

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

Building Science

Adventures In Building Science

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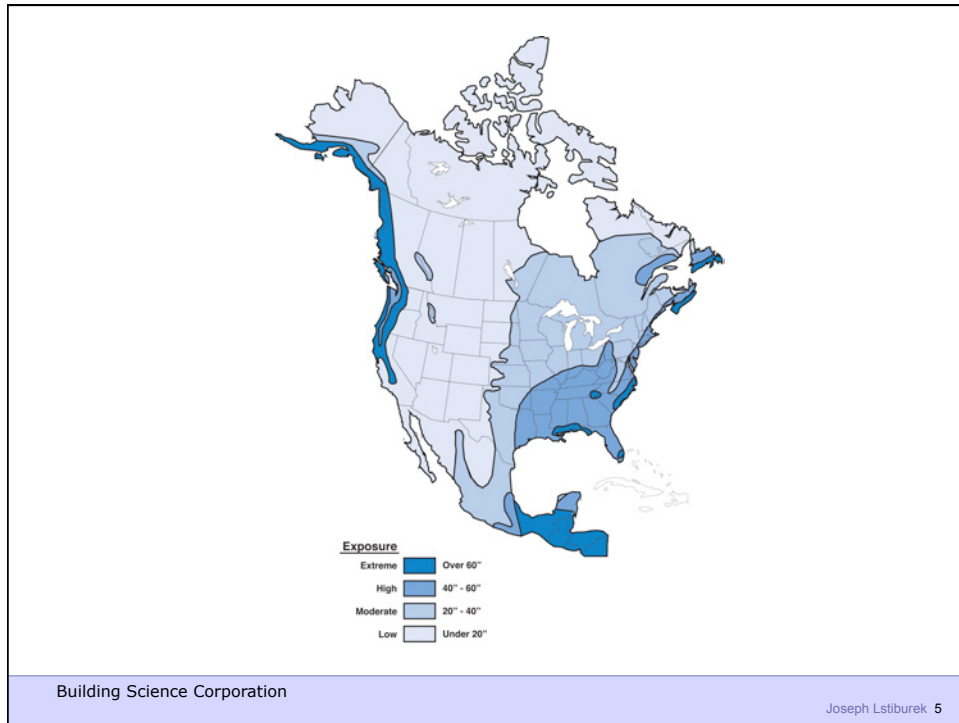
2nd Law of Thermodynamics

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Heat Flow Is From Warm To Cold
Moisture Flow Is From Warm To Cold
Moisture Flow Is From More To Less
Air Flow Is From A Higher Pressure to a
Lower Pressure
Gravity Acts Down

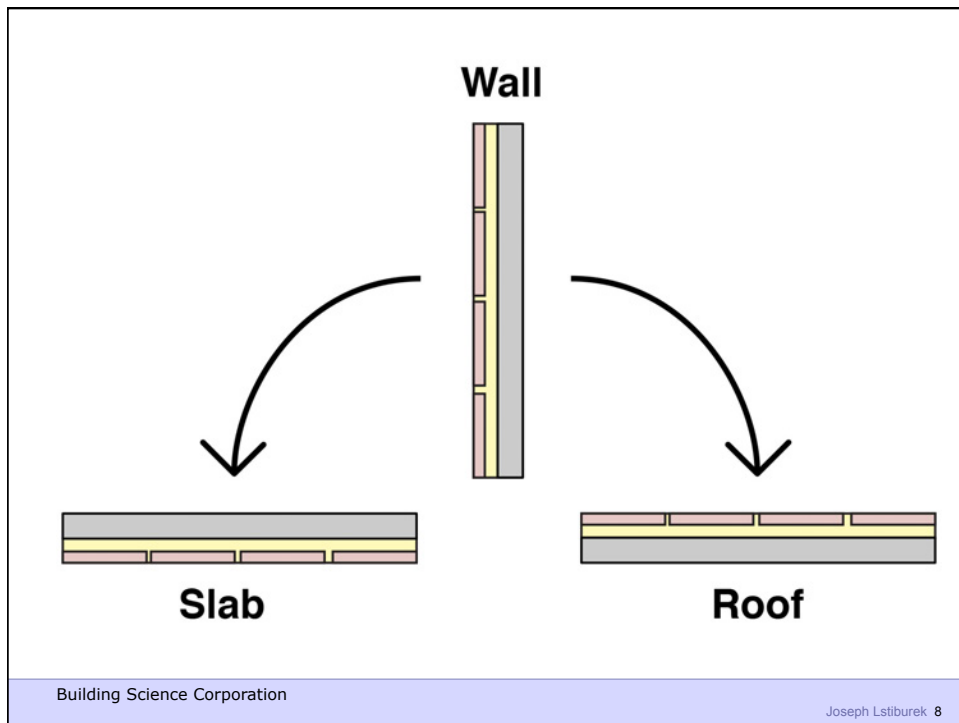
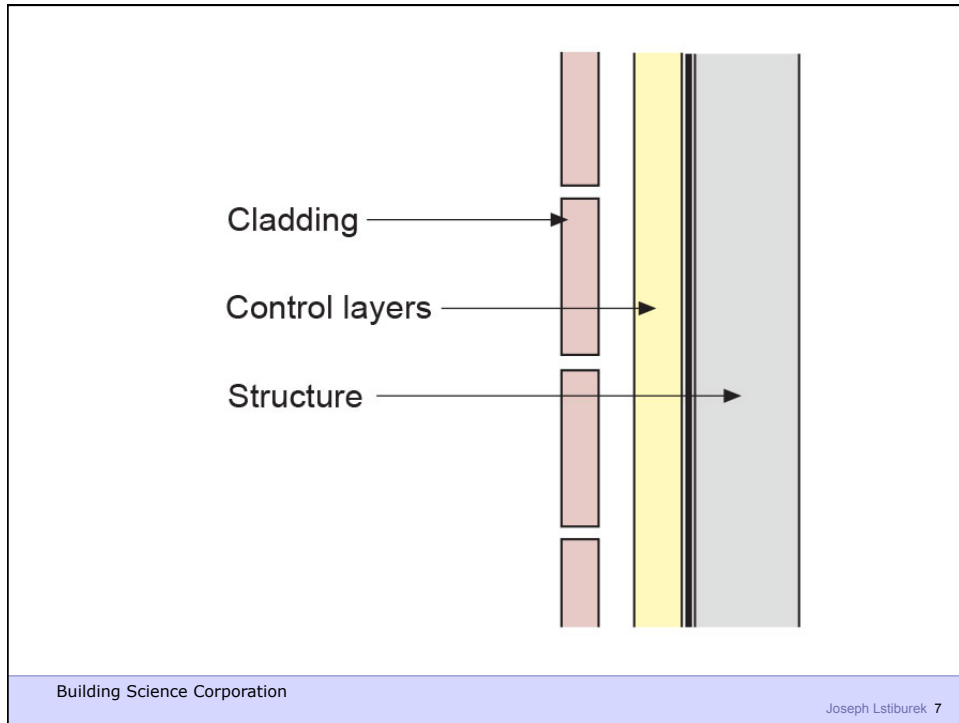


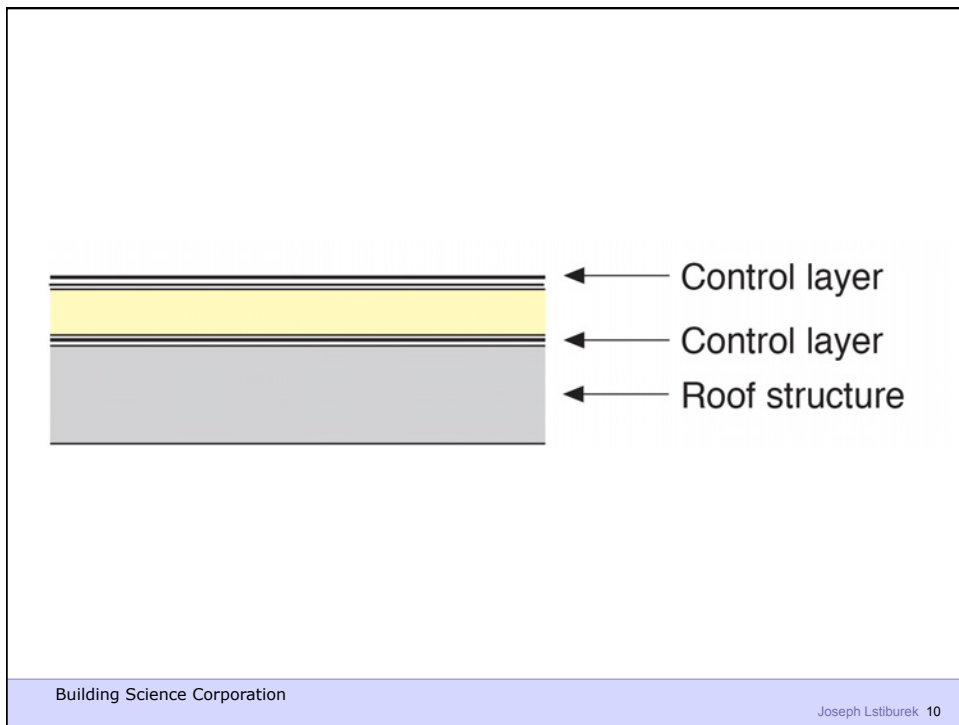
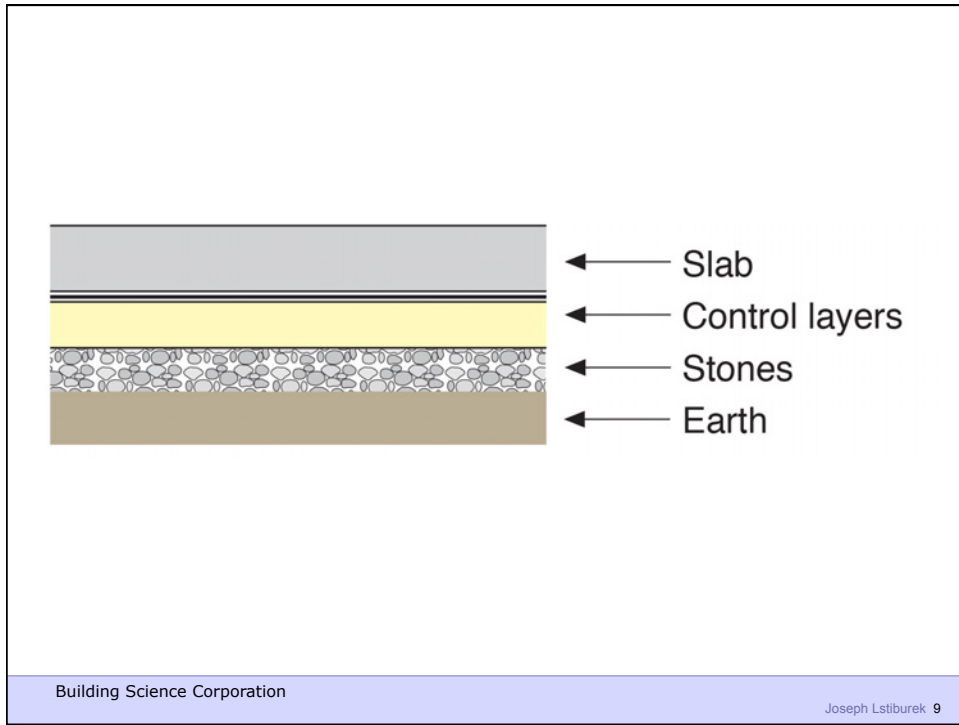


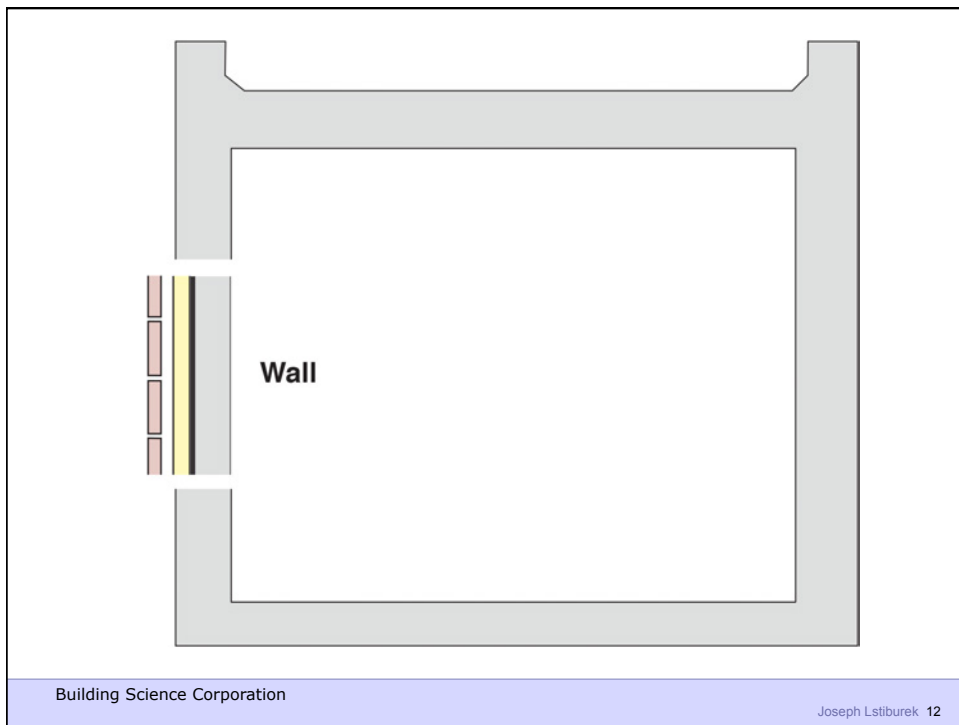
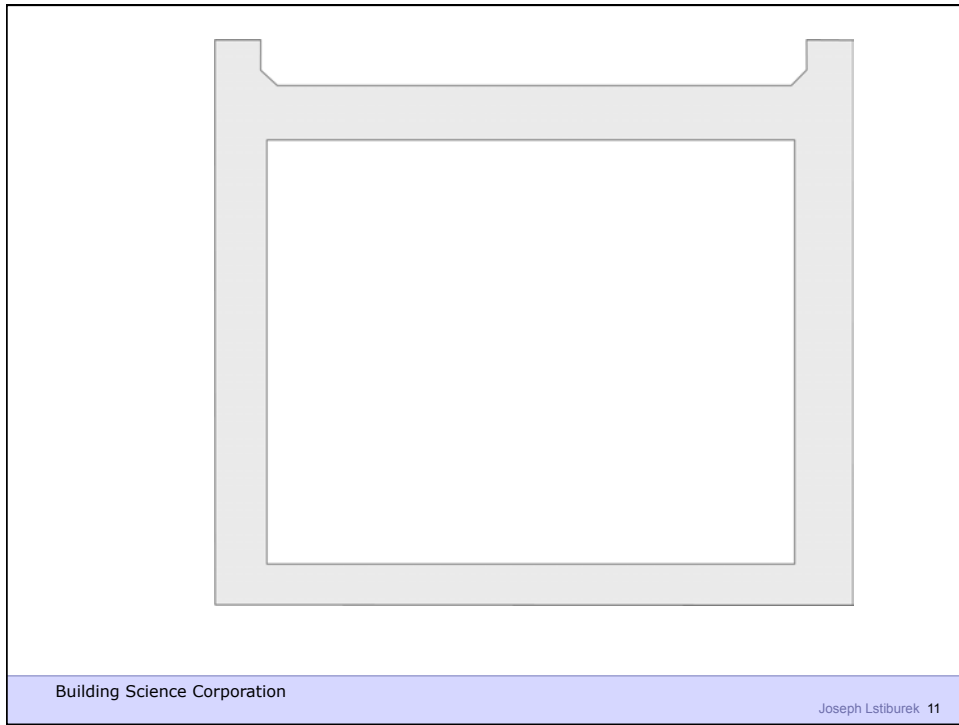
Water Control Layer
Air Control Layer
Vapor Control Layer
Thermal Control Layer

