Cool Metal Roofing

Above Sheathing Ventilation

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Cool Metal Roofing Coalition

Cool Metal Roofing

DEFINITIONS

- ASV means:
  - Air Flow
  - Heat Reduction
  - Energy Savings

- ASV will:
  - Reduce AC load in summer
  - Provide insulation in winter

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ASV and ENERGY

ENERGY CONSUMPTION

Specifically
ENERGY REDUCTION

Especially
PEAK ENERGY REDUCTION

ROOF SURFACE/CONSTRUCTION

How can the Roof Surface Help?

AND

How Can Innovative Roof Construction Help?

ROOF SURFACE-RESIDENTIAL

We were (sort of still are):

- Dark Asphalt-0.08 SR- 92% of sun's energy converts to heat
- Modern Residential Metal Roof- minimum 0.30 SR - 30% or more reflected away

ROOF SURFACE-COMMERCIAL

Same Story - More Dramatic:

- We had Built-Up – hot/cold tar
  SR 0.08

- Today High Quality,long life span Metal Roofs SR 0.70 (minimum)

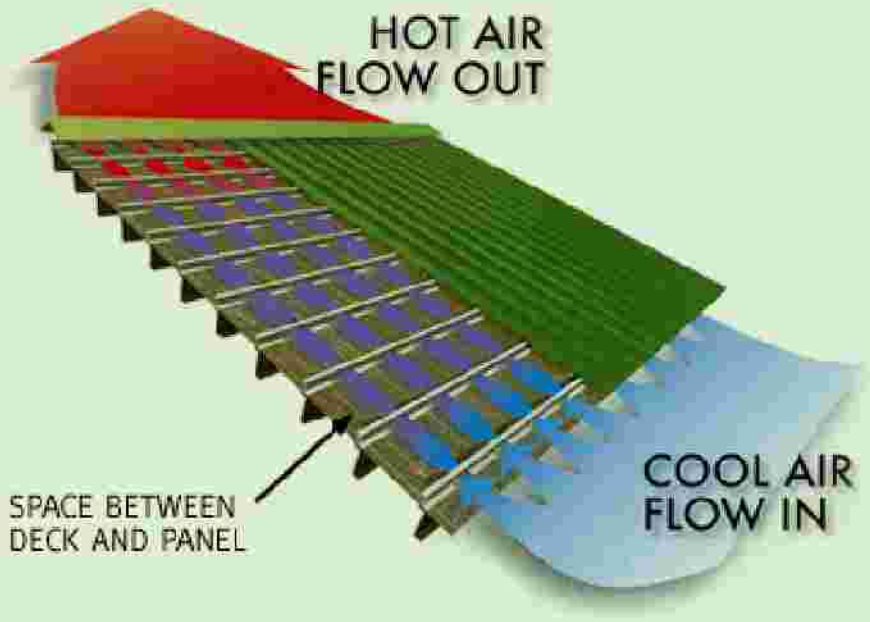
INNOVATIVE CONSTRUCTION - ASV

- Air Gap - between Roof Surface and the Sheathing - which allows air flow to exit at roof top
- Can be used with both:
  - Residential (Steep Slope)
  - Commercial/Industrial (Low Slope)

Above Sheathing Ventilation

ASV ILLUSTRATION

- Created by air space between roof deck and metal roof panel.
- Yields energy savings in summer and winter.
- Also helps remove unwanted moisture.



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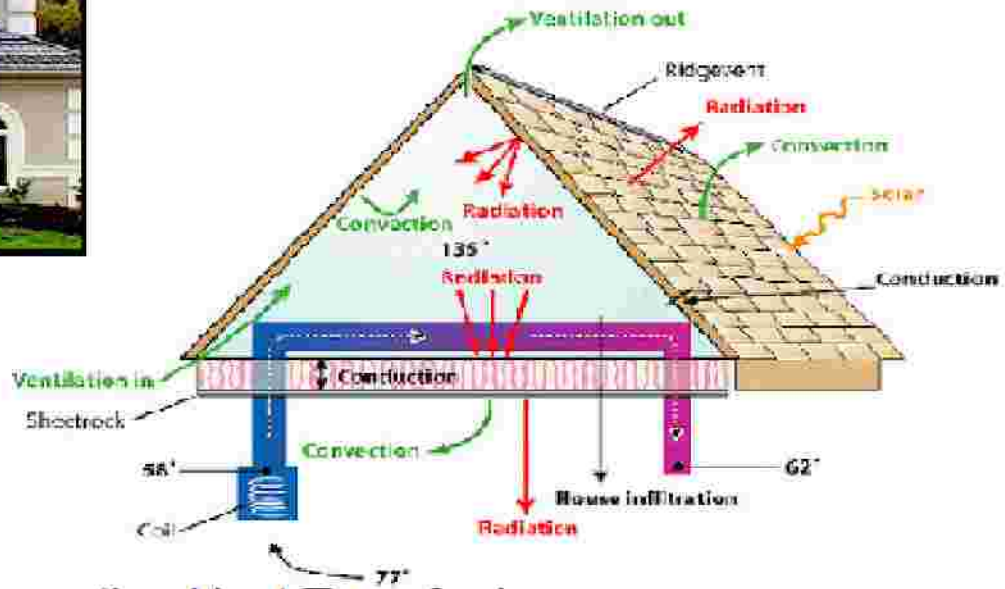
GENERAL RESIDENTIAL MODEL

