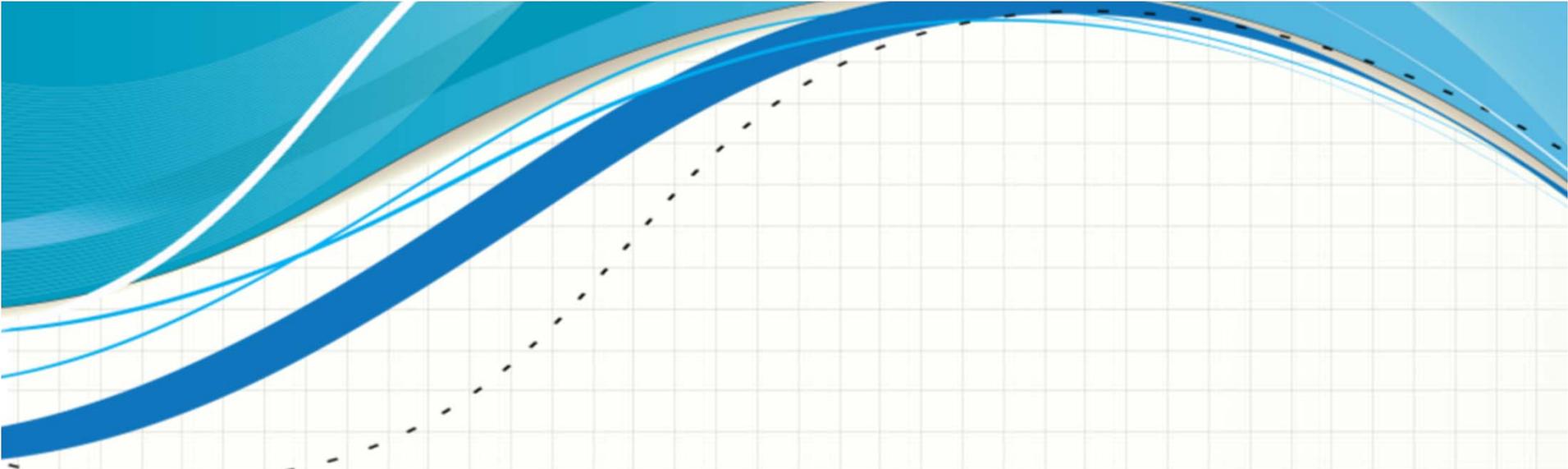
- Full weather station
- Humidity & moisture in roof sheathing
- Whole-house & HVAC energy use
- HVAC run time.
- Temperatures:
 - Roof surface
 - Roof sheathing
 - Attic air (north & south)
 - Indoor at thermostats
- Roof deck & attic floor heat flows
- Bulk air temperature profile along and inside longest supply duct
- Air pressure drops across attic floor and eaves





DELIVERABLES

- Attic Moisture in Sealed Attics
- Air-Sealing the Attic
- Guidelines for Permeance Requirements of Roofing Underlayment and Netting Materials
- Materials and Methods to Insulate Above-Roof Decks on Ventilated Attics
- Assessment of HP Attics and Whole-House Energy Use in Test / Demonstration Homes
- Performance of Ventilated- and Sealed-Insulated Attics in CA Climates
- High-Performance Attic Fact Sheet
- Technology/Knowledge Transfer Plan and Report
- Project Final Report



THANK YOU!

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