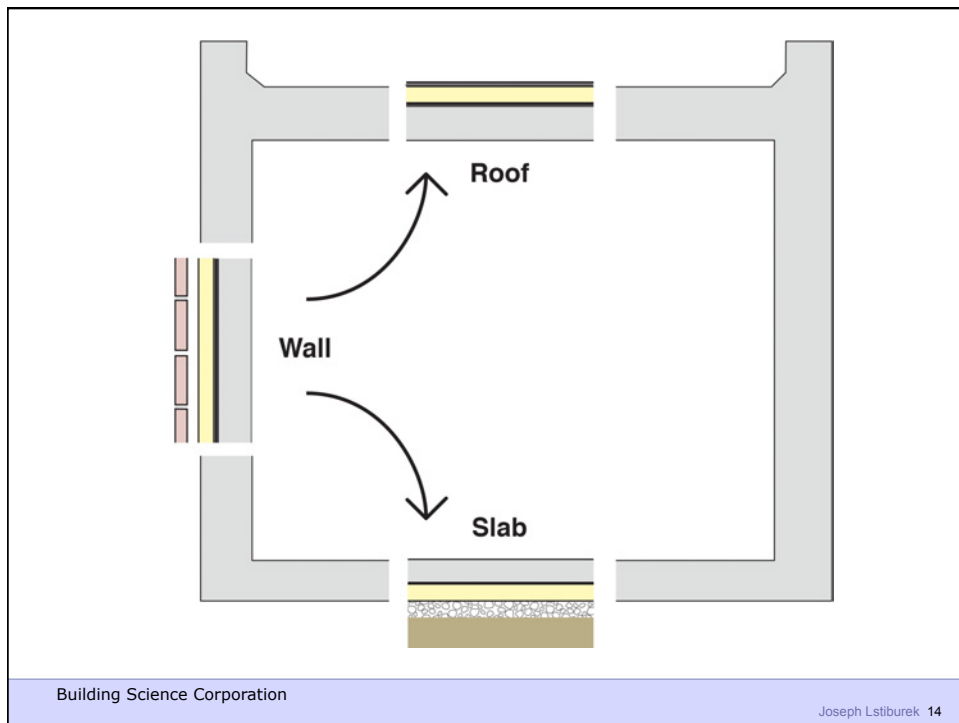
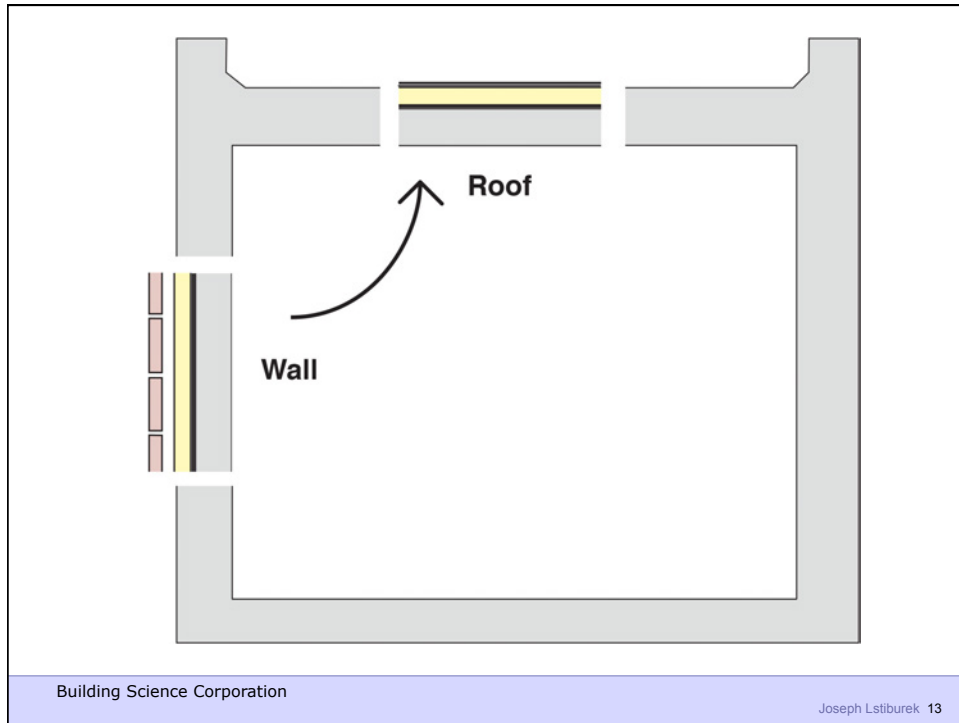
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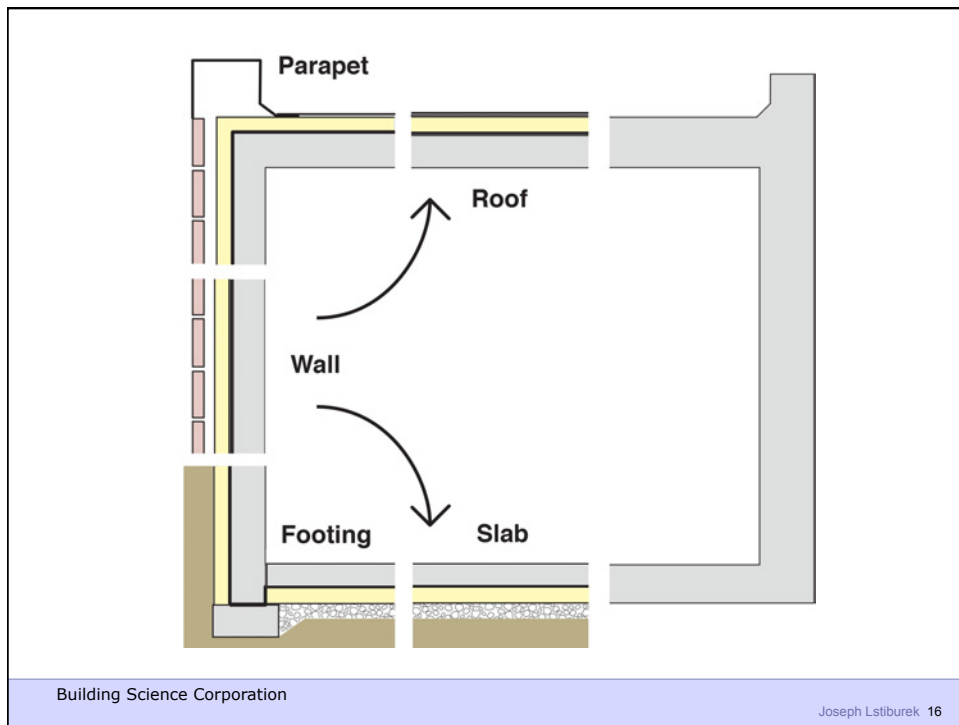
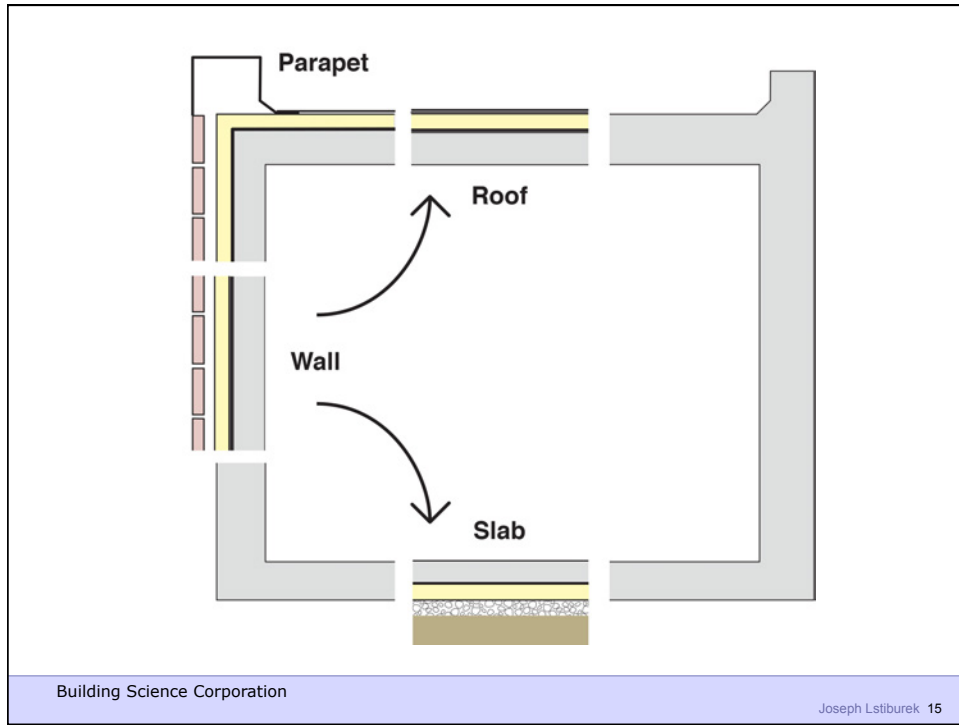
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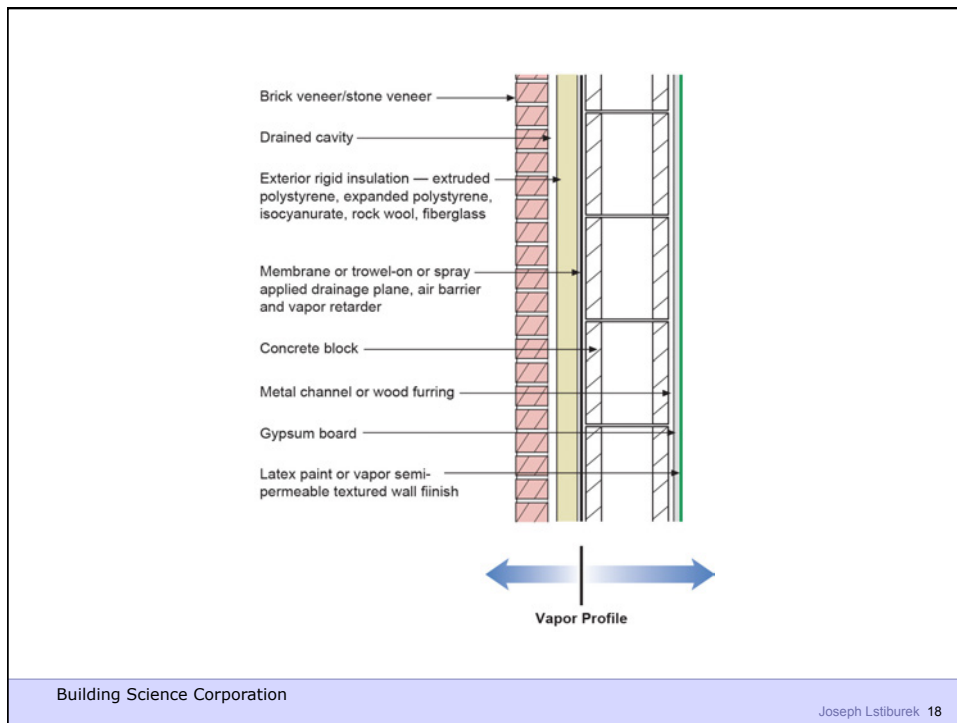
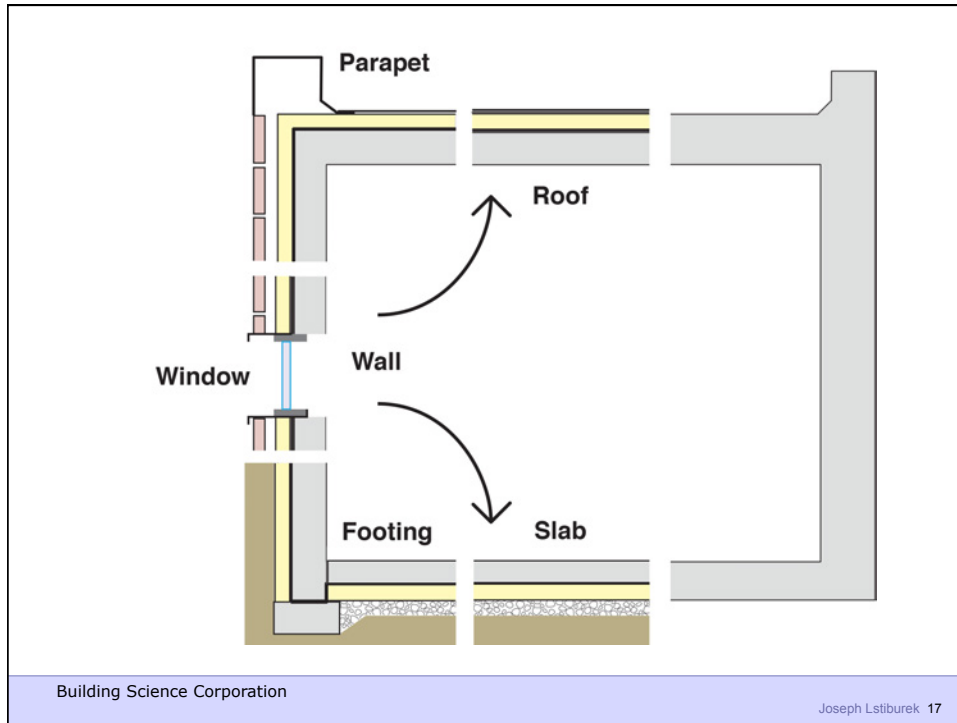


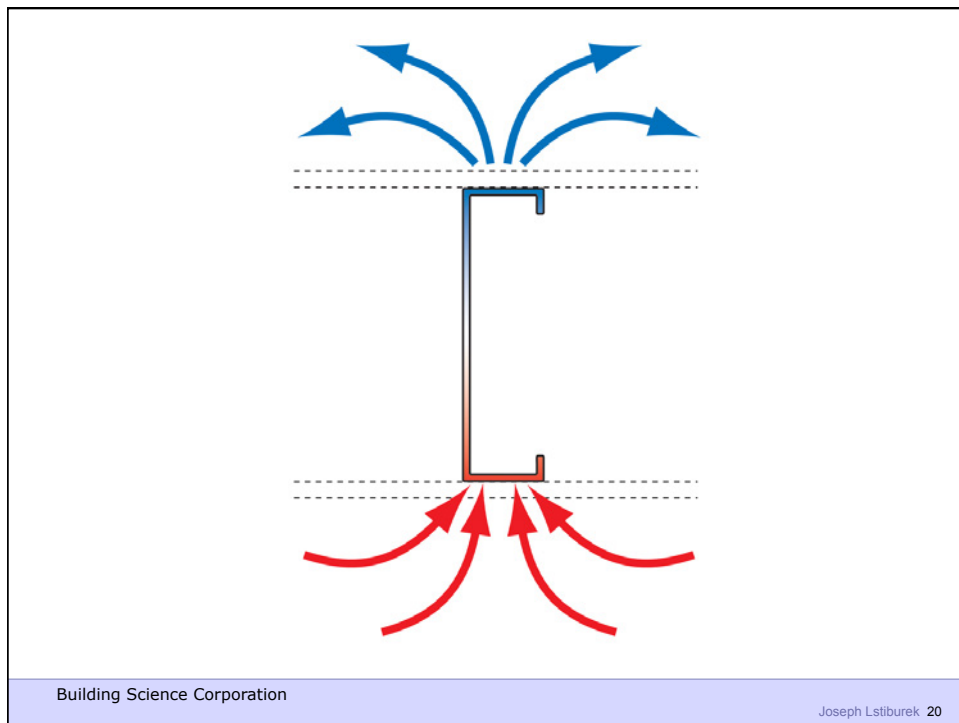
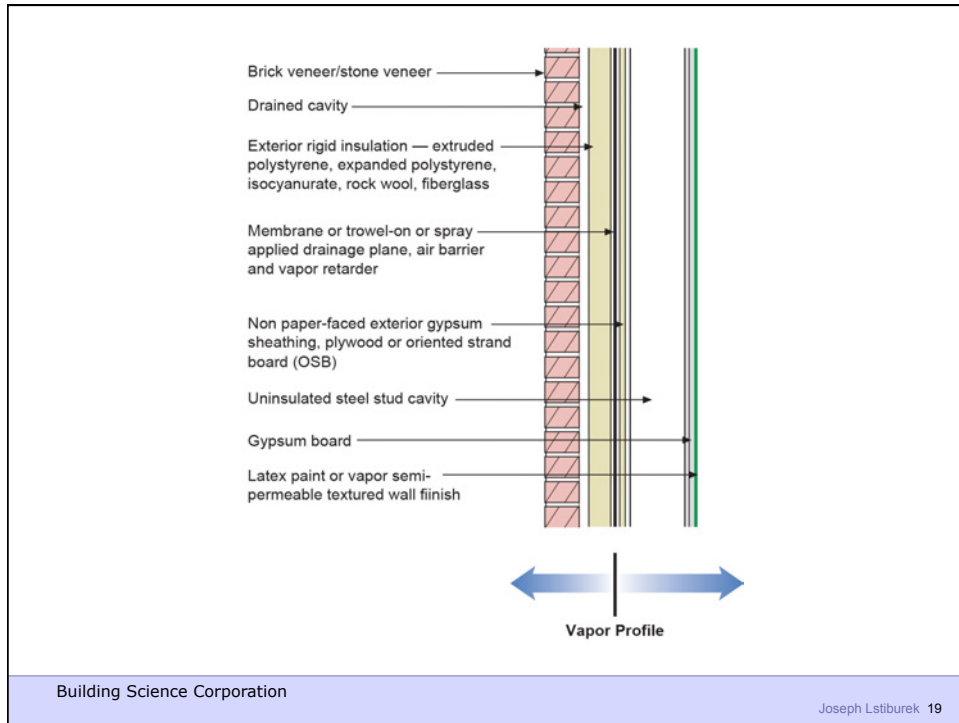


