Joseph Lstiburek, Ph.D., P.Eng, ASHRAE Fellow

Building Science

Roofs

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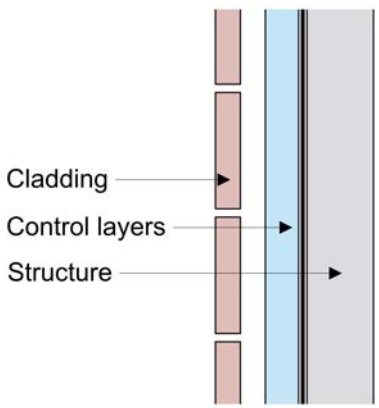
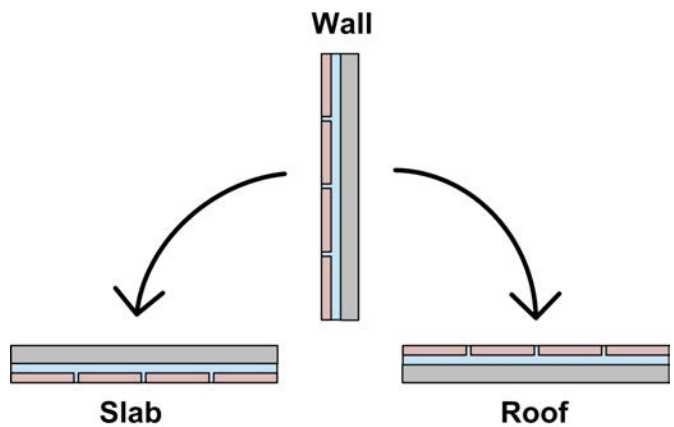
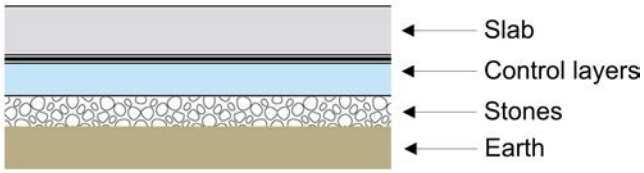
Water Control Layer
Air Control Layer
Vapor Control Layer
Thermal Control Layer







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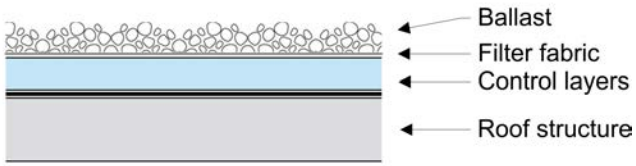

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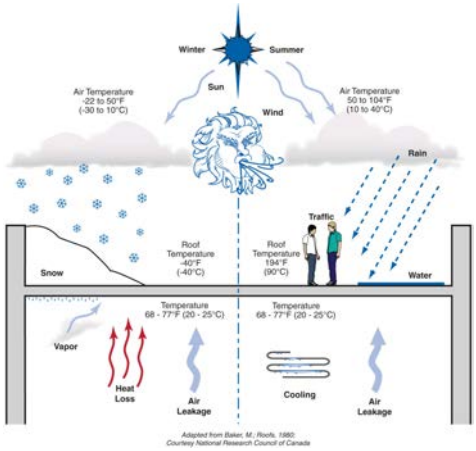
Joseph Lstiburek 6



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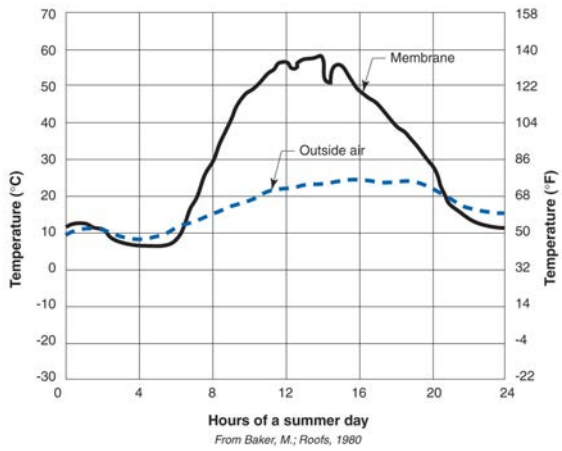
Joseph Lstiburek 7



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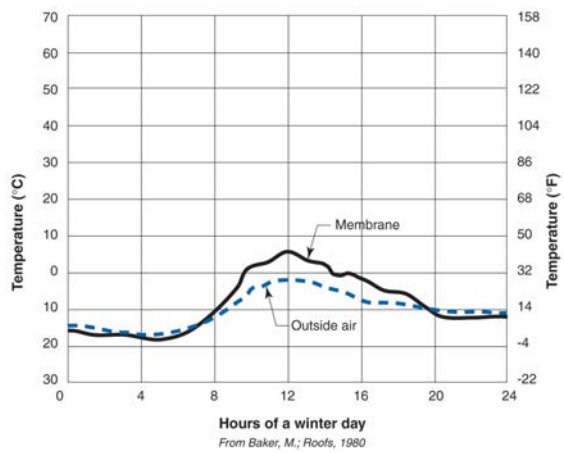
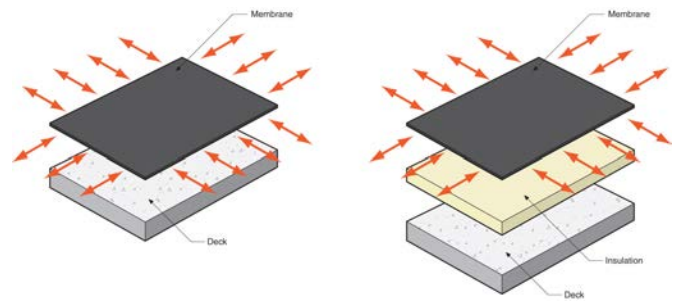
Joseph Lstiburek 8



Building Science Corporation Joseph Lstiburek 9



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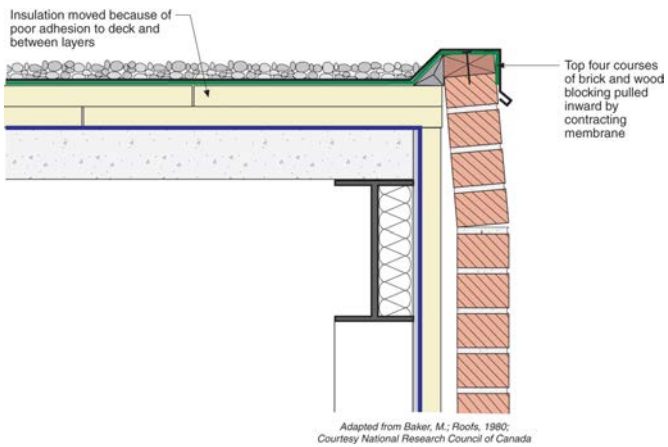
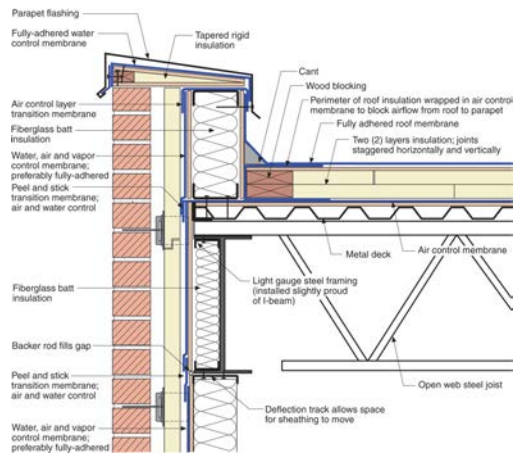


