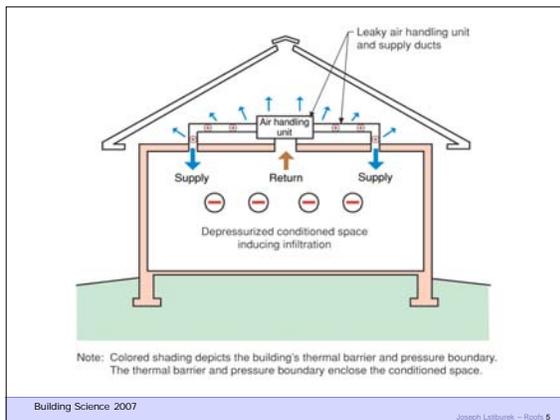
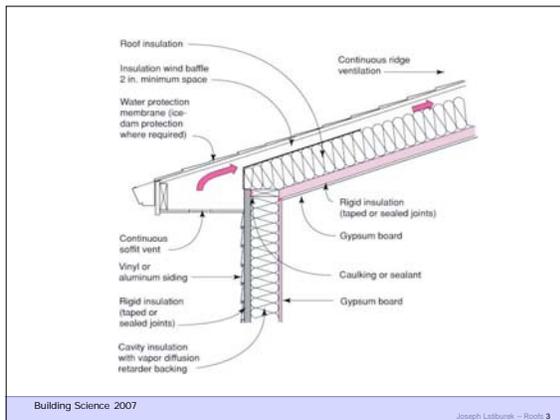
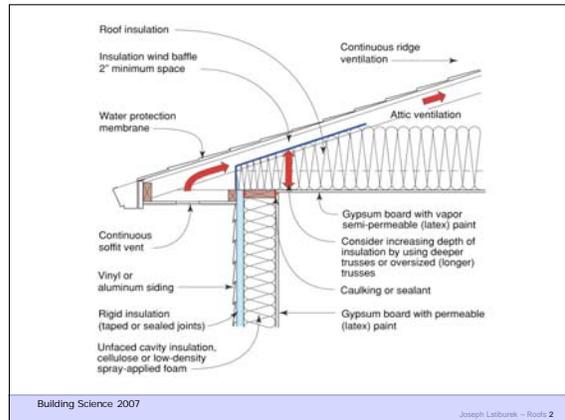
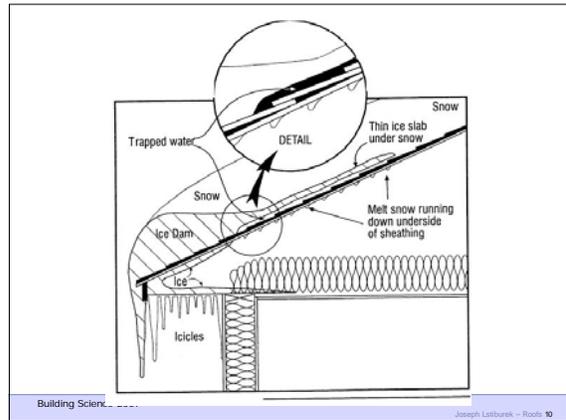
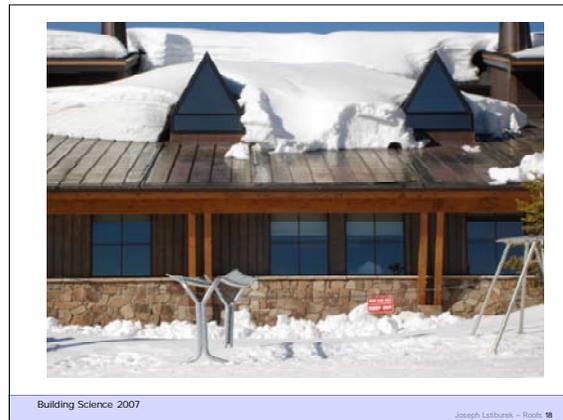
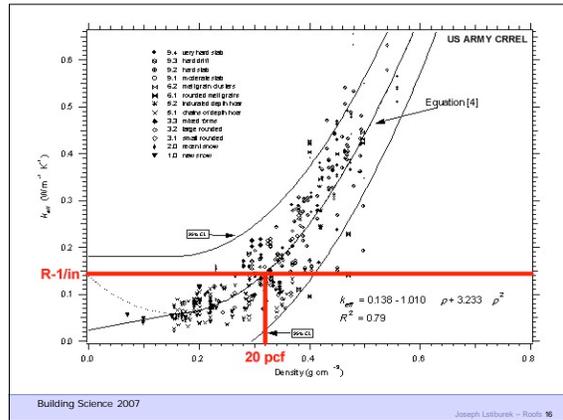