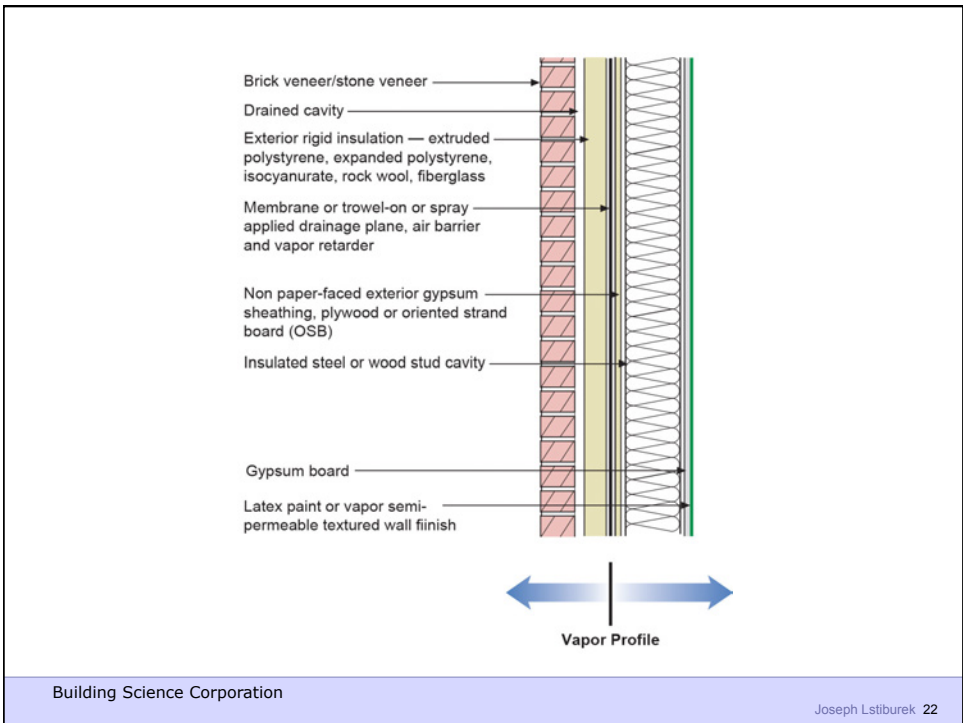








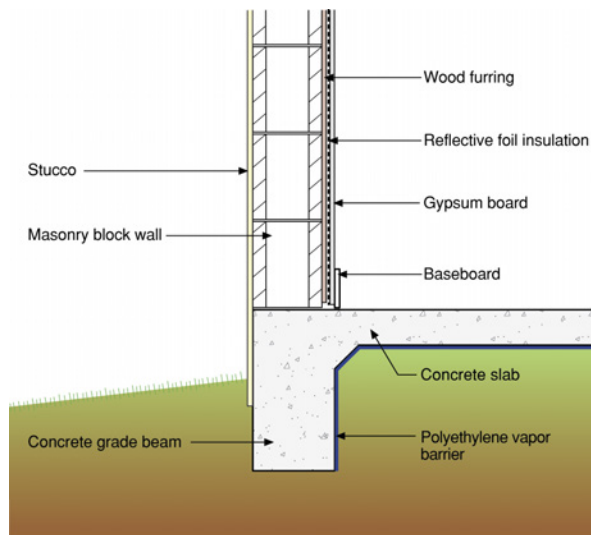


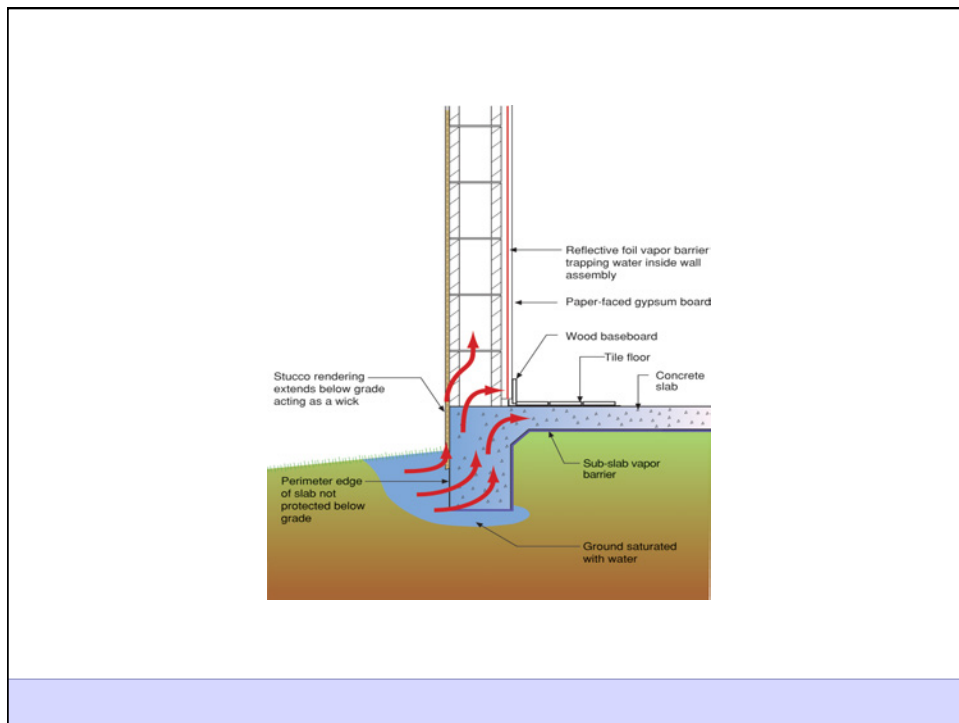
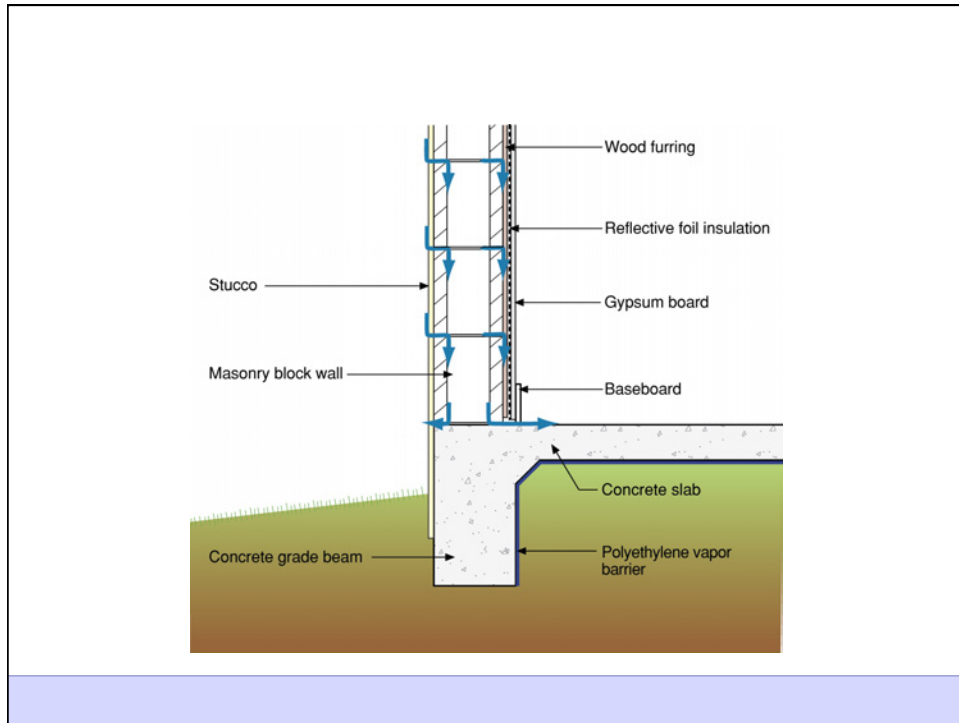


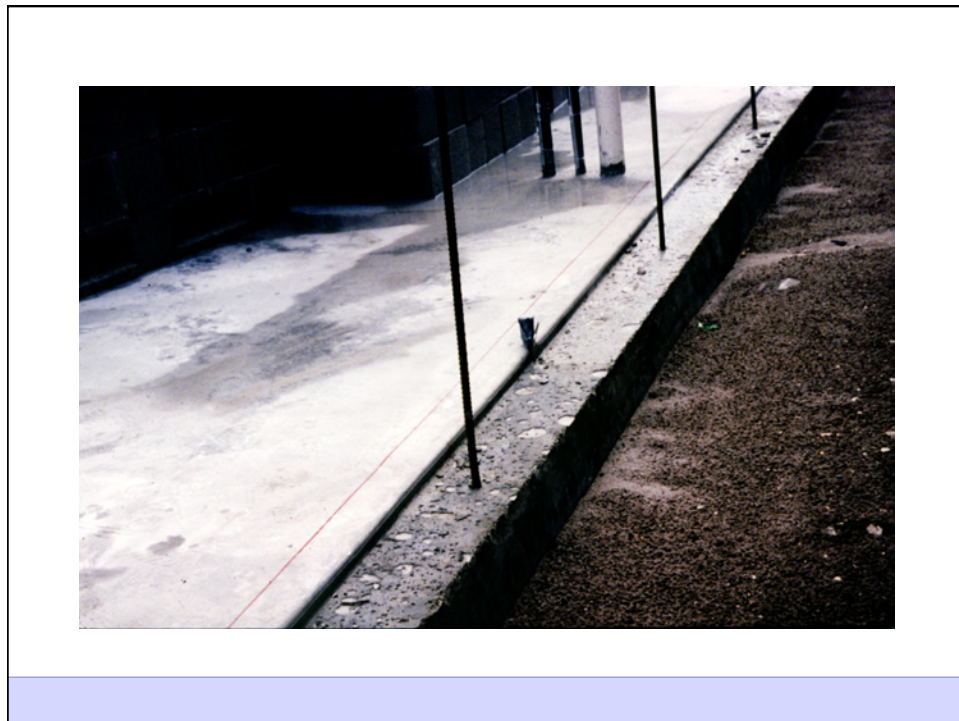
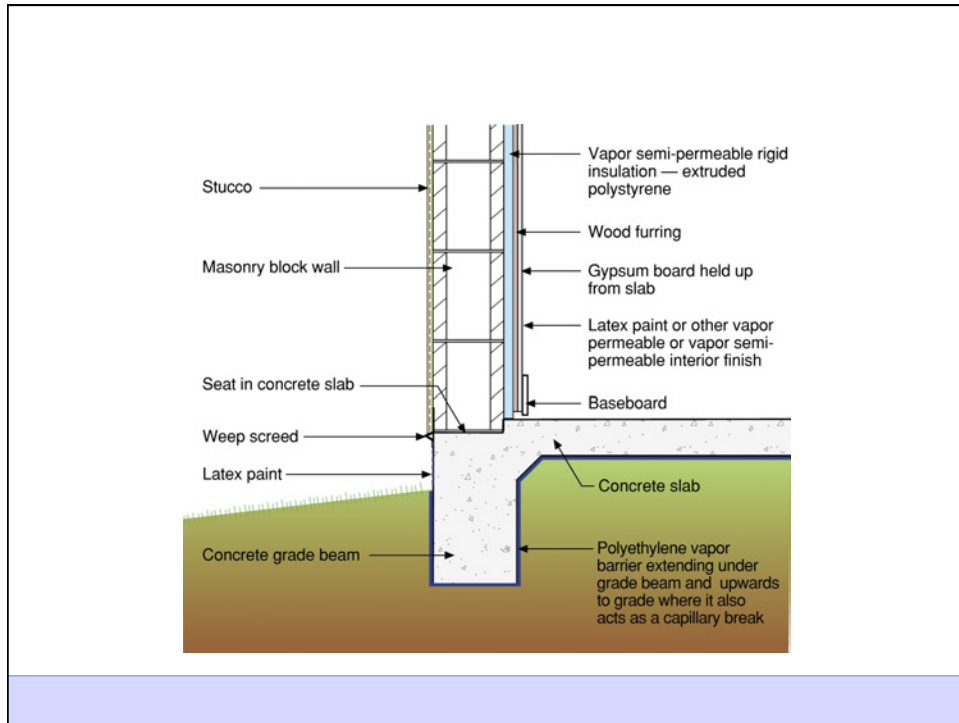
South Florida

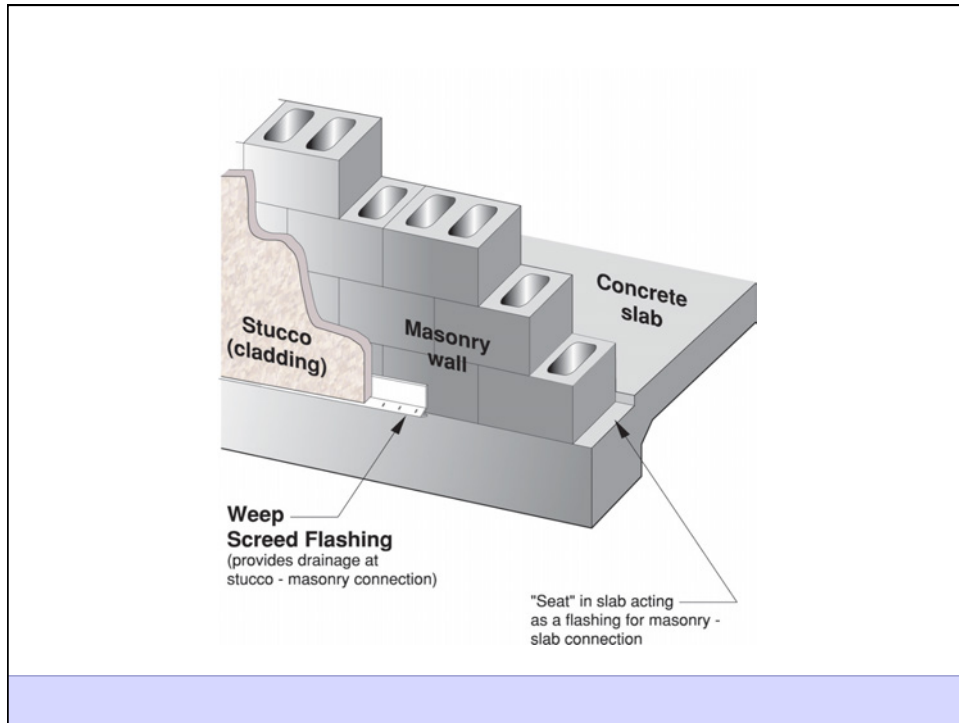
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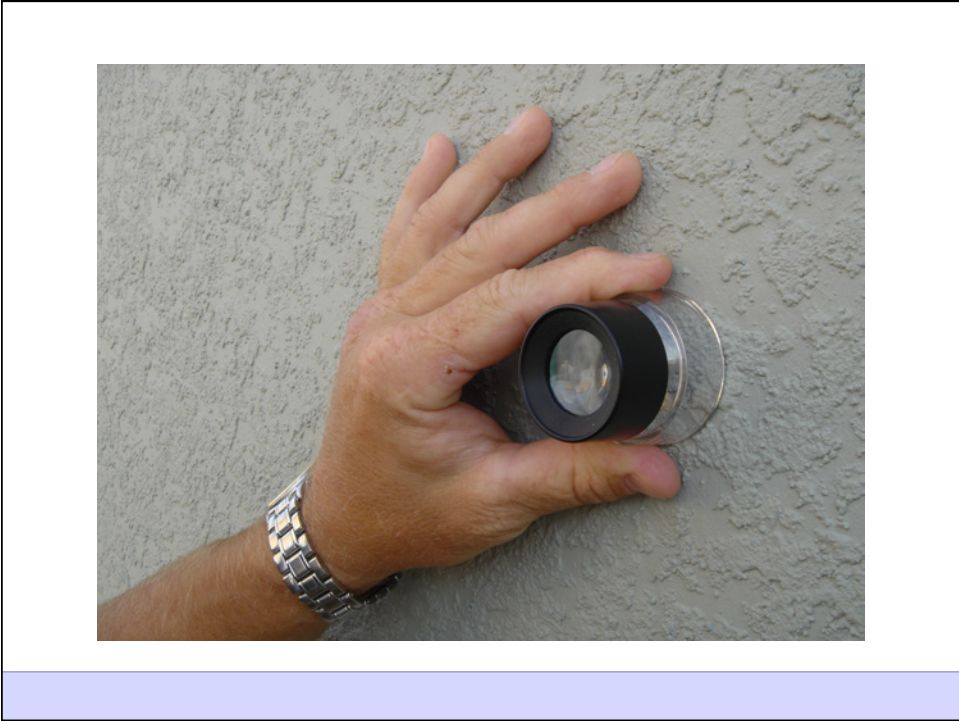
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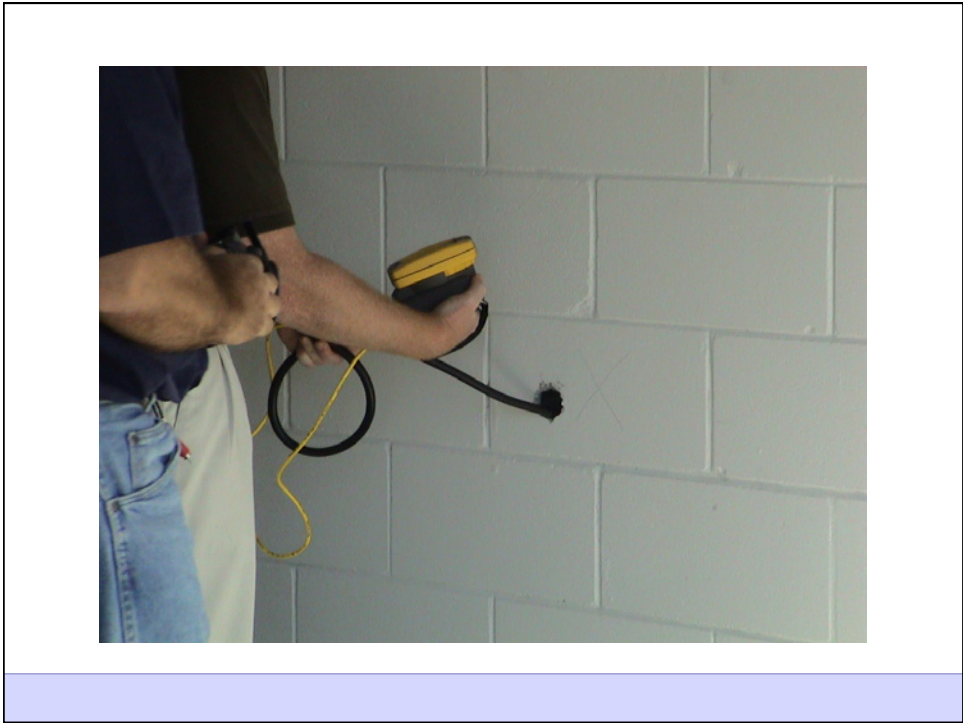