Building Science Corporation Joseph Lstiburek 11



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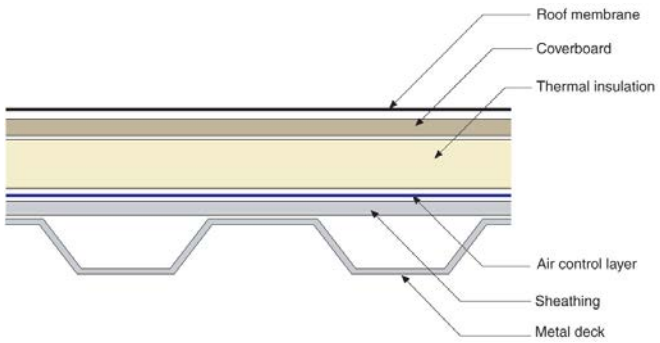

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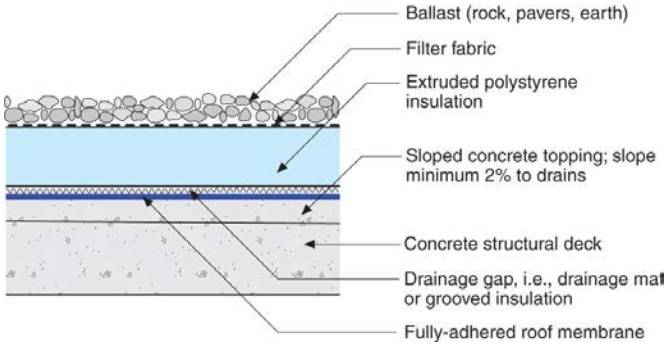

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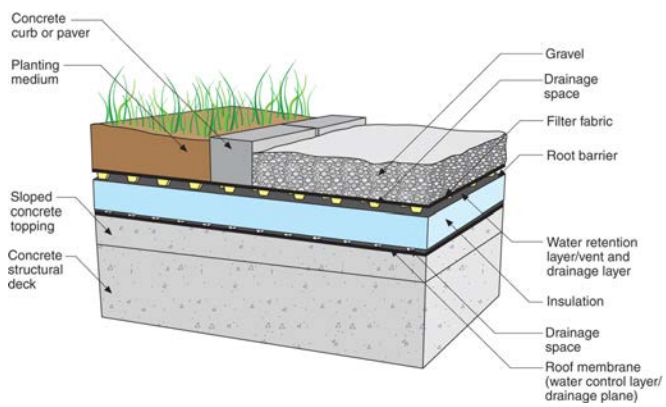
Building Science Corporation
Joseph Lstiburek 15



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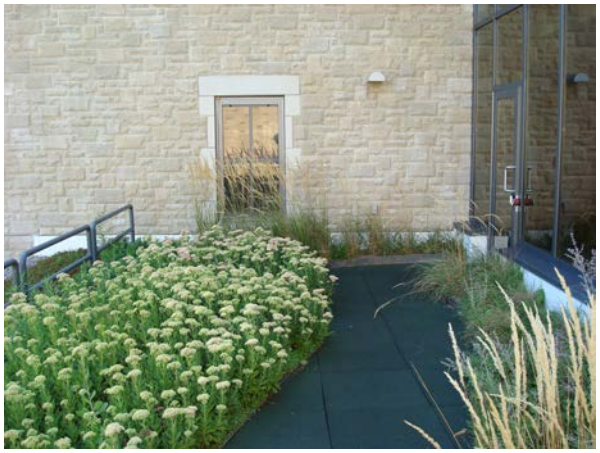
Joseph Lstiburek 17



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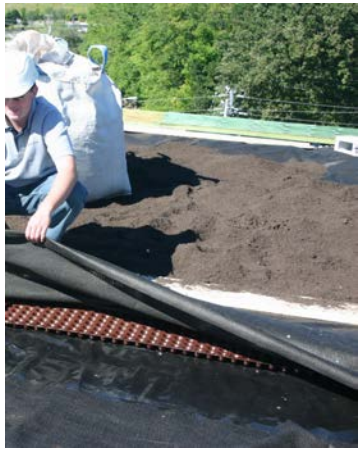
Building Science Corporation
Joseph Lstiburek 19



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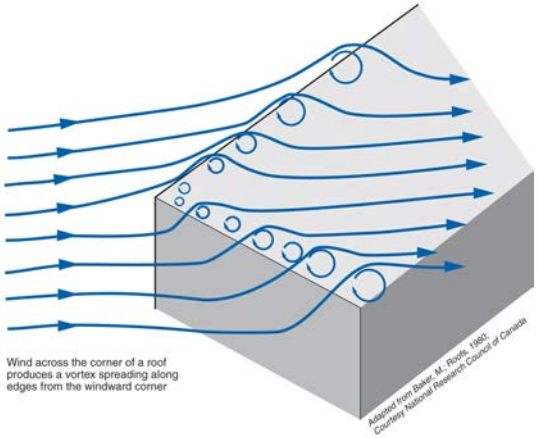

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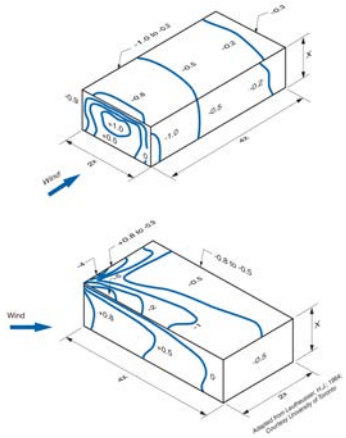

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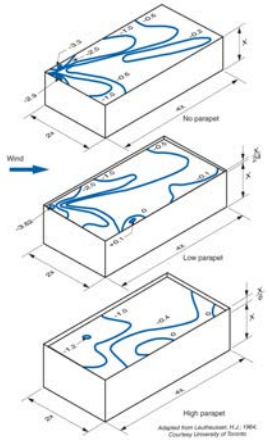