AtticSIM *(Attic Simulation)* Model

ASTM C 1340-99 Standard For Estimating Heat Gain of Loss Through Ceilings Under Attics

Roof Energy Balance



- Miller et al. (2007), "*Natural Convection Heat Transfer in Roofs with Above-Sheathing Ventilation.*"

Florida Solar Energy Center

APPLYING ASV- RESIDENTIAL

- Some Roof Construction Has ASV Naturally, such as

  Batten and Counter Batten

- Metal Tile, Stone Coated, and some Metal Shingle Designs

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RESIDENTIAL EXAMPLE

Batten and Counter Batten Roof Construction

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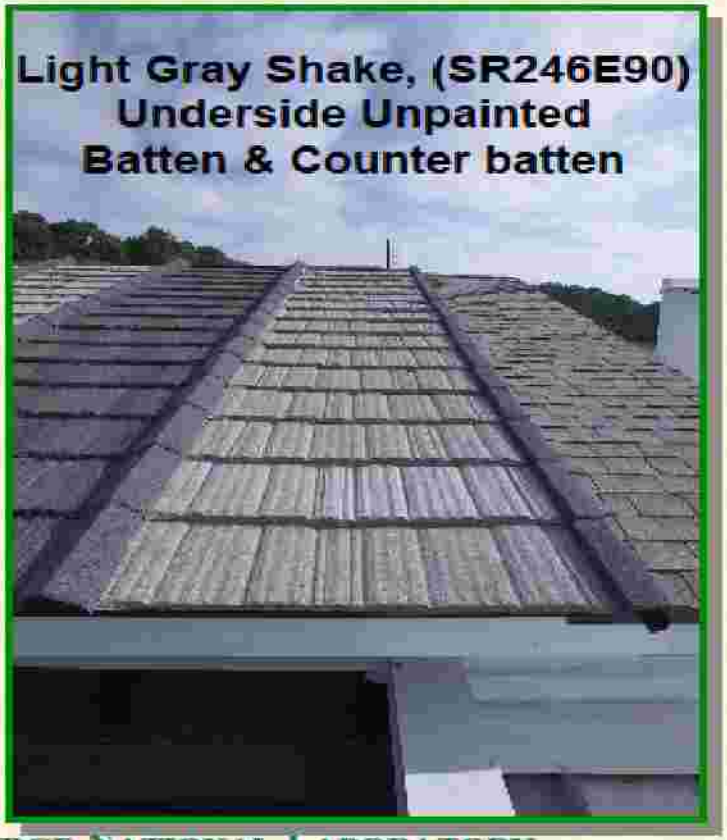
RESIDENTIAL EXAMPLE