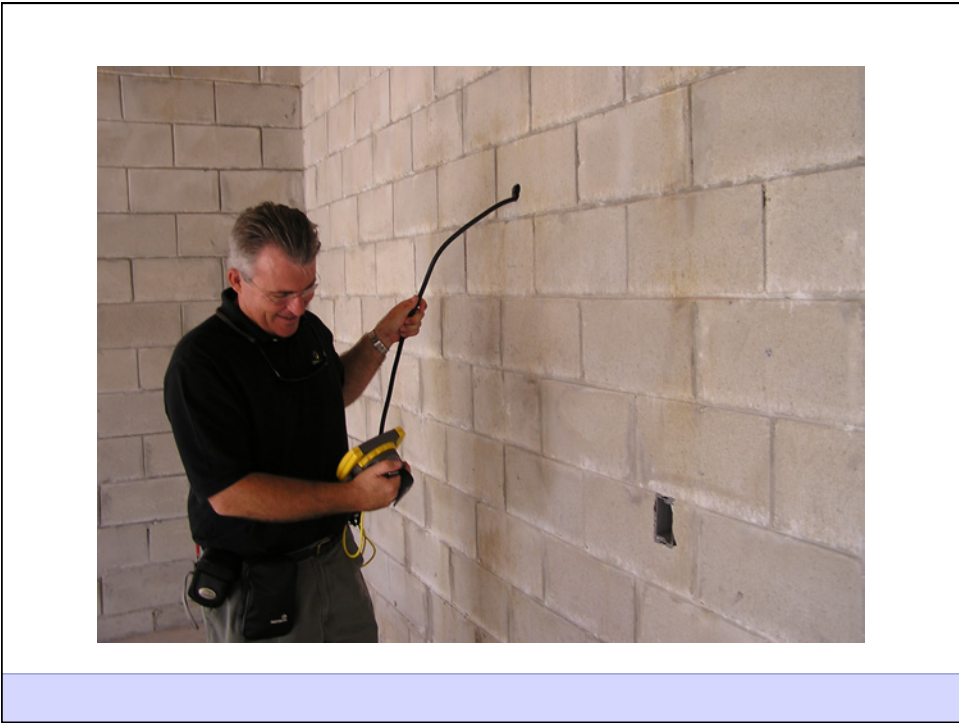


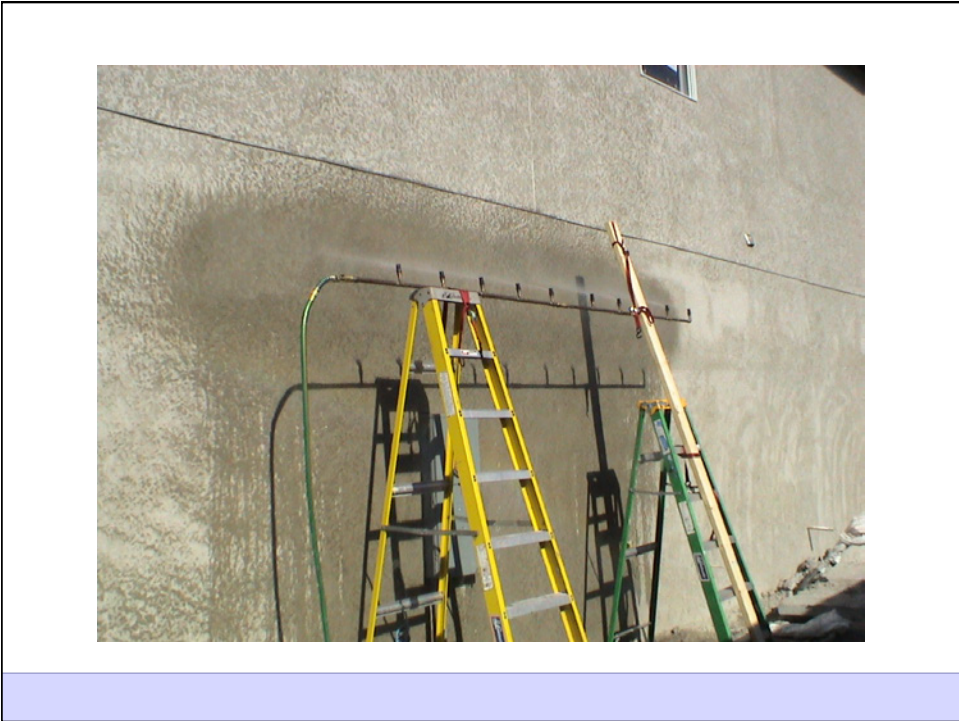
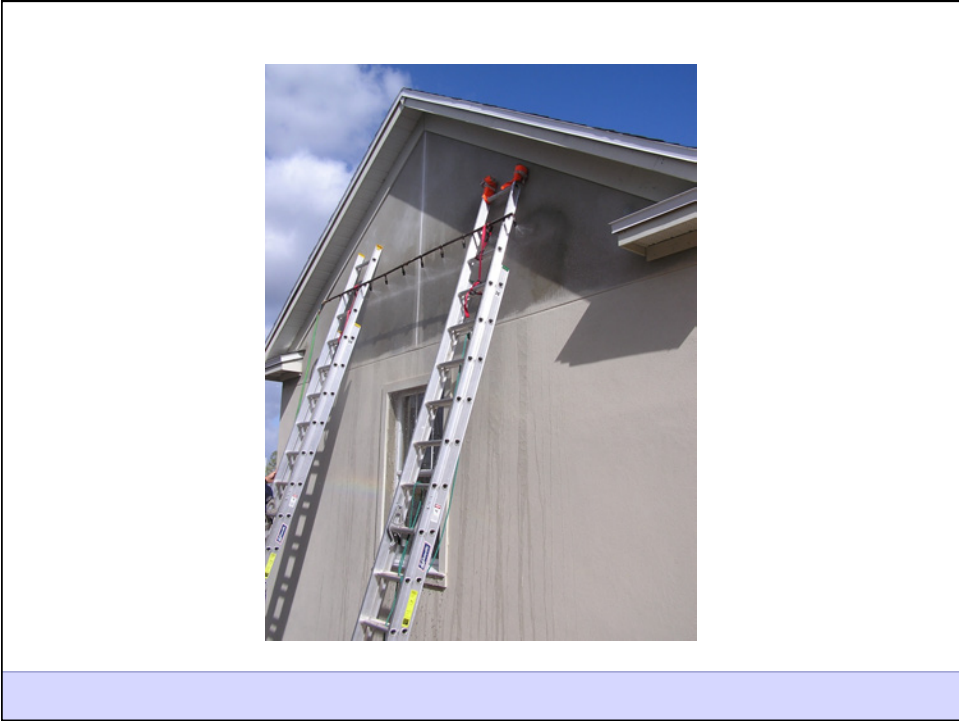






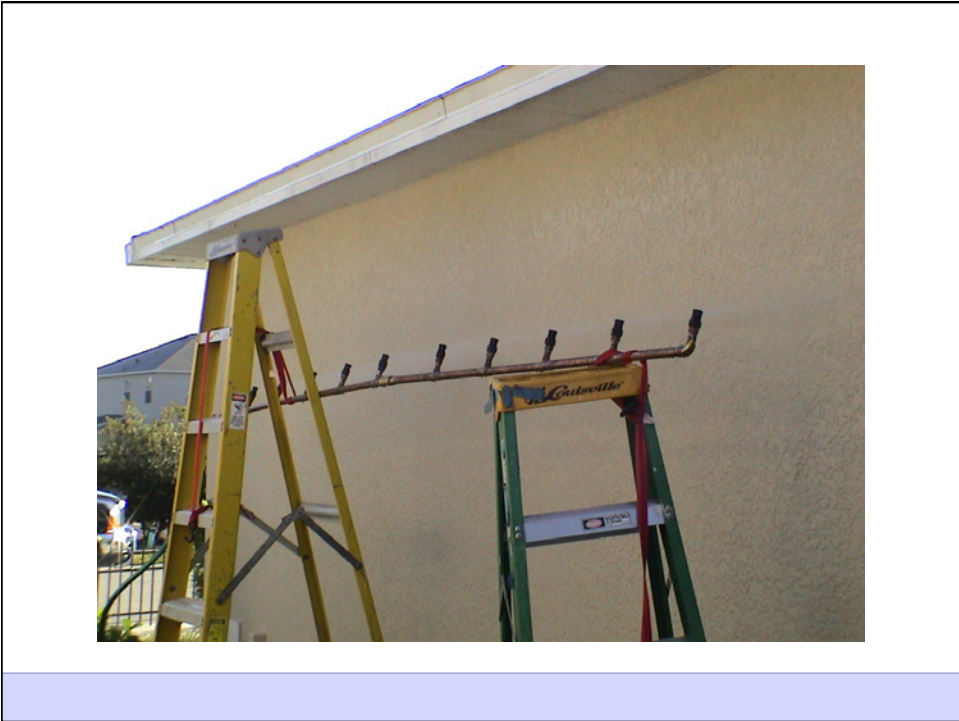


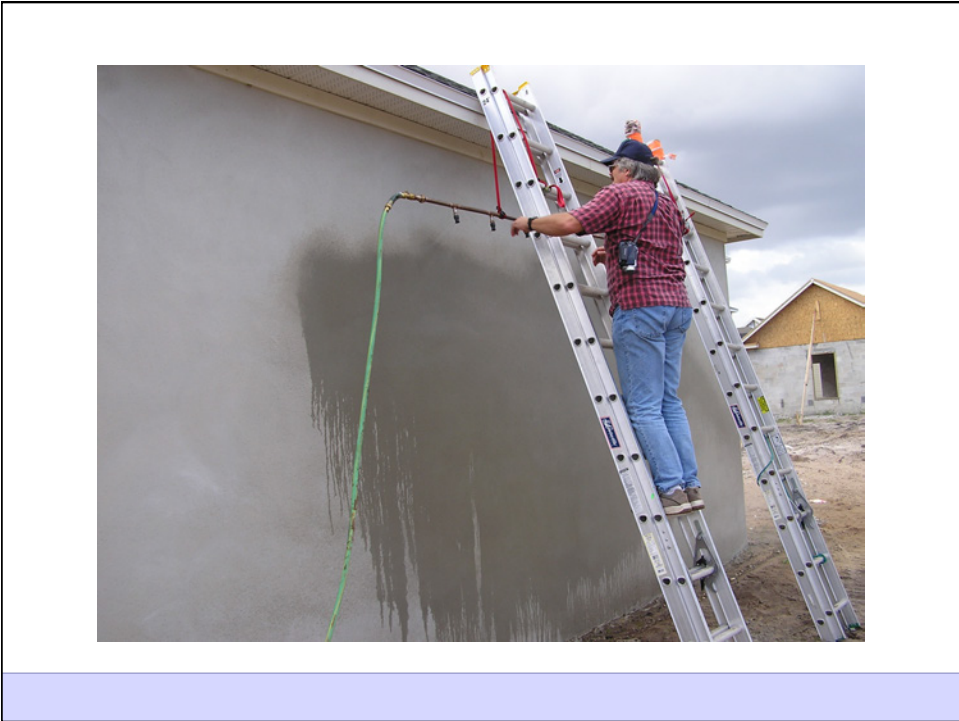
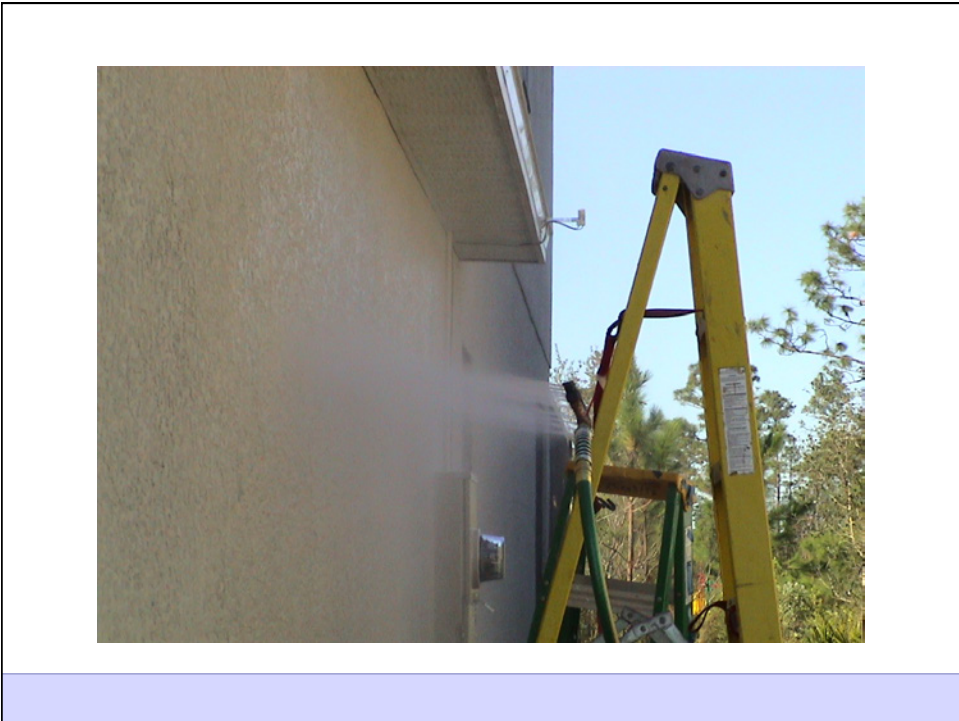