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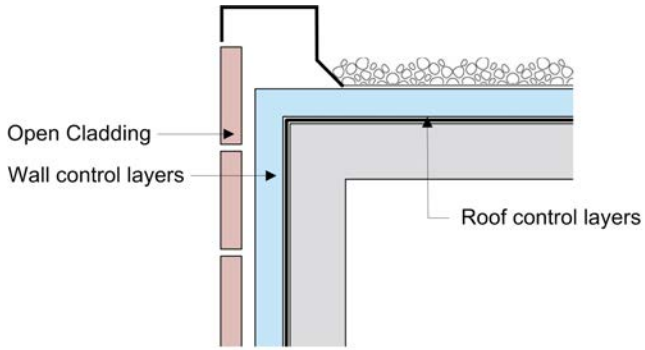

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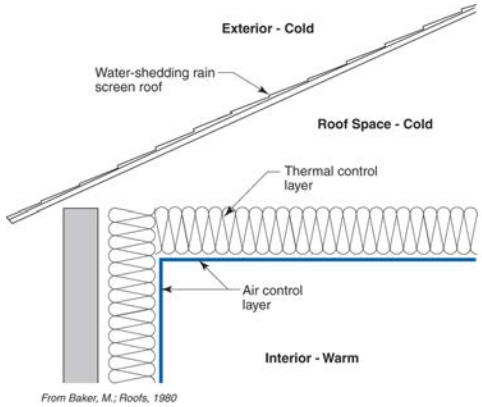

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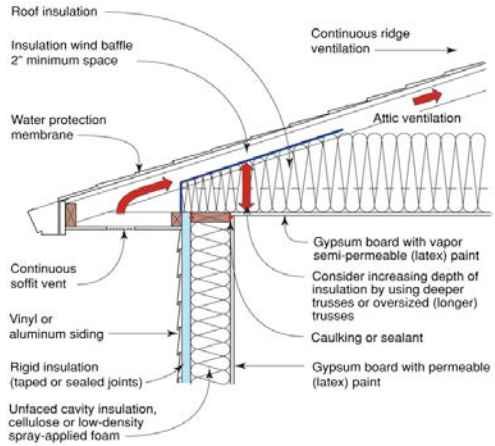

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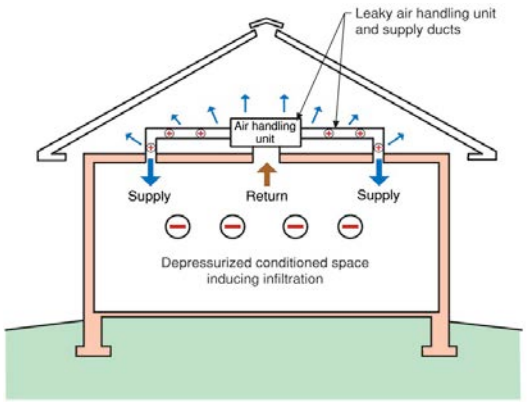

Note: Colored shading depicts the building's thermal barrier and pressure boundary. The thermal barrier and pressure boundary enclose the conditioned space.

Building Science Corporation Joseph Lstiburek 28

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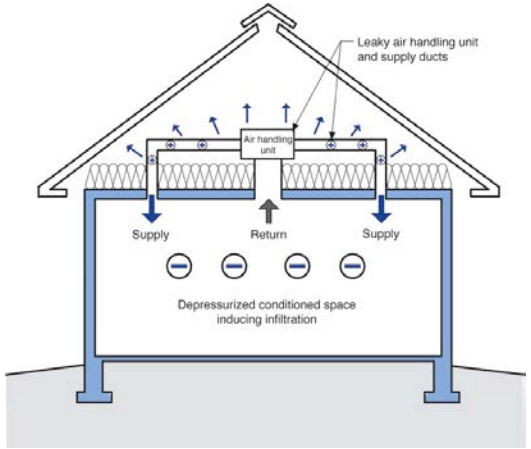
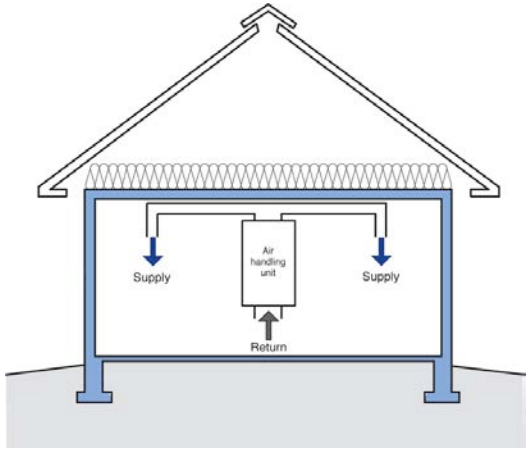
Joseph Lstiburek 29

Building Science Corporation
Joseph Lstiburek 30



Building Science Corporation
Joseph Lstiburek 31



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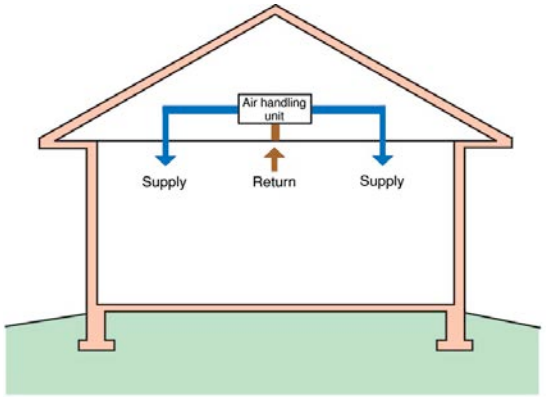
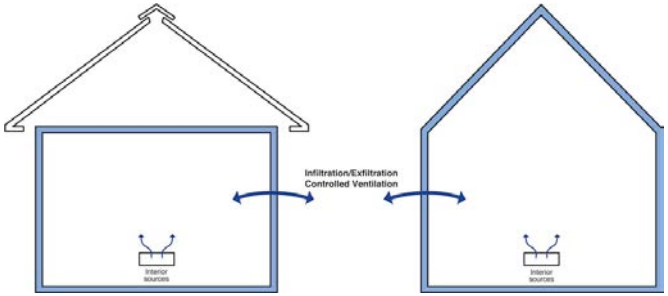
Joseph Lstiburek 32

Building Science Corporation
Joseph Lstiburek 33

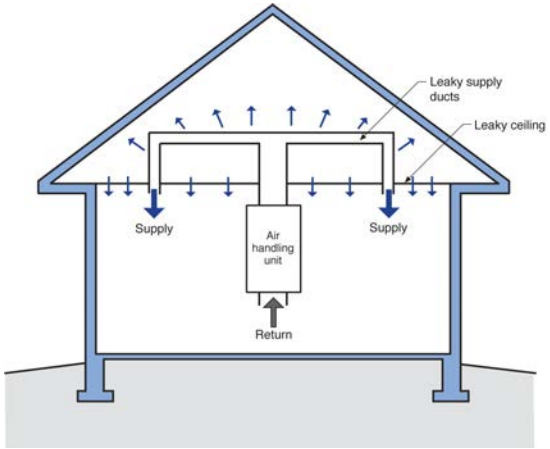


Note: Colored shading depicts the building's thermal barrier and pressure boundary. The thermal barrier and pressure boundary enclose the conditioned space.