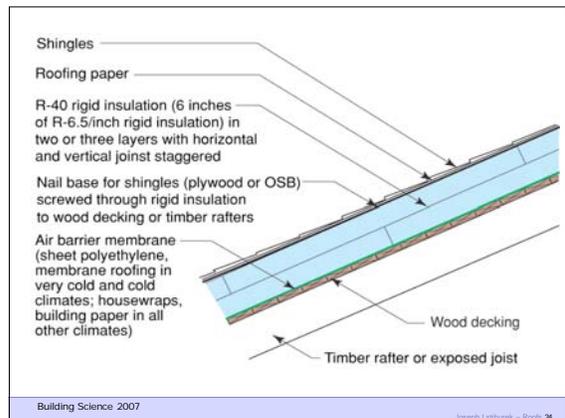
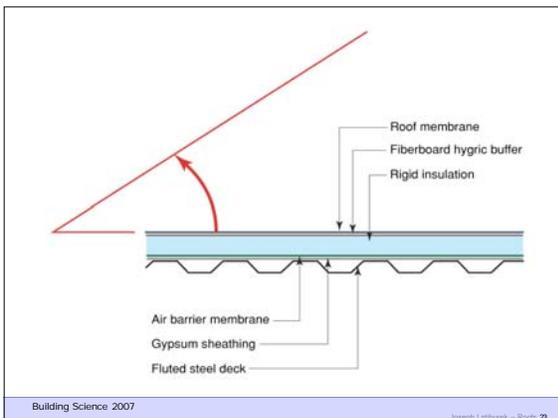
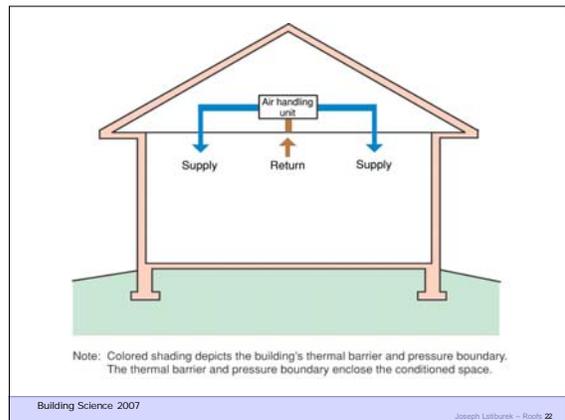
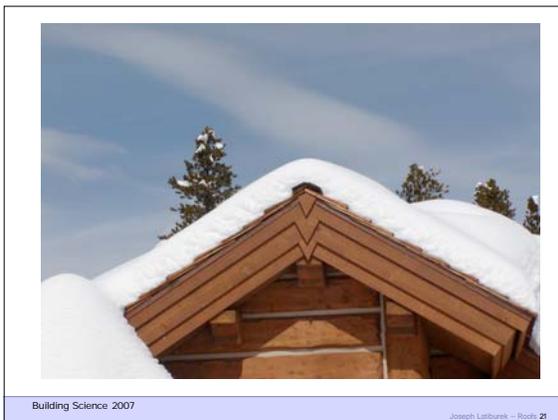
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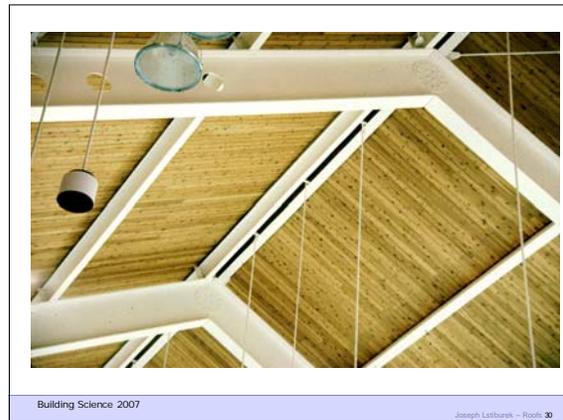
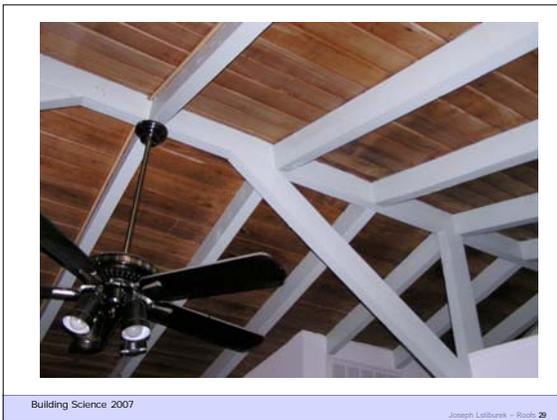
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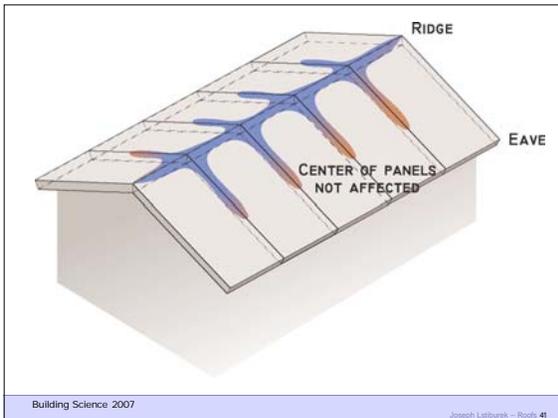
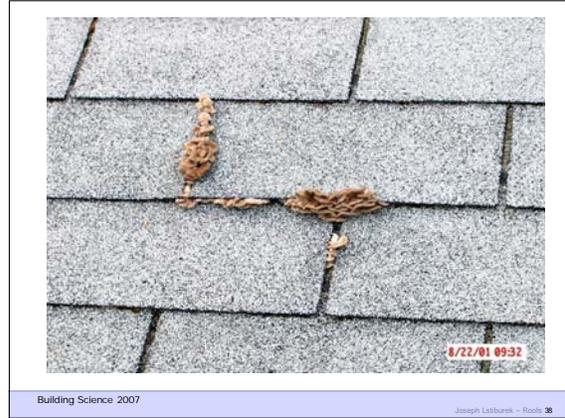