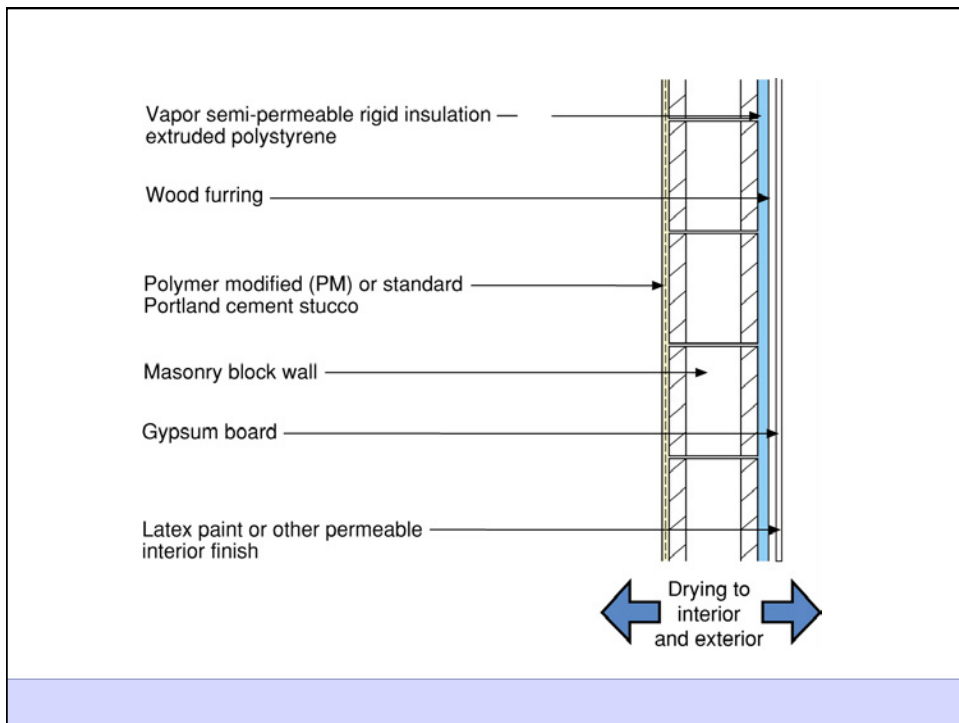




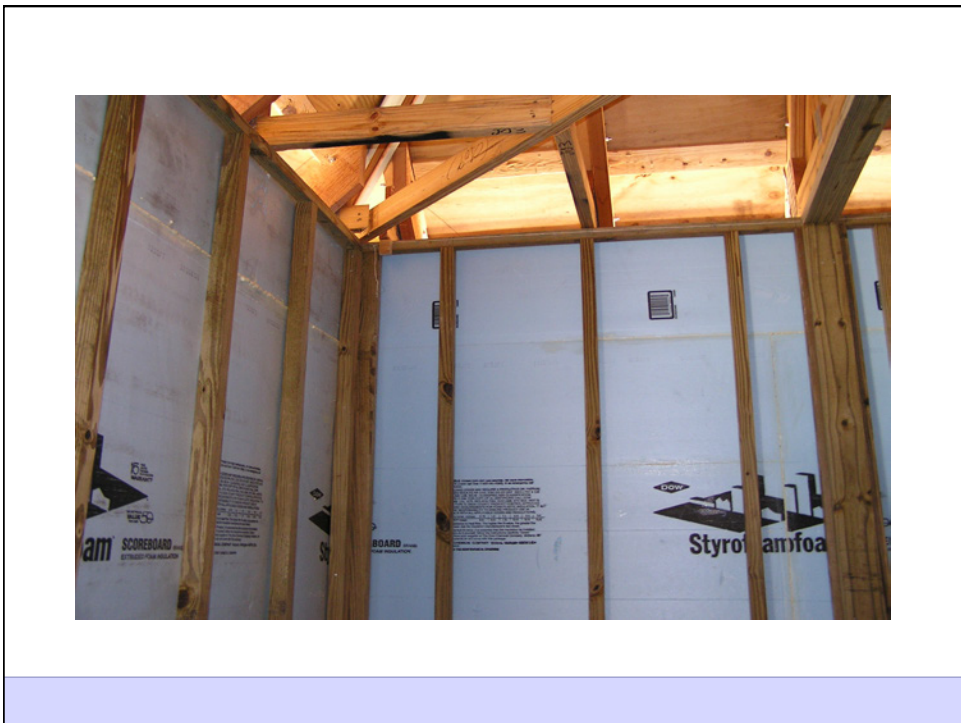


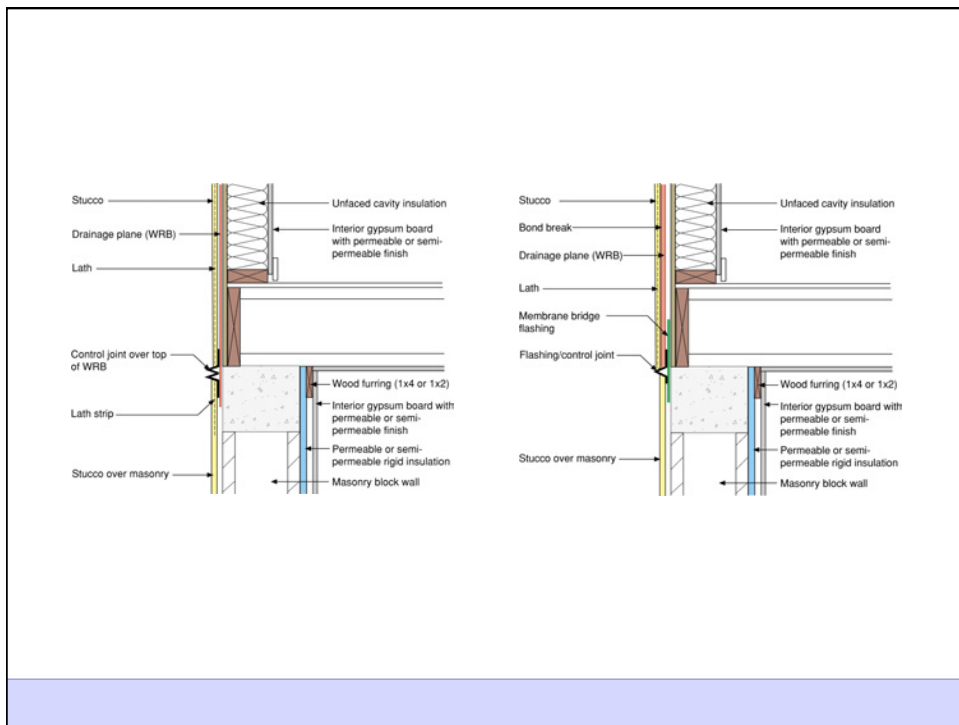
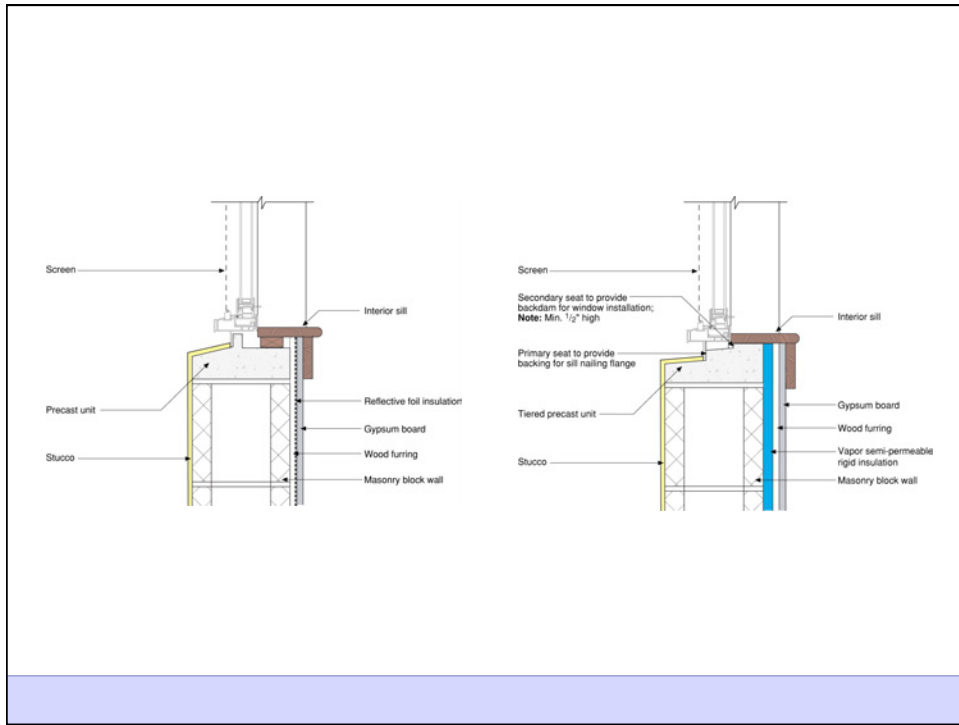