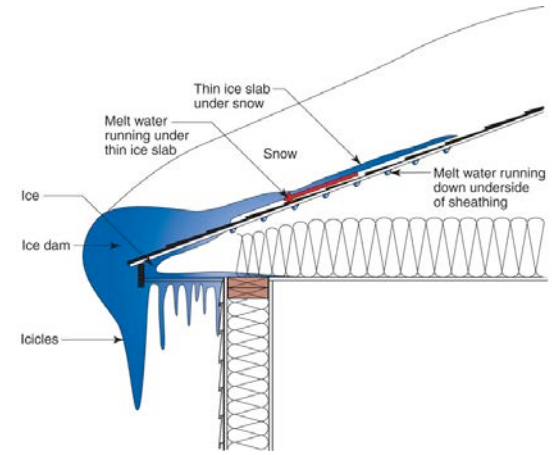
Building Science Corporation
Joseph Lstiburek 34



Building Science Corporation
Joseph Lstiburek 35

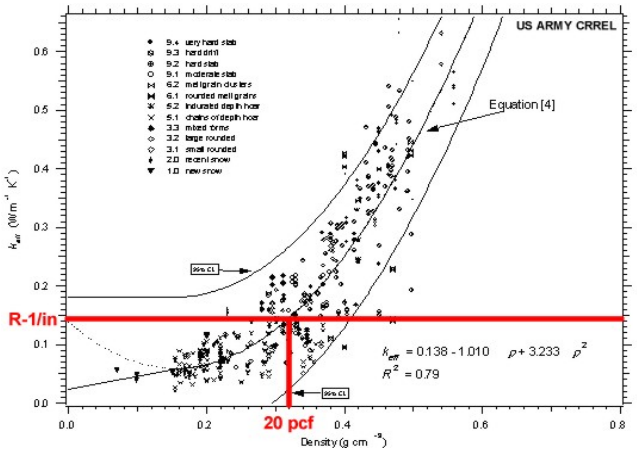


Building Science Corporation
Joseph Lstiburek 36



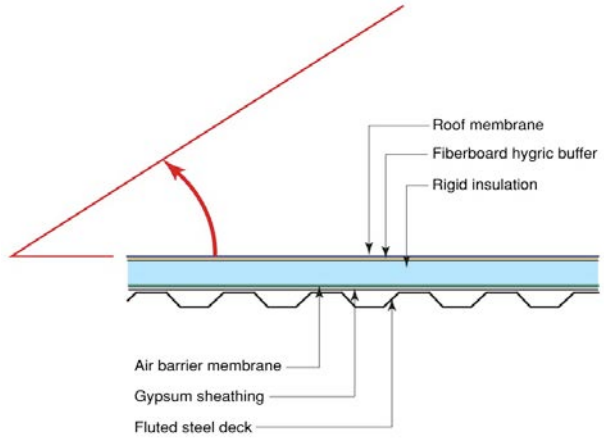
Building Science Corporation
Joseph Lstiburek 37

Building Science Corporation
Joseph Lstiburek 38

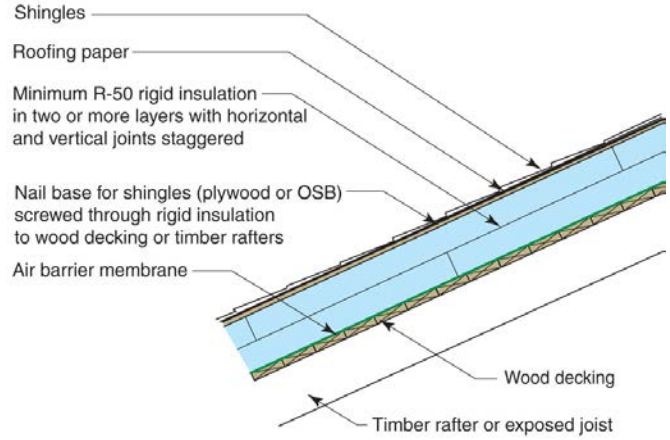


Building Science Corporation
Joseph Lstiburek 39

Building Science Corporation
Joseph Lstiburek 40



Building Science Corporation Joseph Lstiburek 41



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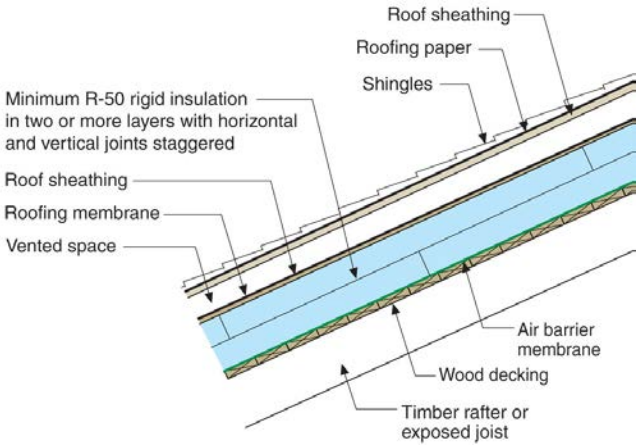

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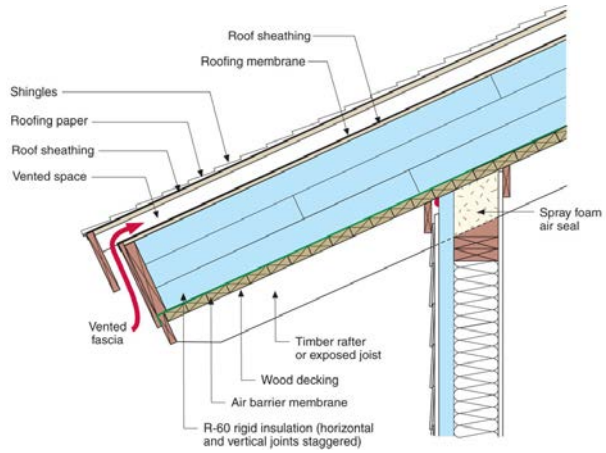