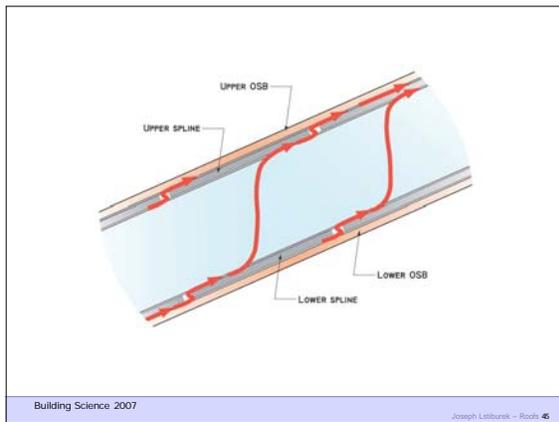
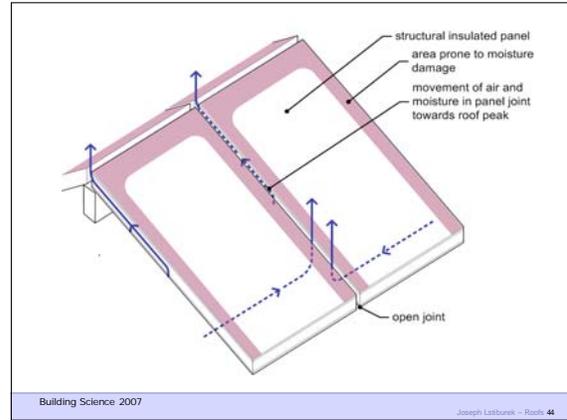
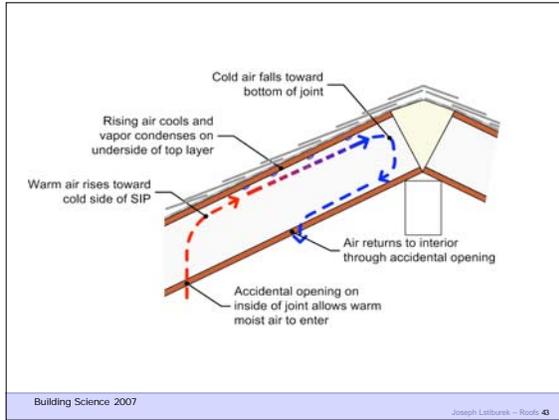