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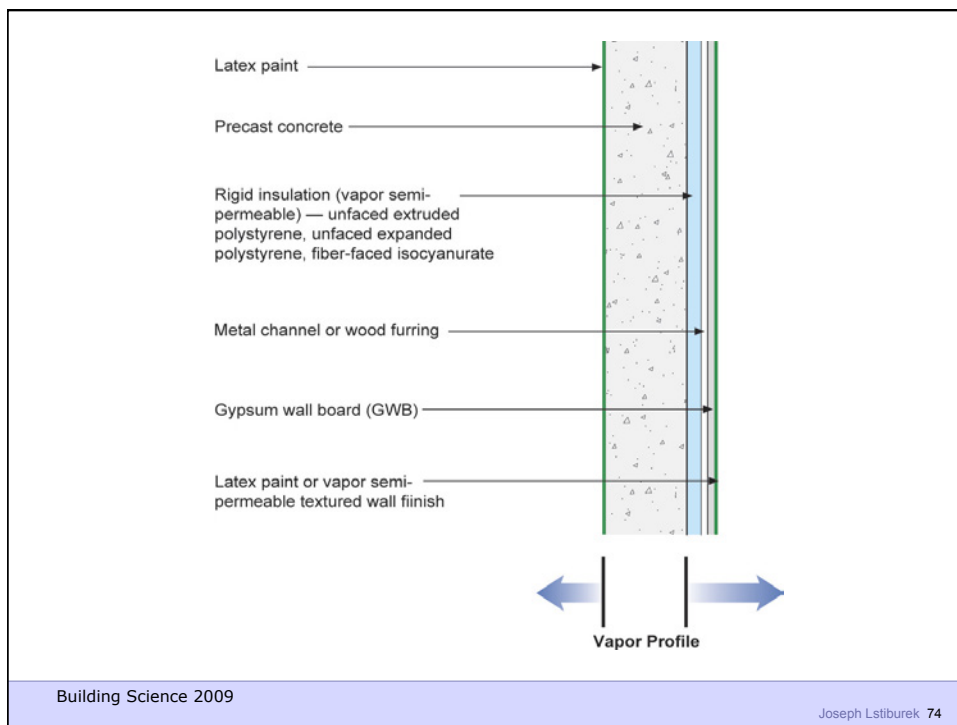
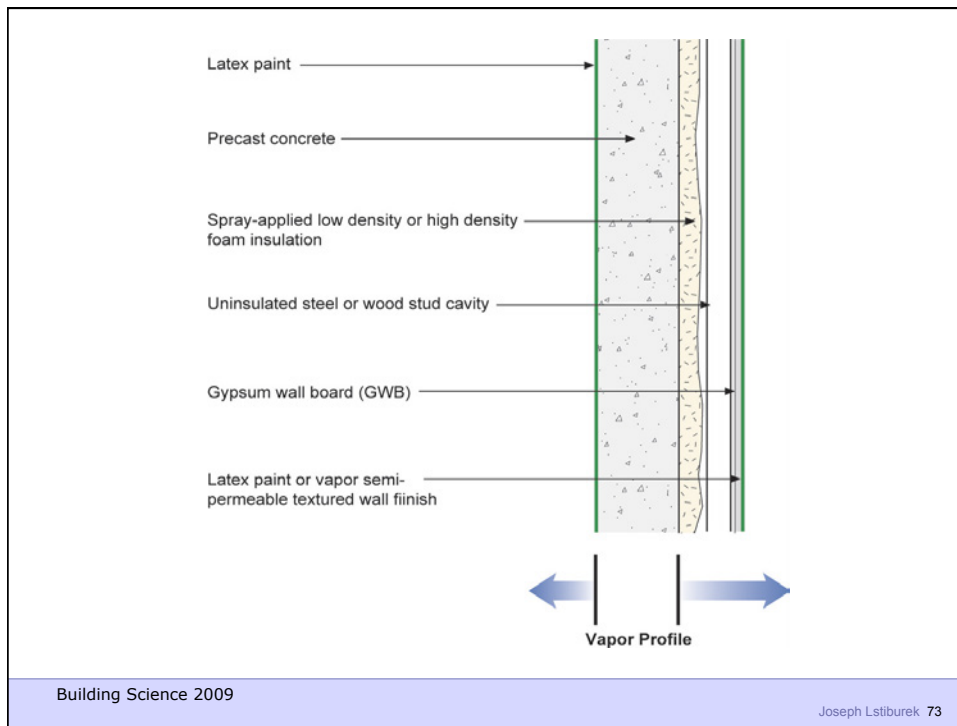
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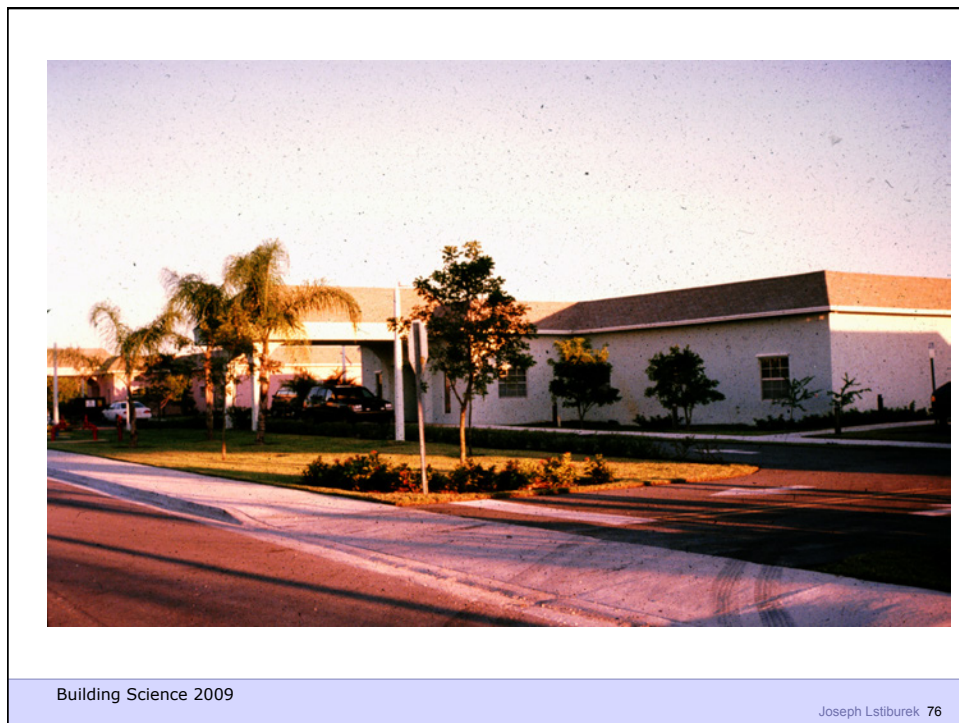
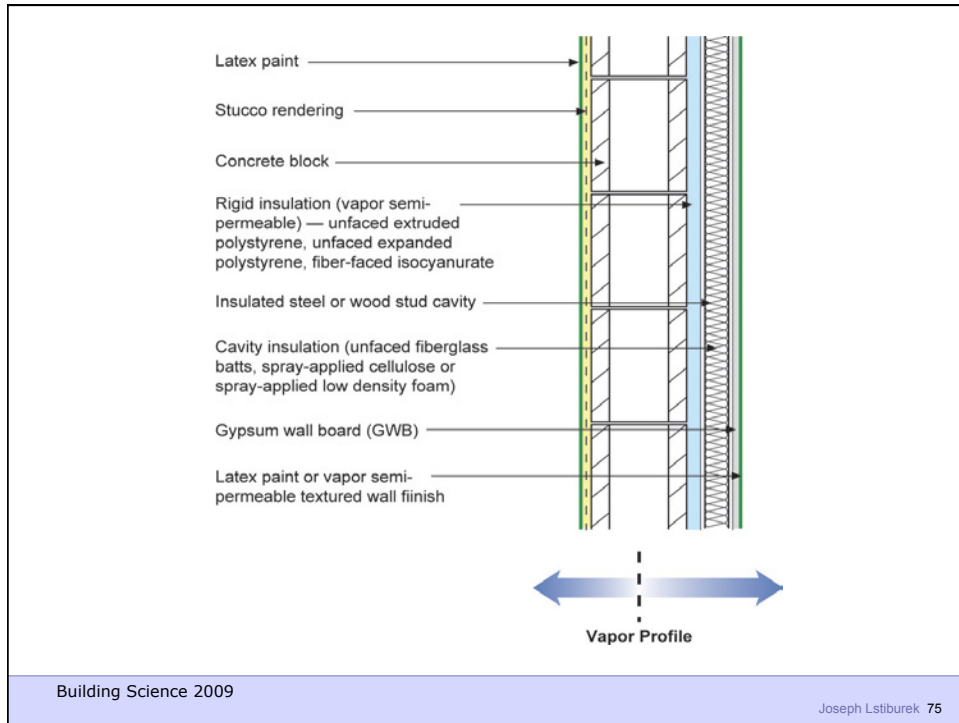
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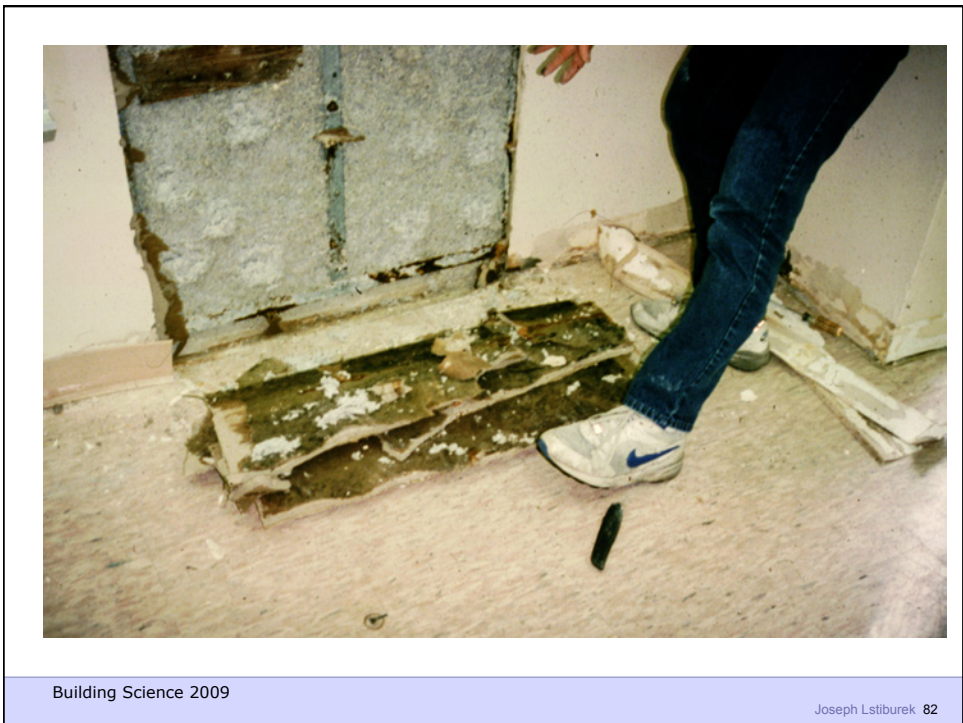
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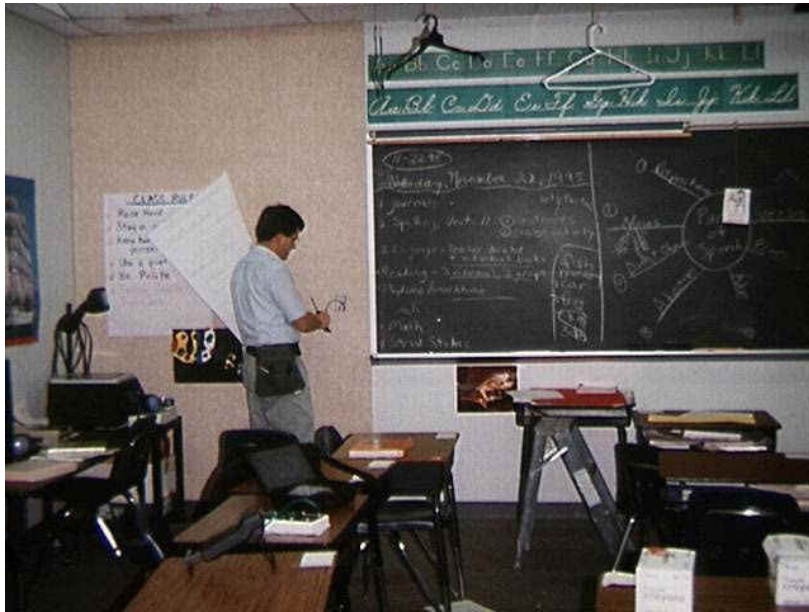
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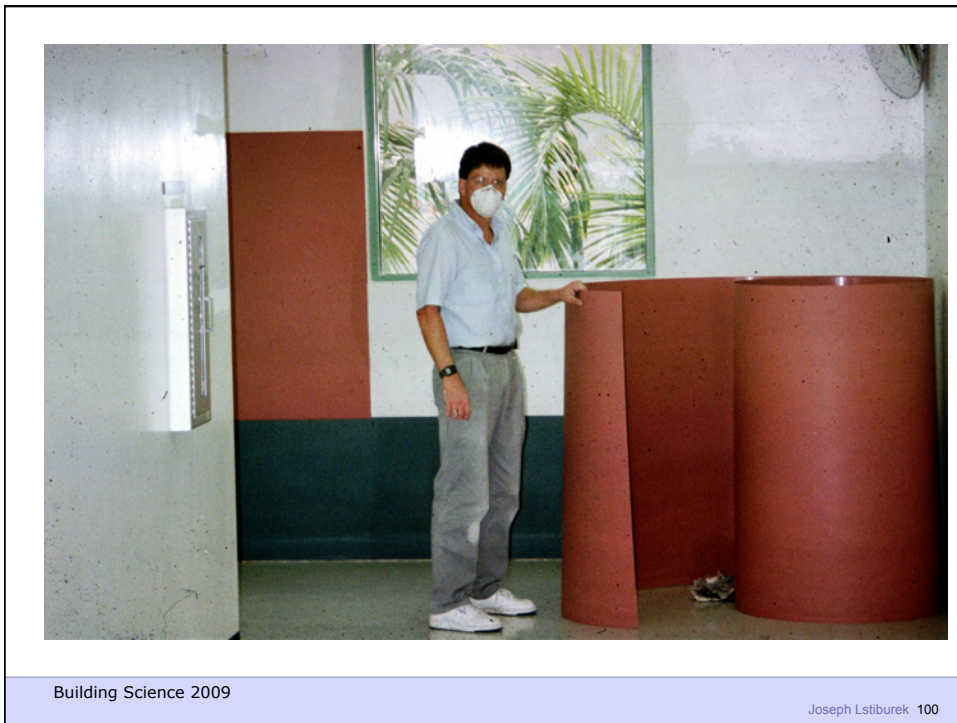
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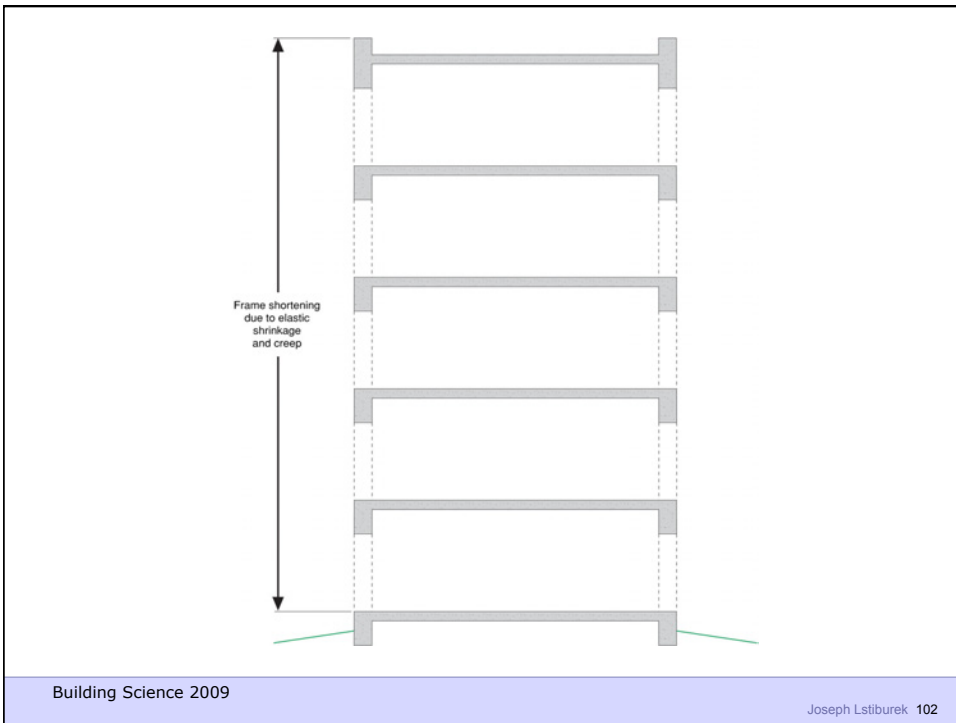


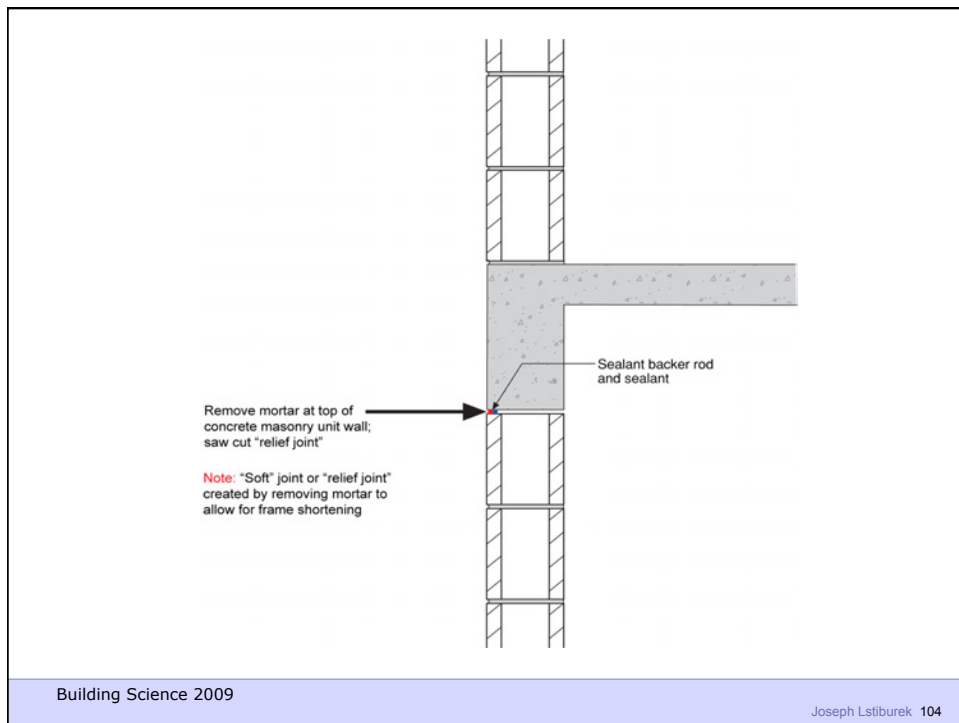
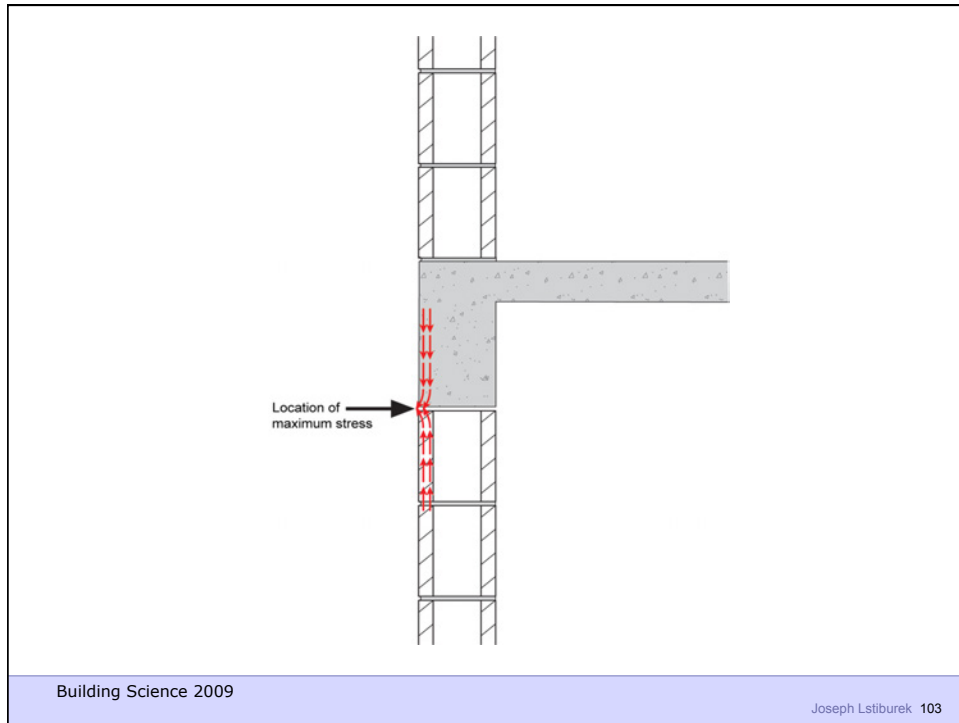
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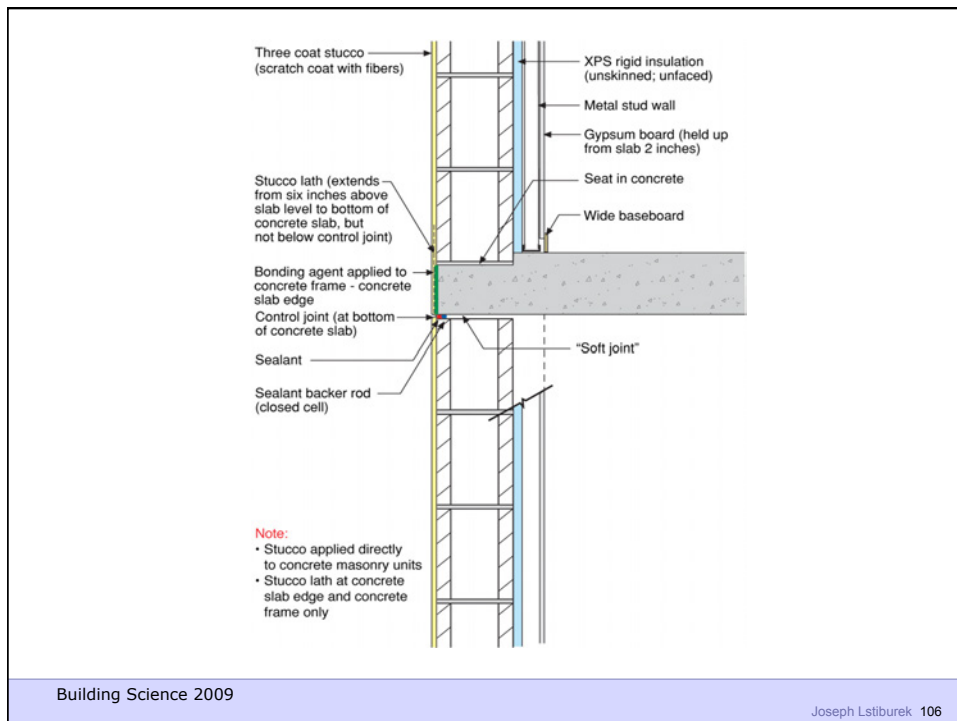
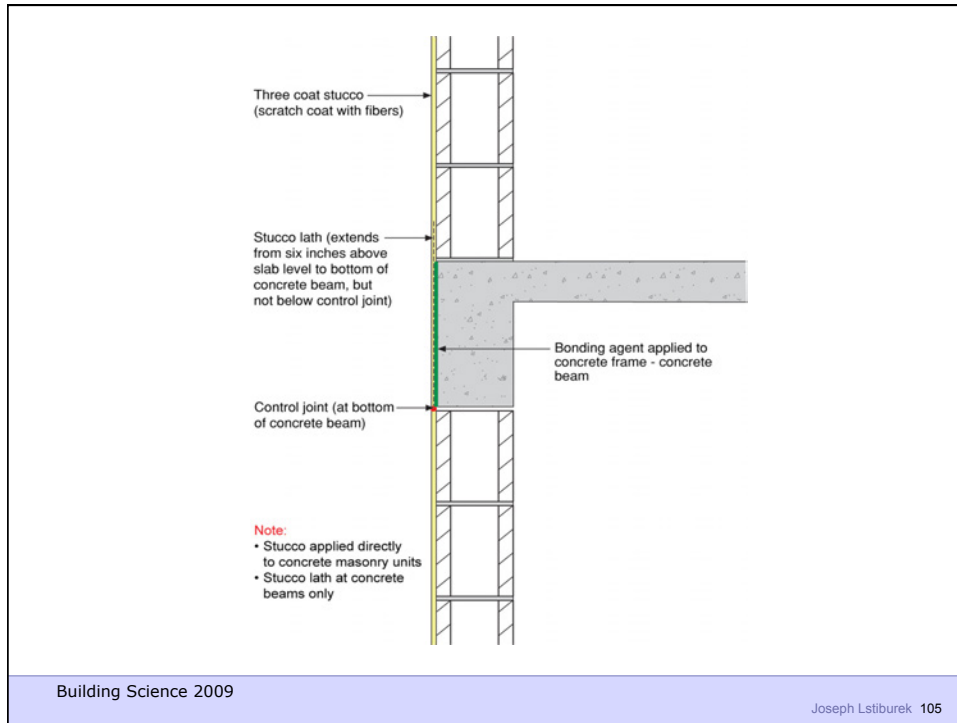
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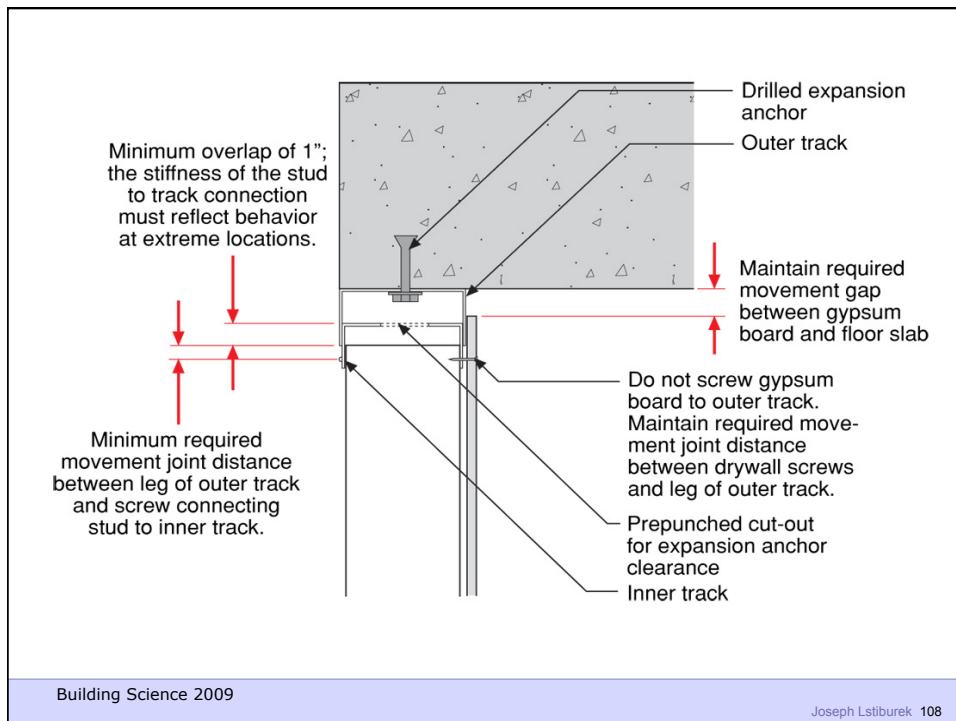
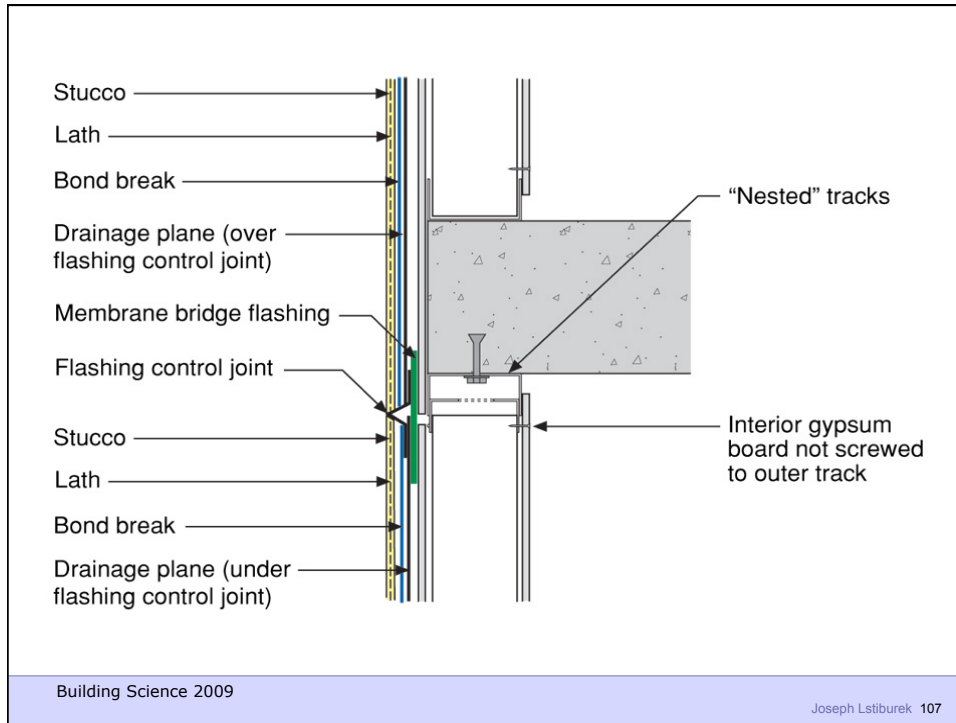