Solar Reflectance and Above-Sheathing Ventilation (ASV) Effects



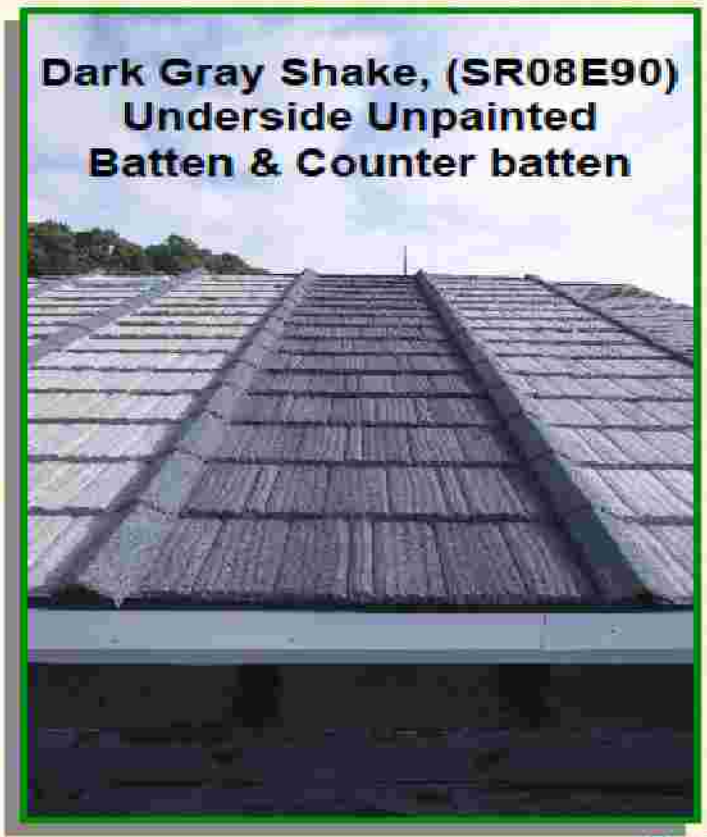


ILLUSTRATION OF COMMERCIAL

Metal roofs can be installed over old flat roofs.

- Eliminates need to remove old roofing and preserves landfill space.
- Can create ventilation cavity that can reduce peak heat gain.

APPLYING ASV-COMMERCIAL

ASV can be Applied to Others:

- Standing Seam - First Gen. 4”
- Subsequent work showed 2” and ¾” to have similar performance

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Commercial / Industrial

1st Generation Roof and Attic

Painted metal roof (SR28E81, 4-in air gap, 2 RB, PCMs)

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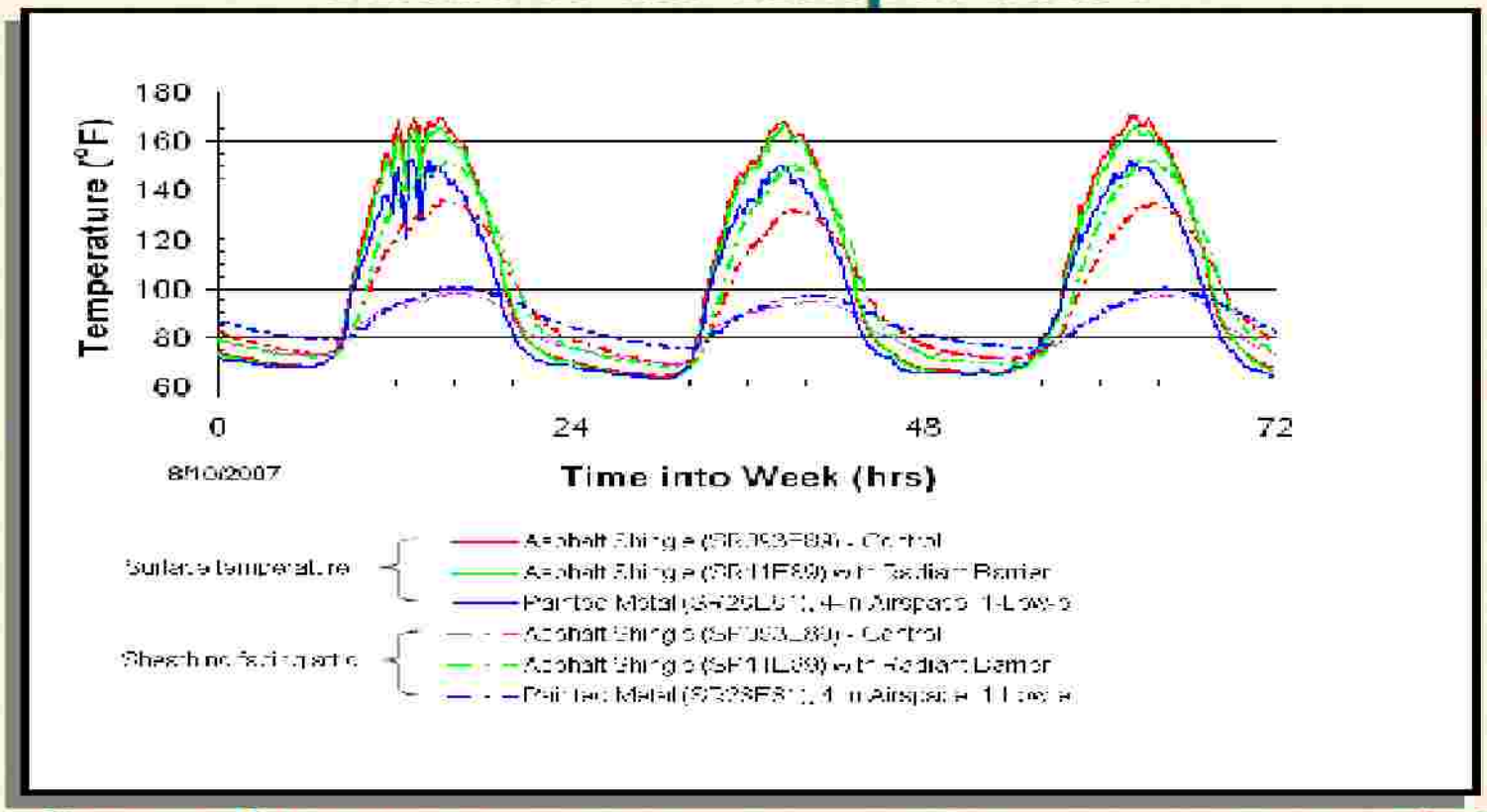
STANDING SEAM