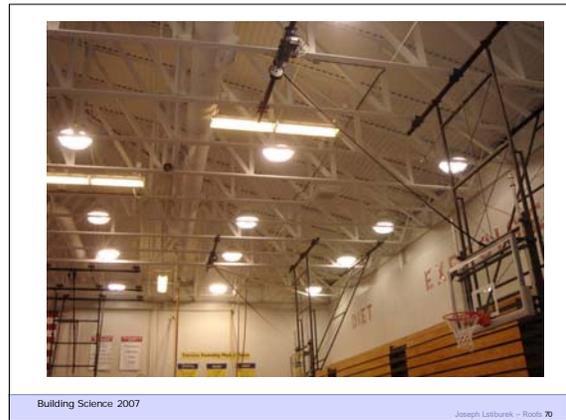


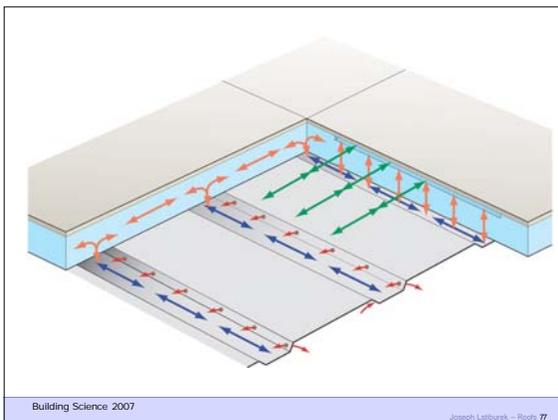
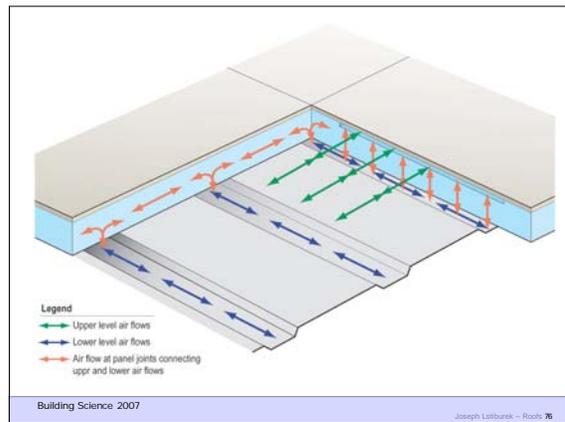
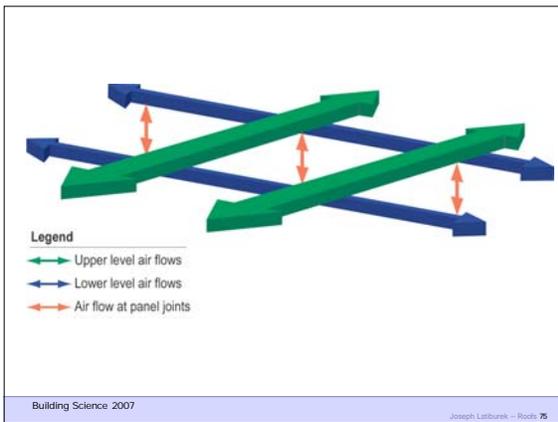
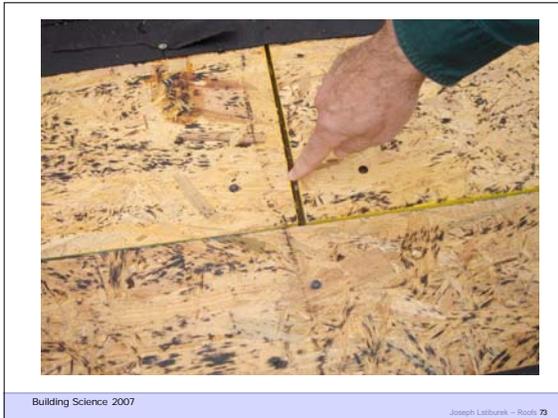


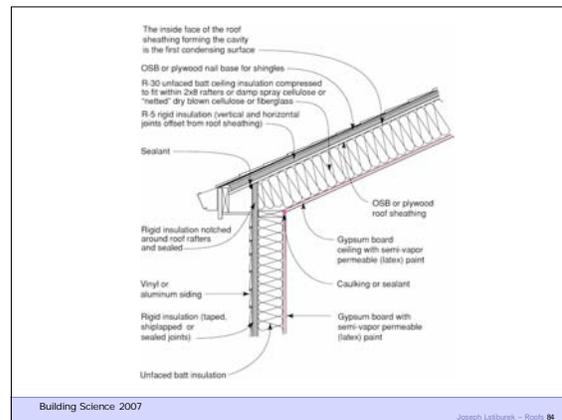
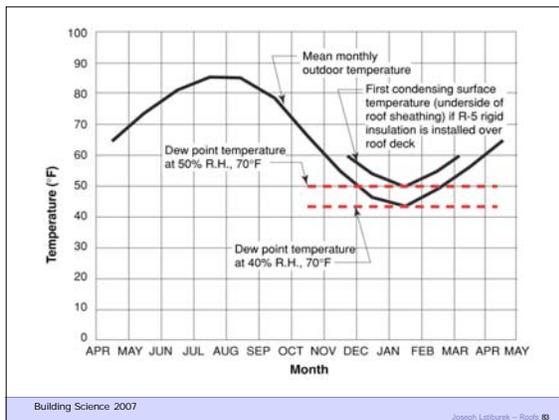
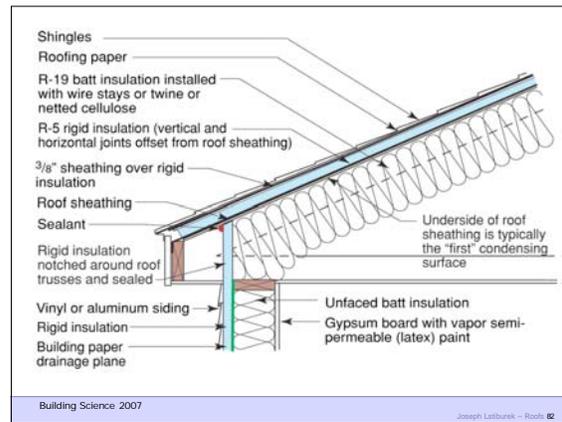
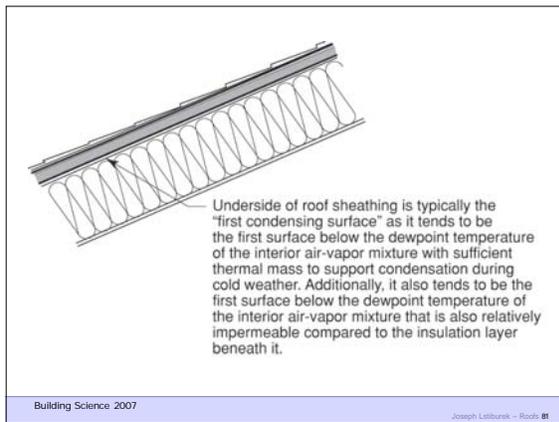
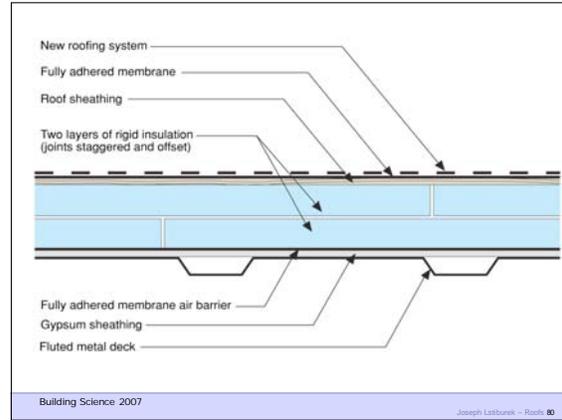
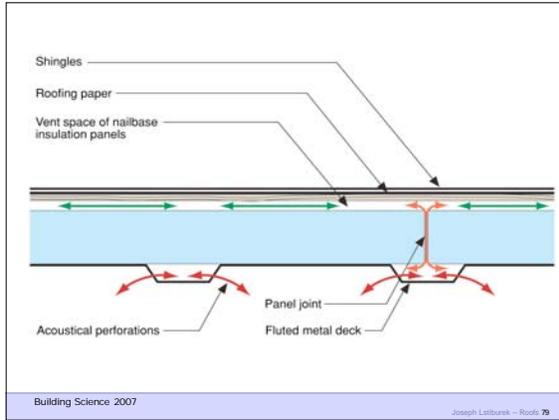