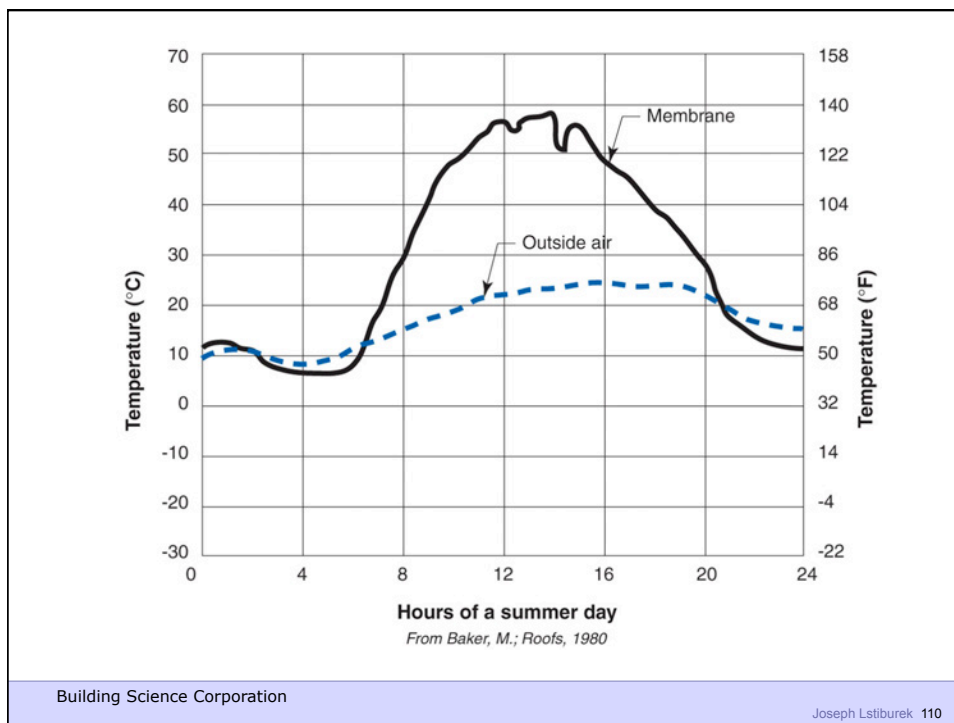
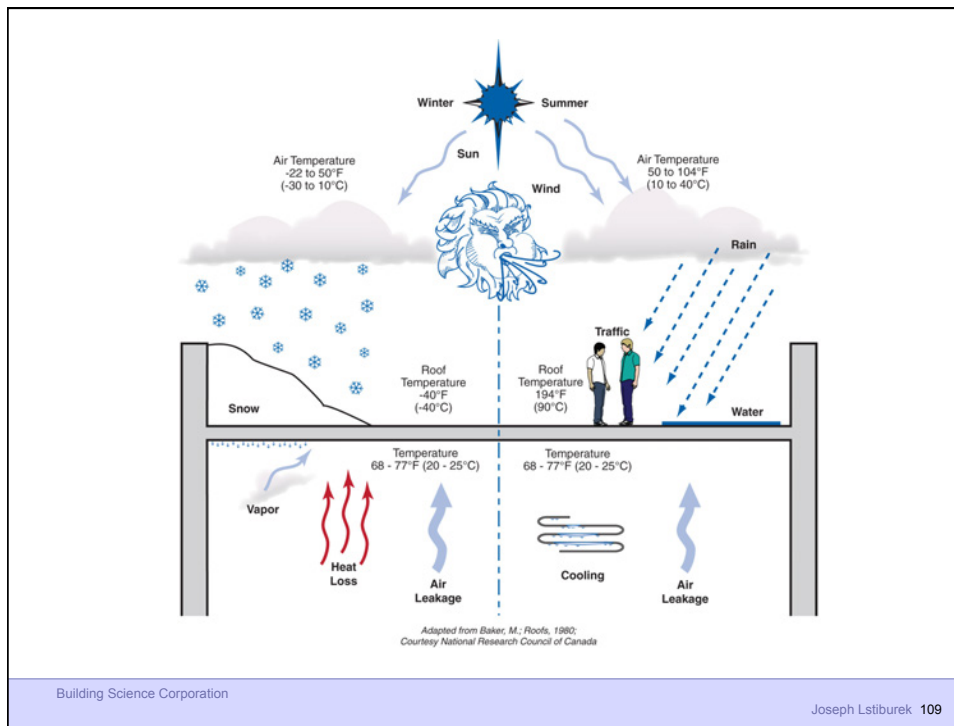


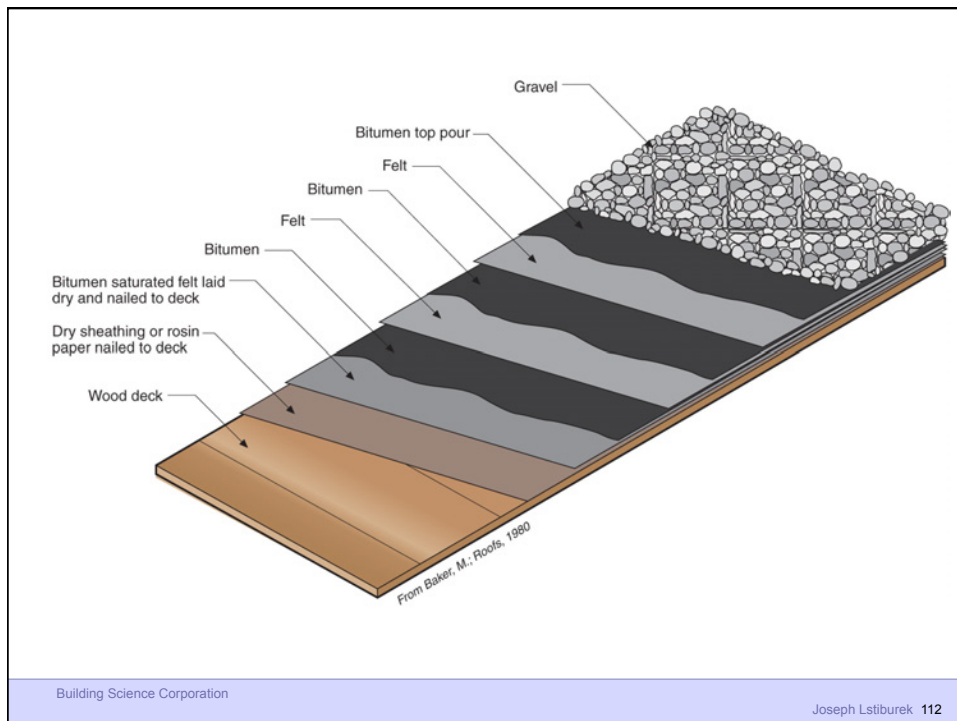
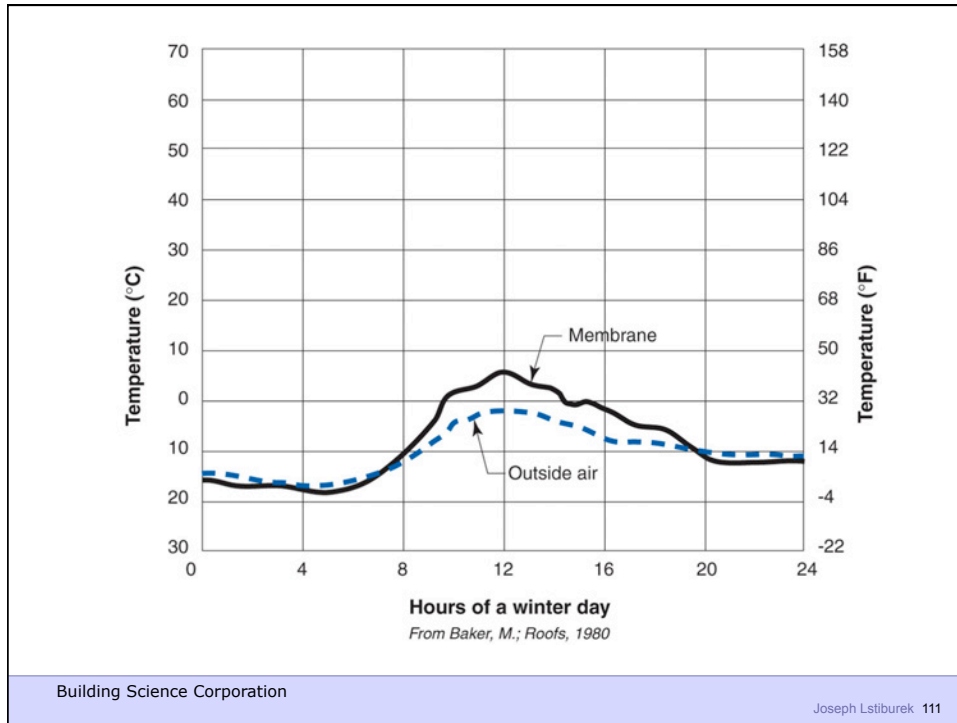