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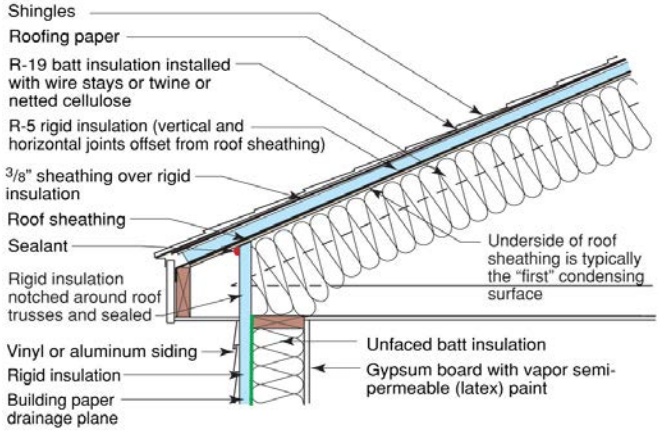
Joseph Lstiburek 45



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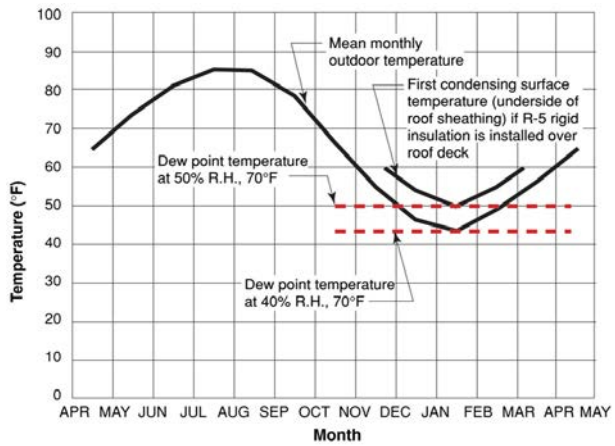

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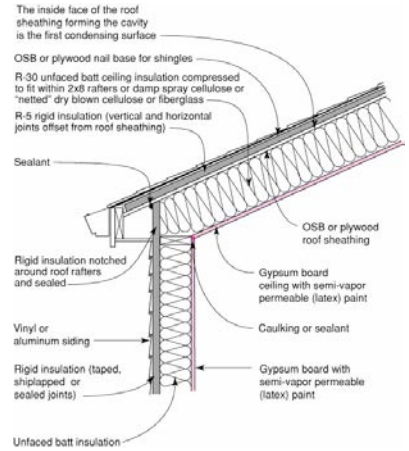
Joseph Lstiburek 47



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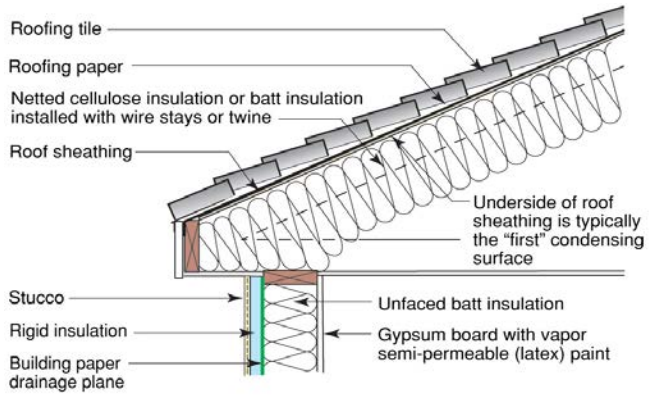
Joseph Lstiburek 48



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Joseph Lstiburek 50

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Joseph Lstiburek 51

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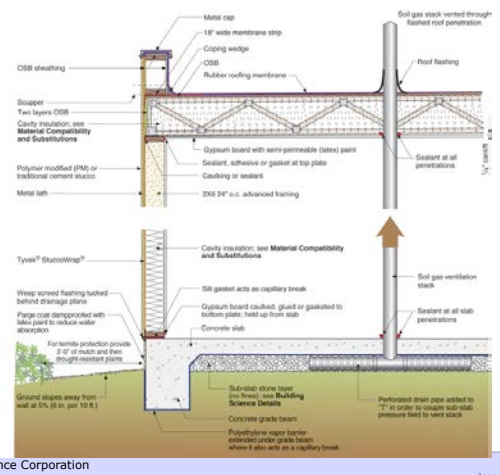
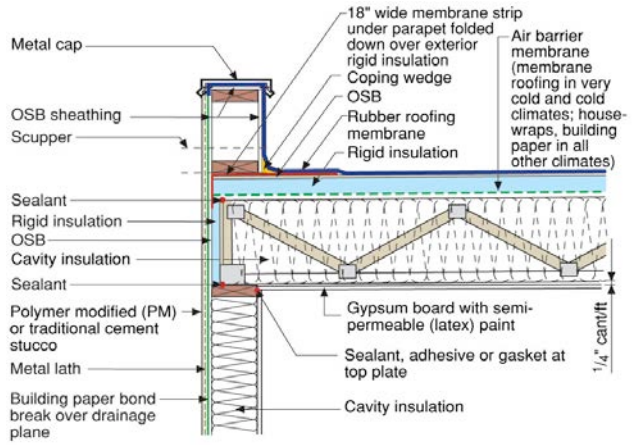
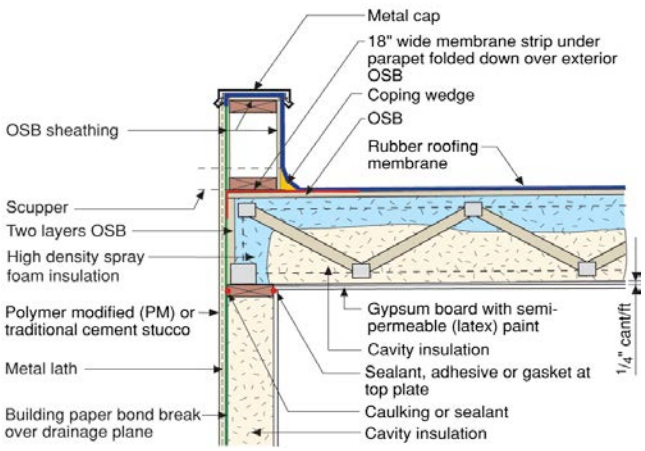
Joseph Lstiburek 52



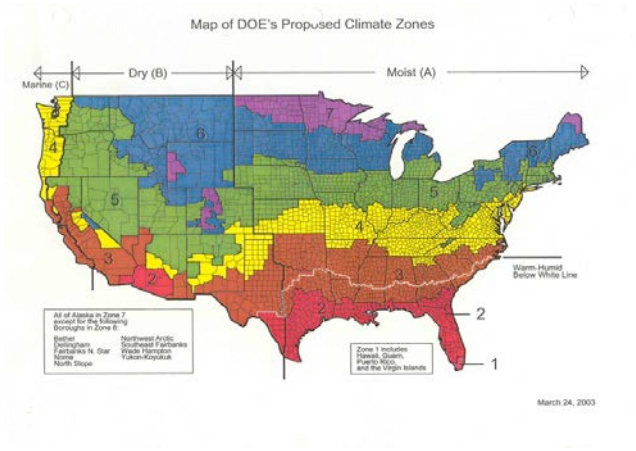
Building Science Corporation Joseph Lstiburek 53