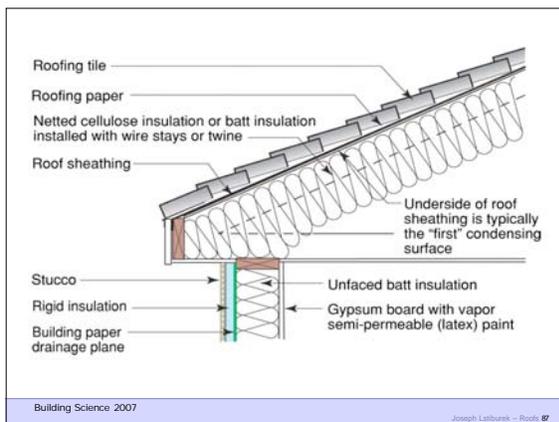
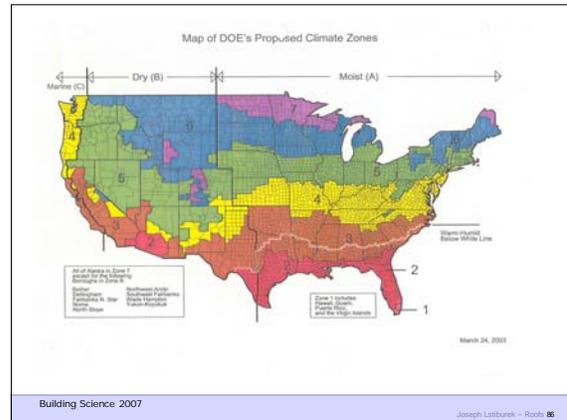
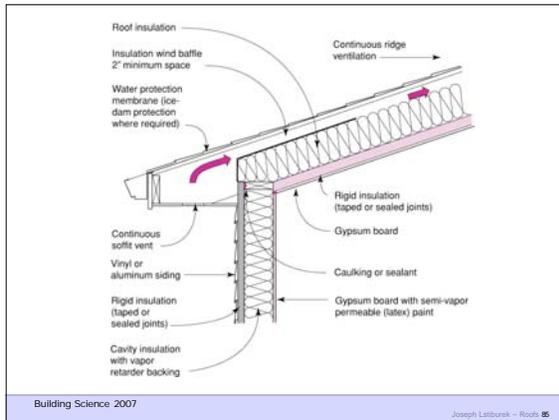