Painted Metal (SR28E81) with 4-in airspace has attic temperatures that do not exceed peak day outdoor air temperature



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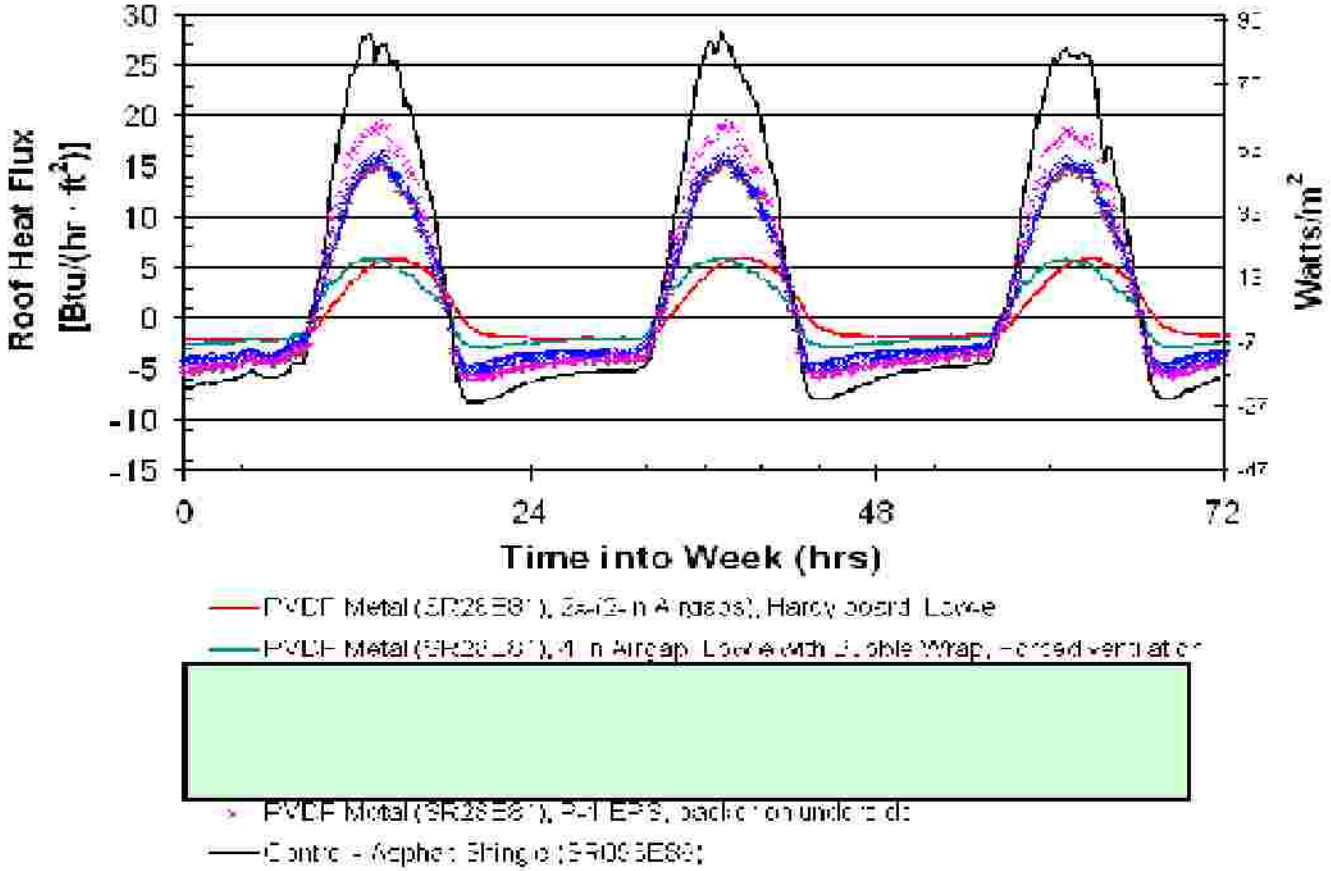
STANDING SEAM – ¾” and 2”