Building Science Corporation Joseph Lstiburek 54



Building Science Corporation Joseph Lstiburek 55



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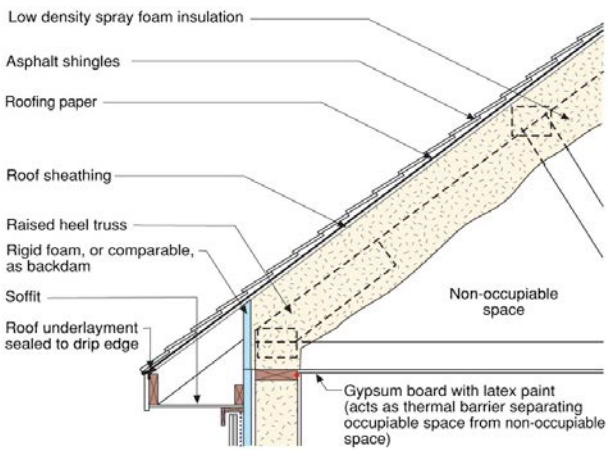

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Joseph Lstiburek 60

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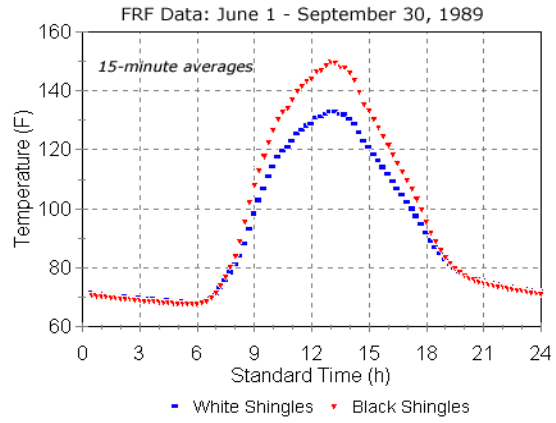

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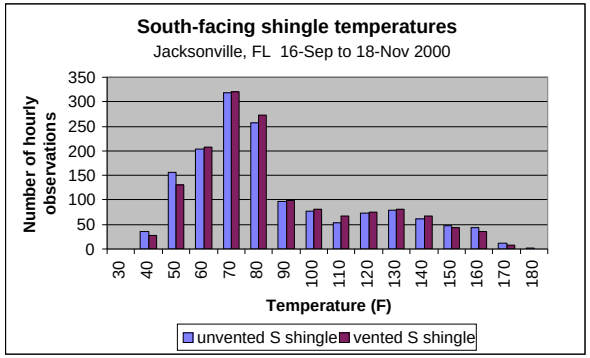
Vented vs. unvented shingle temperatures



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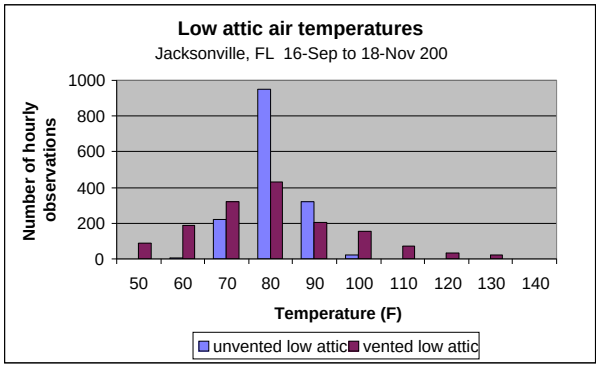
Vented vs. unvented attic air temperatures



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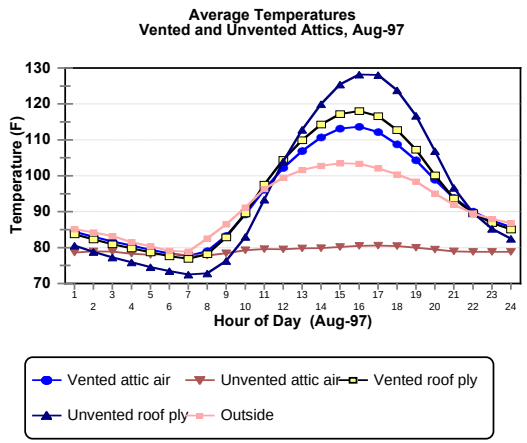

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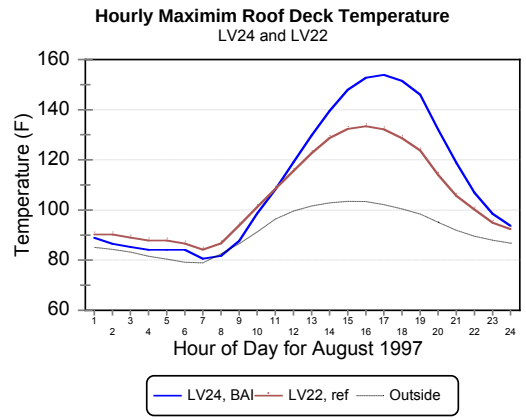

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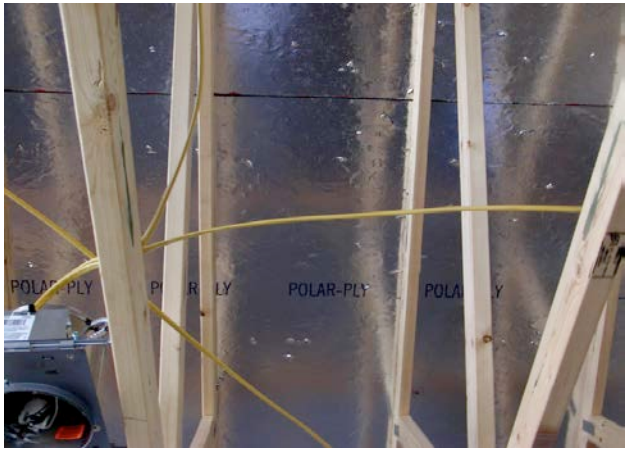

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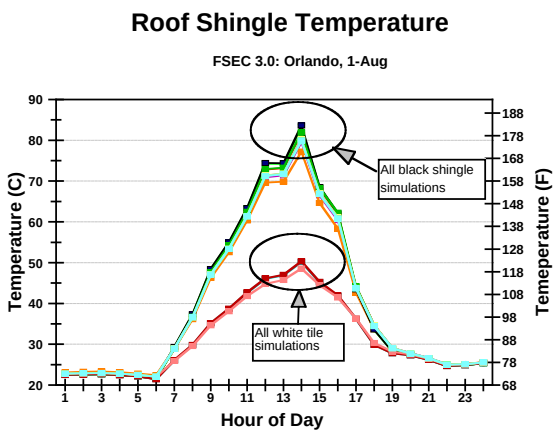