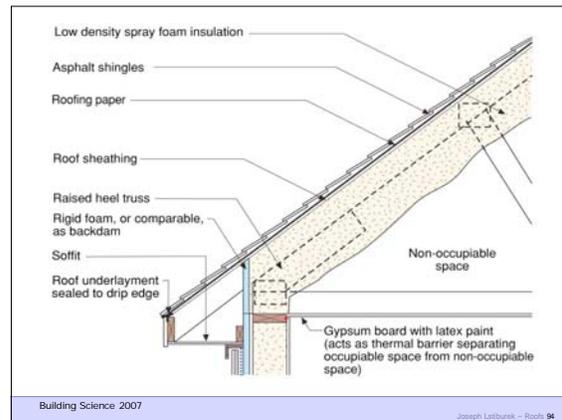
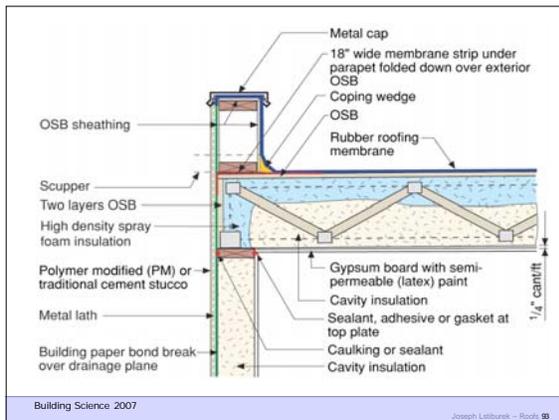
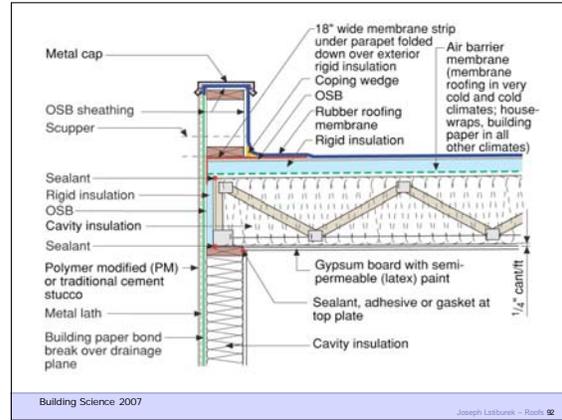
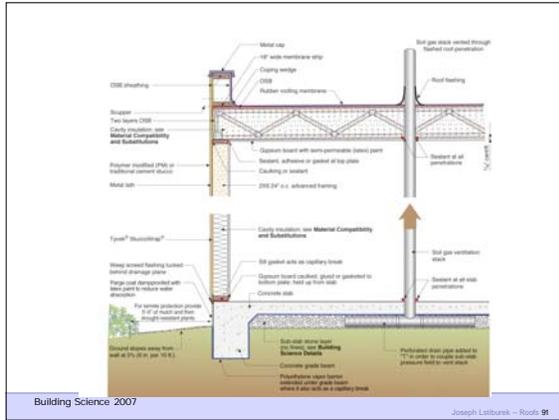


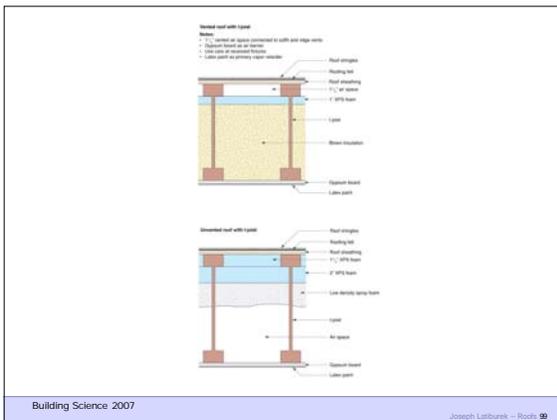




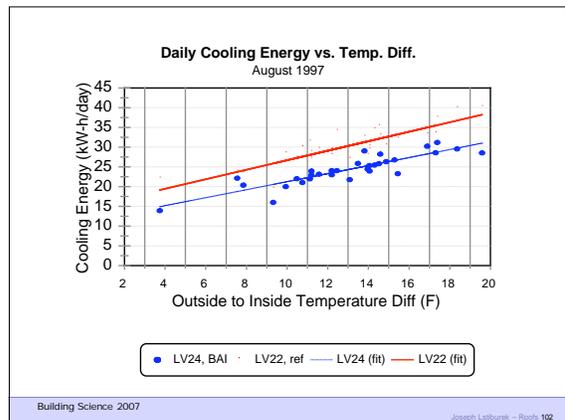
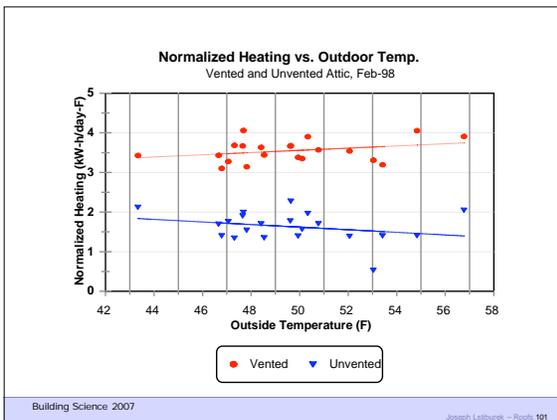