Roof with ¾- and 2-in airspace yield similar roof heat flows to roof with 4-in airspace



COMBINE ROOF SURFACE / ASV

Heat transfer studies at Oak Ridge showed the effect of ASV equivalent to 0.15 SR Gain

The Combination is Dramatic:

- Steep Slope 0.30 + 0.15 = 0.45 SR
- Low Slope 0.70 + 0.15 = 0.85 SR

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ROOF TEMPERATURE

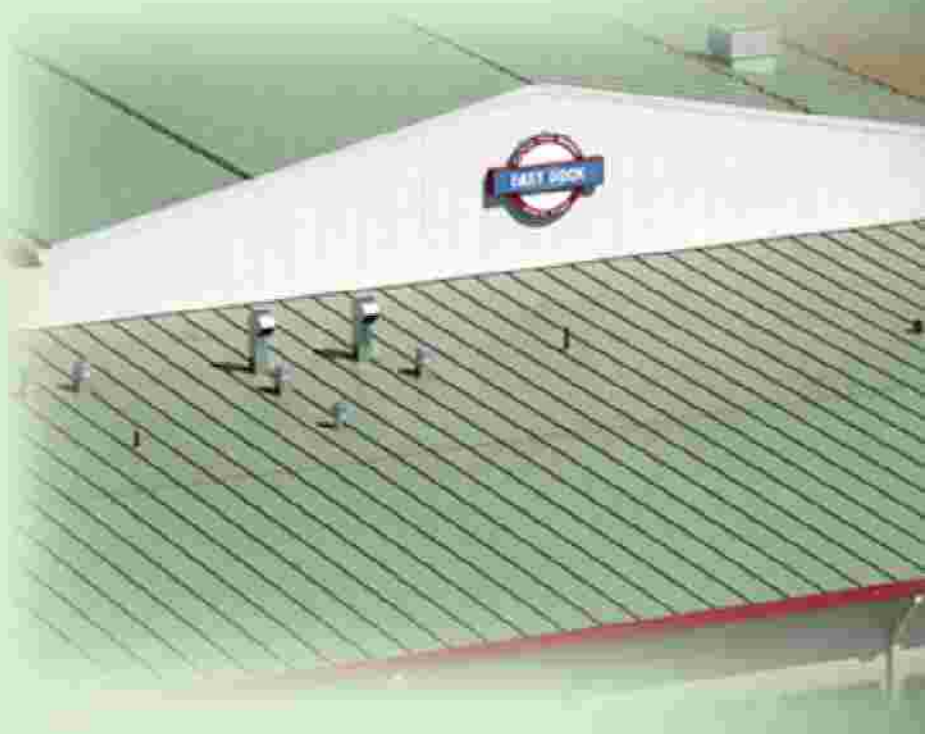
We Might Expect to Find:

- Old Low Slope 150°F +
- NEW Low Slope 90°F
  (Close to the air temp)

- Old Steep Slope 150°F
- NEW Steep Slope 110-120°F

Above Sheathing Ventilation

When combined with cool metal roof surface, ASV can reduce heat gain through the roof assembly up to 45%.



(Source: Oak Ridge National Laboratory)

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ARE THERE ANY QUESTIONS?

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THANK YOU

Thank you to the Coalition for inviting me to speak

To Oak Ridge National Lab for the work they do for all of us and especially to Andre Desjarlais and Bill Miller

To Scott Kriner for his time and help

And to all of you for your attention!