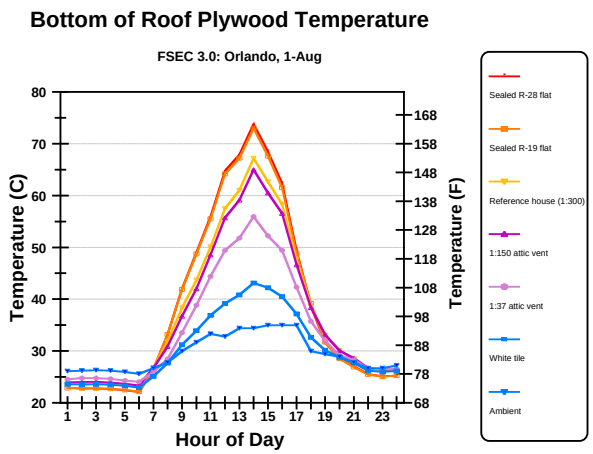

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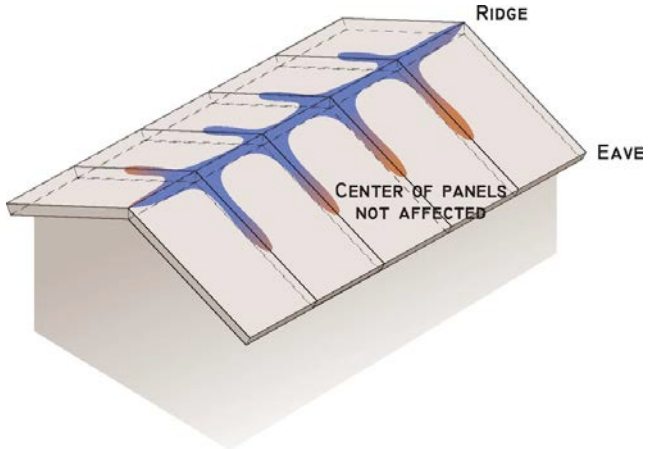

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Joseph Lstiburek 84

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Joseph Lstiburek 85

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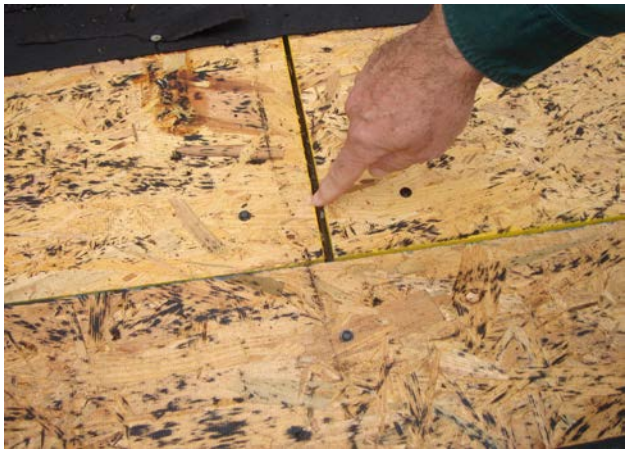
Joseph Lstiburek 88



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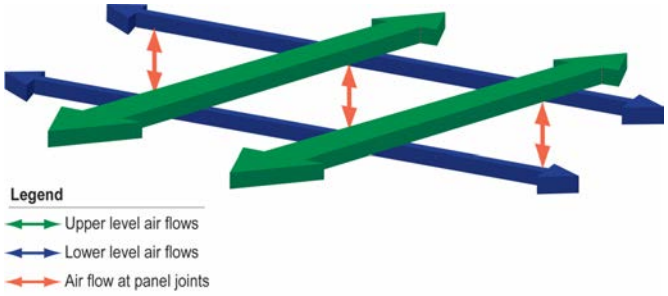

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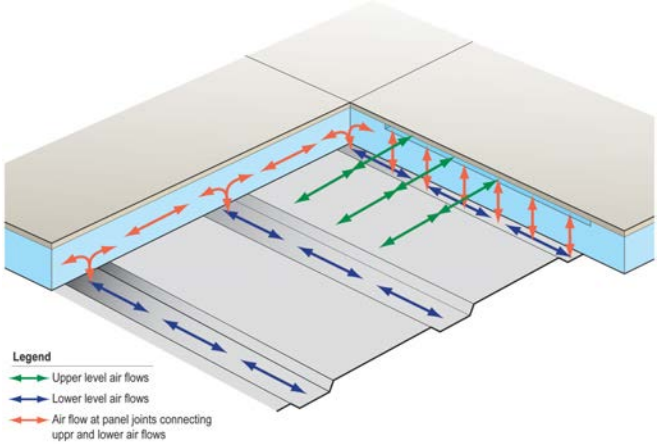
Joseph Lstiburek 91



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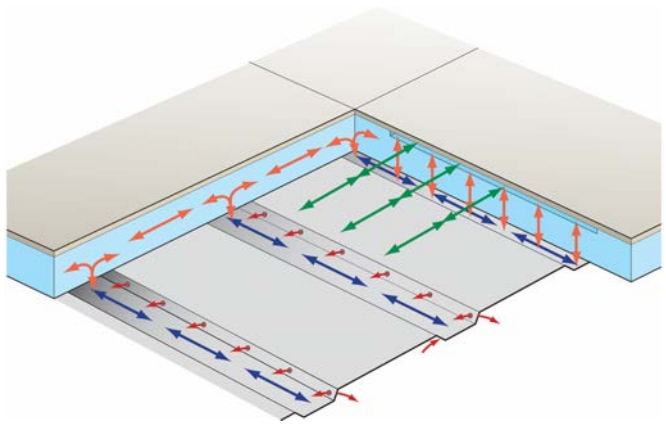
Joseph Lstiburek 92



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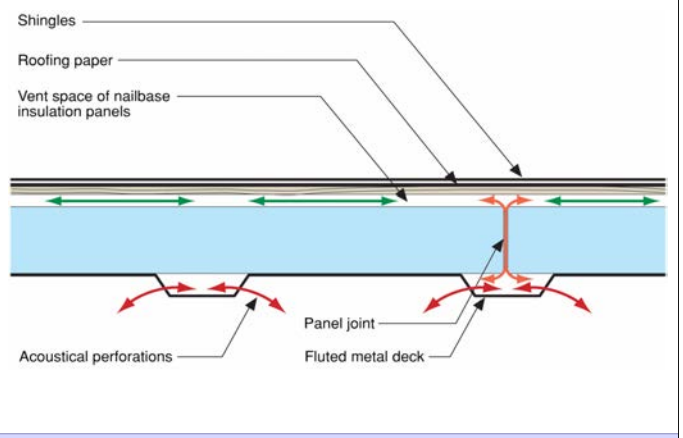
Joseph Lstiburek 94