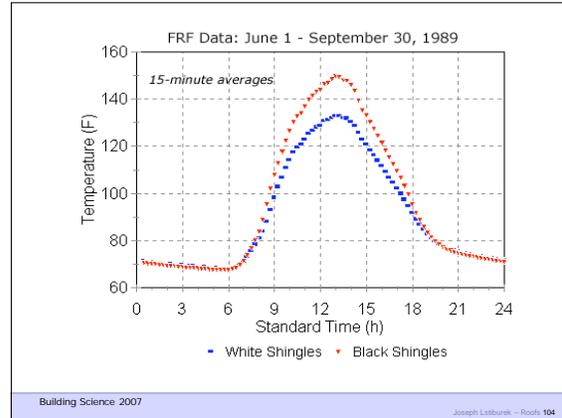
- Key is controlling the temperature of the roof sheathing or preventing air from getting to the roof sheathing
  - This can be accomplished by climate (where you are) or by installing insulation on top of the roof sheathing (compact roof-rigid insulation) or by installing air impermeable insulation on the under side of the roof sheathing (spray foam)
  - Spray foam insulation eliminates air transported moisture from getting to the roof sheathing.
  - The temperature at the bottom surface of the foam is always above the attic dewpoint temperature, which is the same, or nearly the same as the principal living area.
  - Spray foam density determines vapor permeability - density addresses vapor diffusion - climate specific
  - Low density spray foam in the south (zones 1 through 4 or add vapor retarder), high density anywhere
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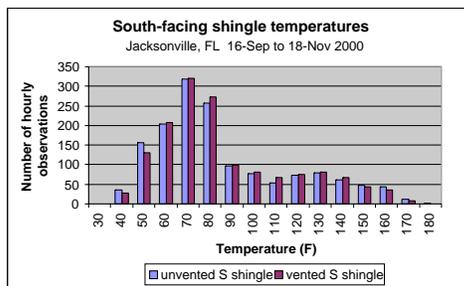
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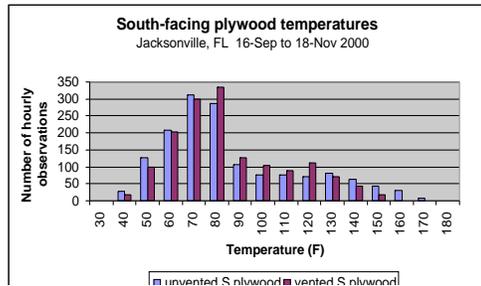
Vented vs. unvented shingle temperatures



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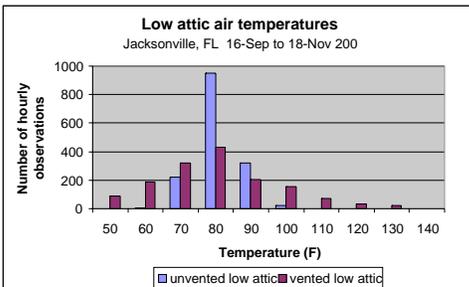
Vented vs. unvented roof sheathing temperatures



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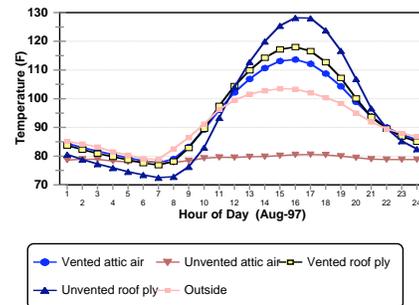
Vented vs. unvented attic air temperatures



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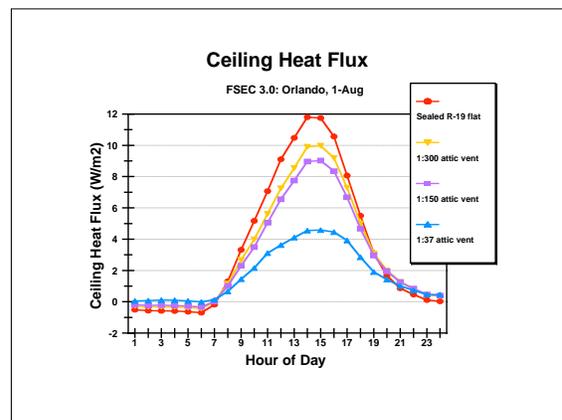
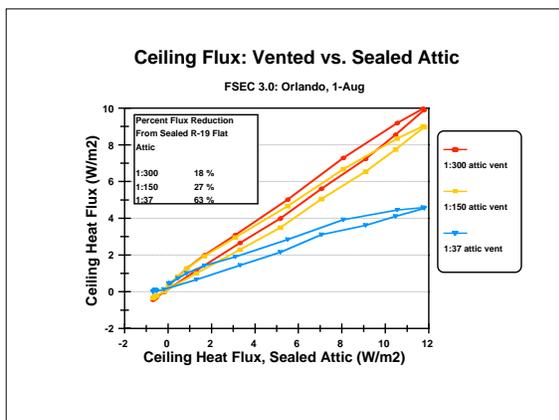
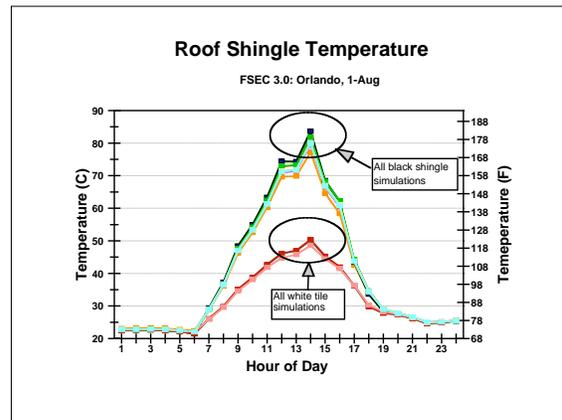
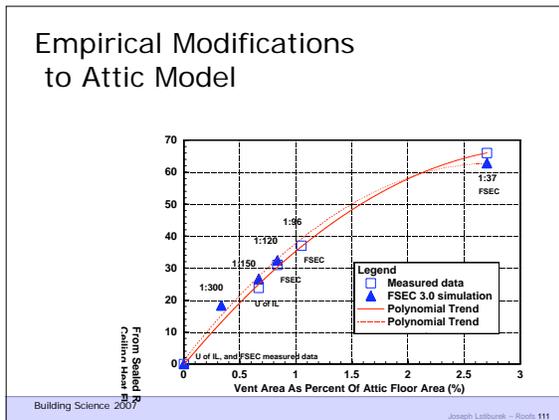
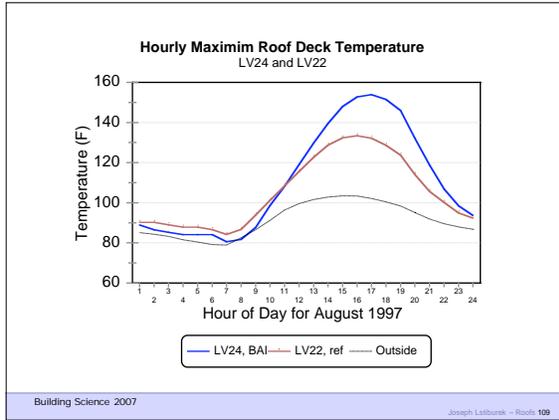
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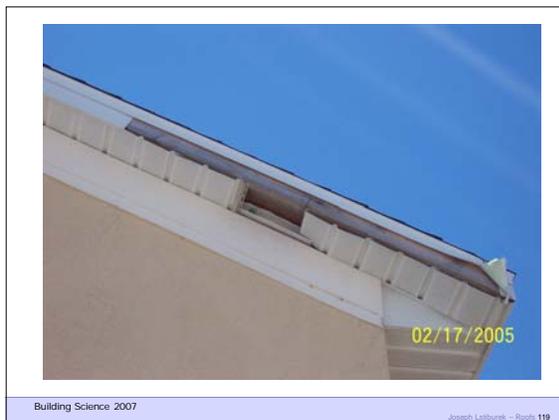
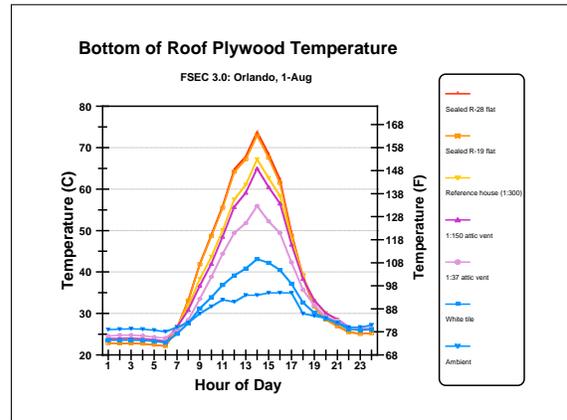
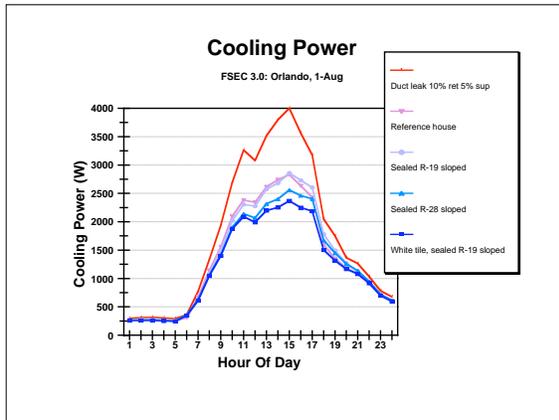
Average Temperatures Vented and Unvented Attics, Aug-97



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Soffit ventilation lead to wind driven rain entry into roof assemblies

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