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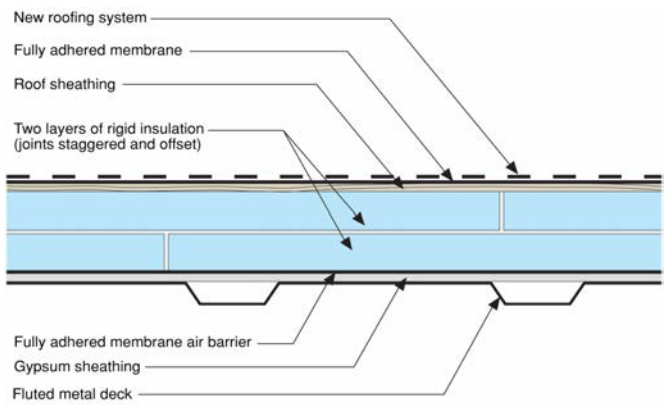

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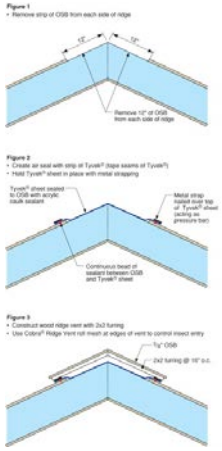

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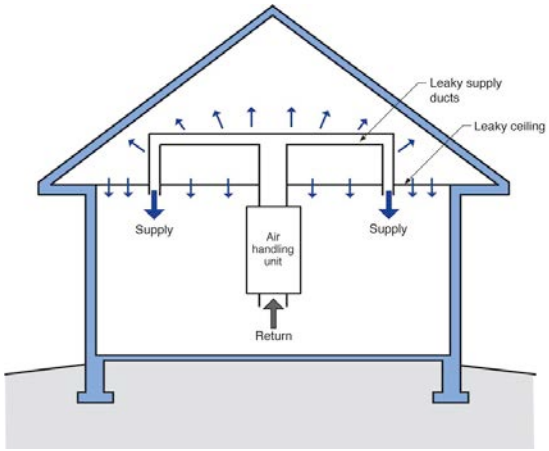

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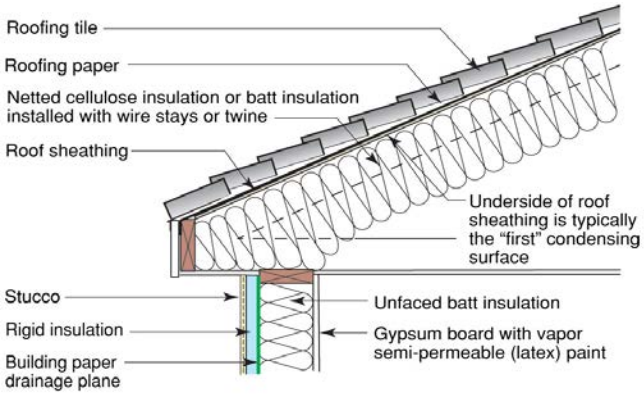

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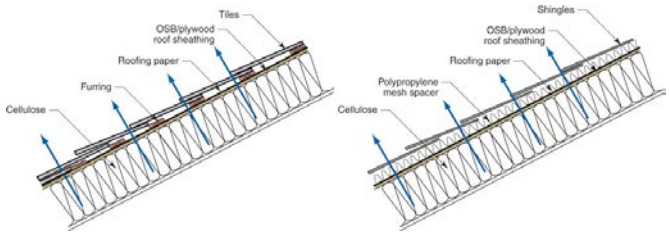

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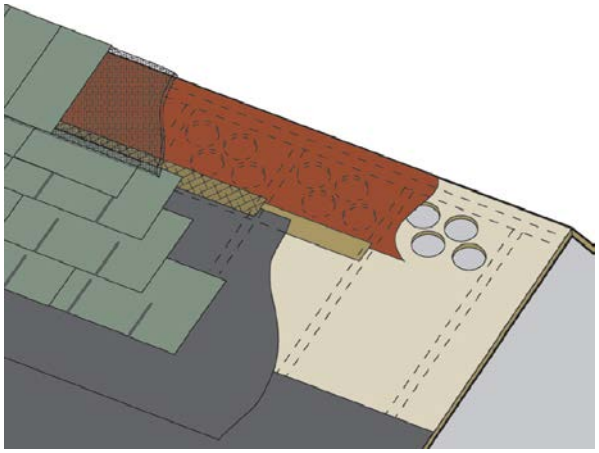

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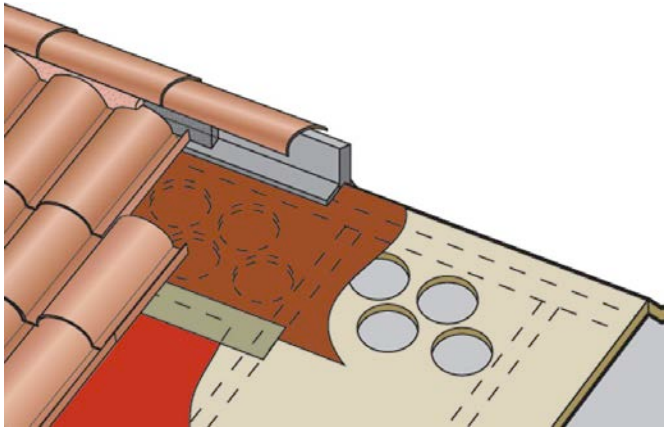

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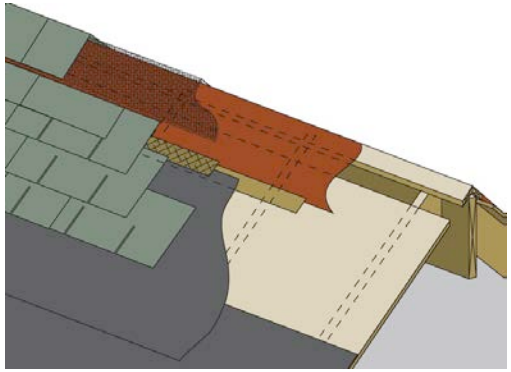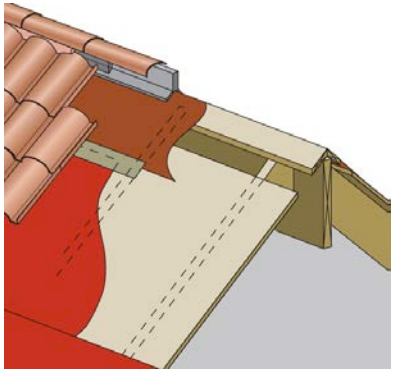
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