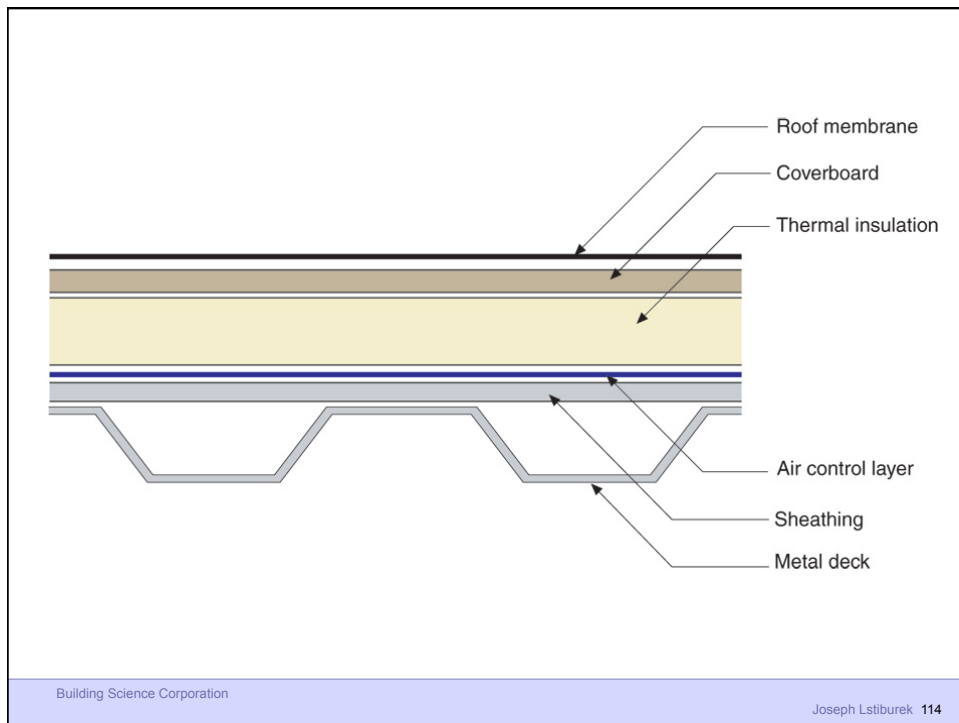
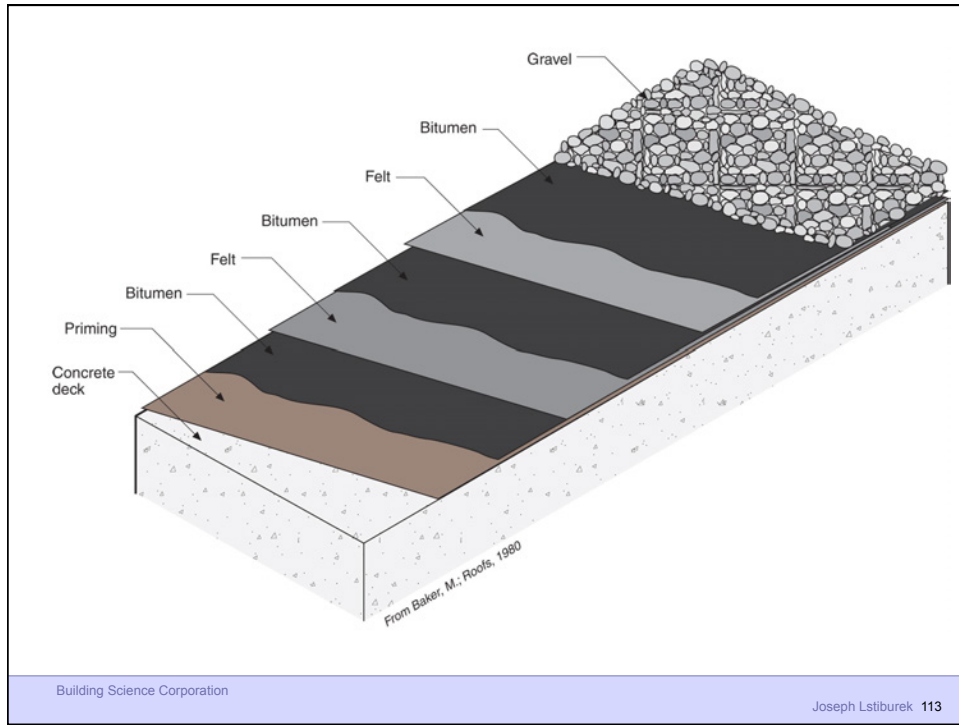


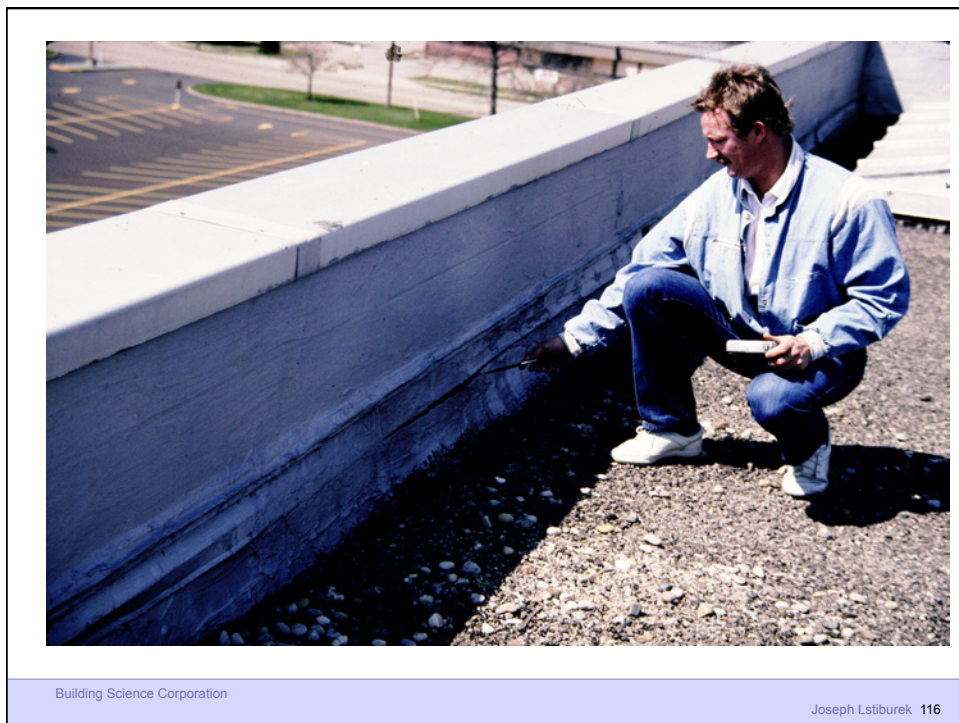
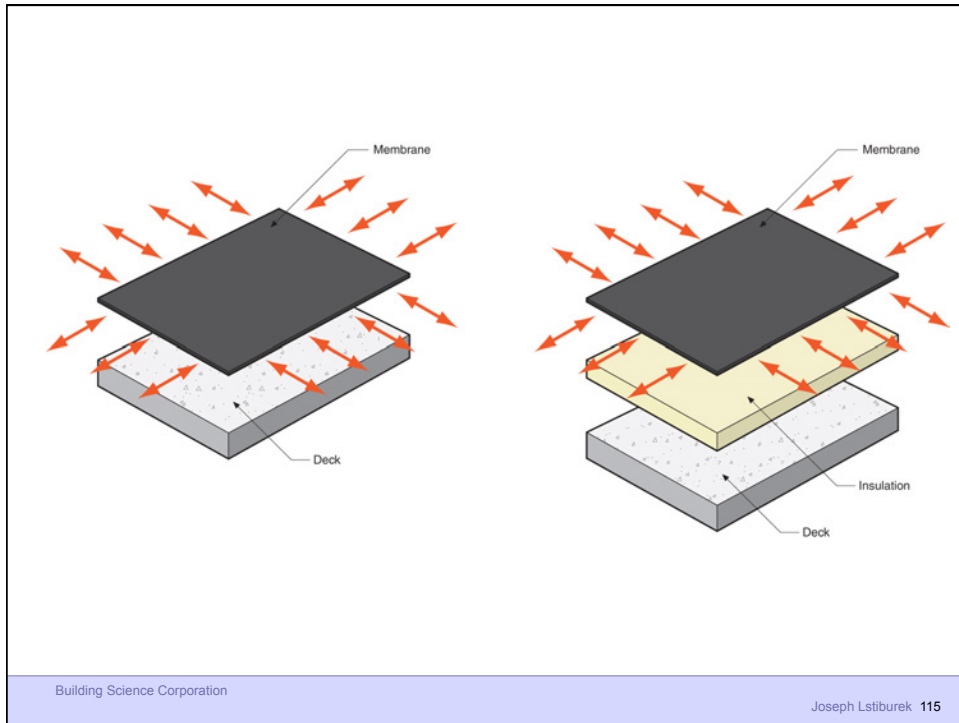


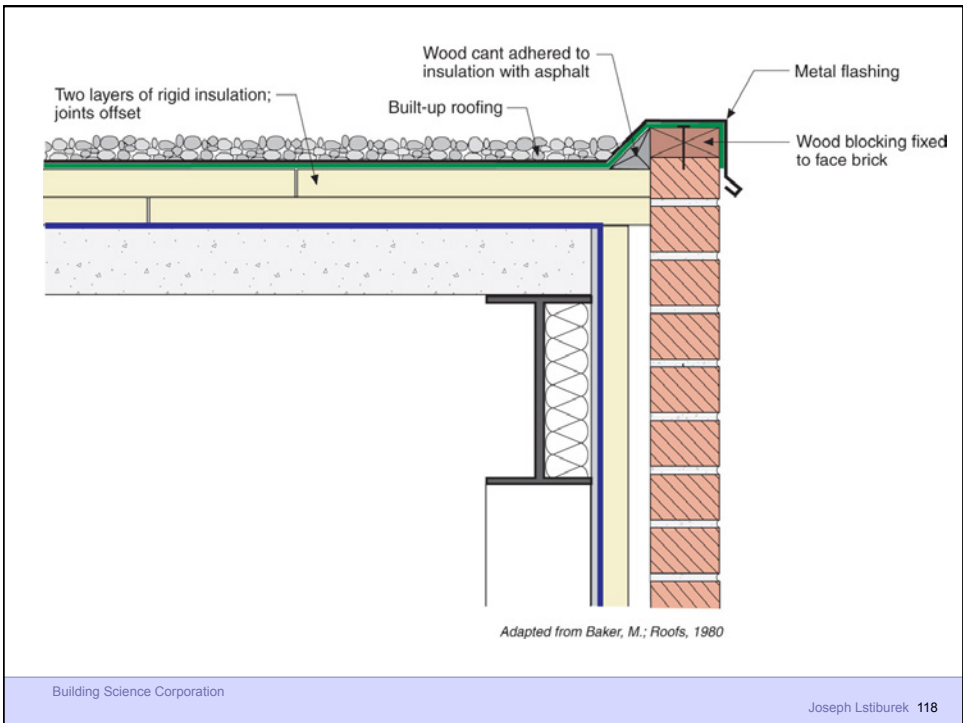
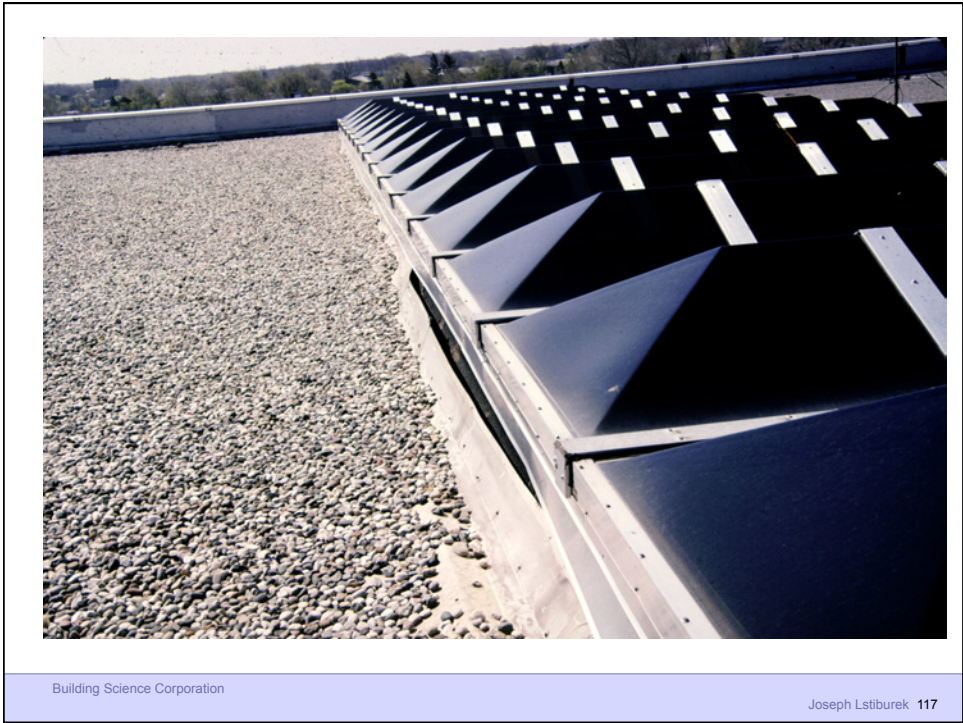


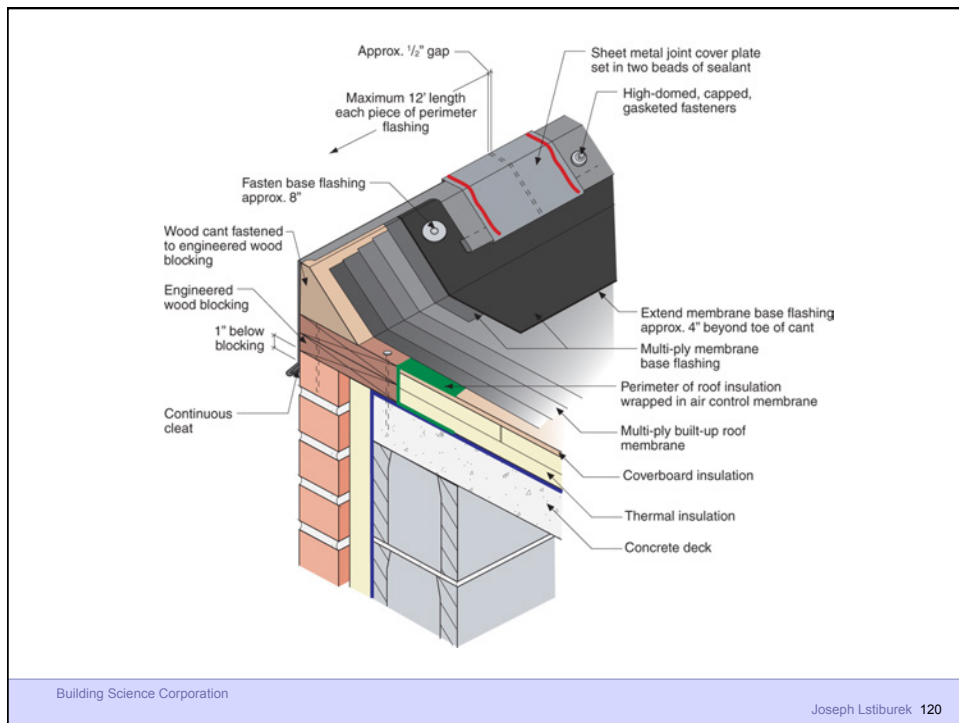
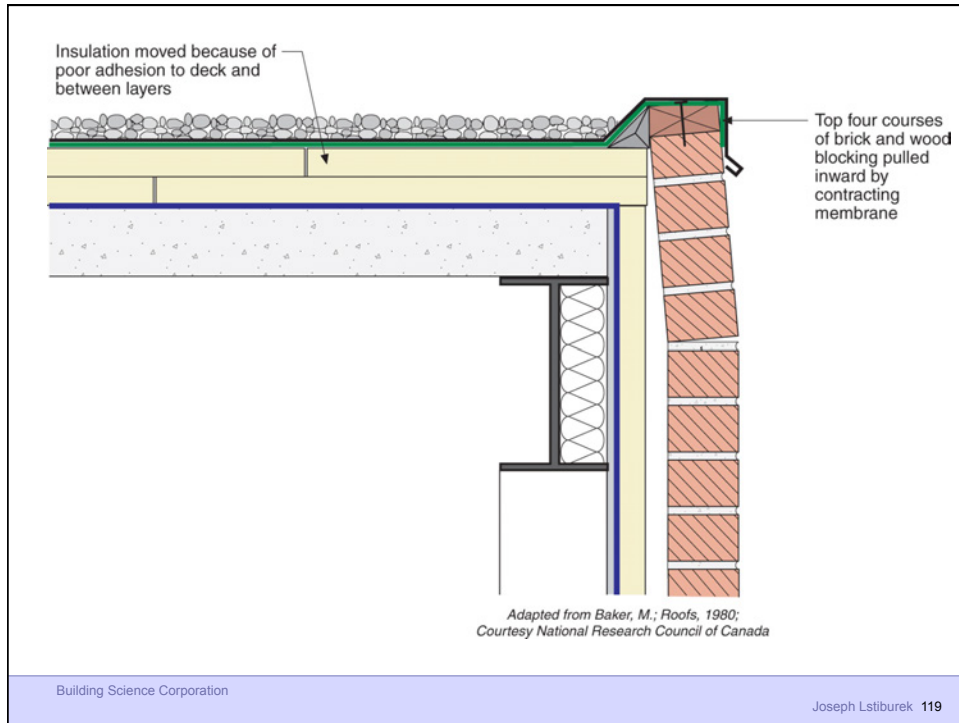


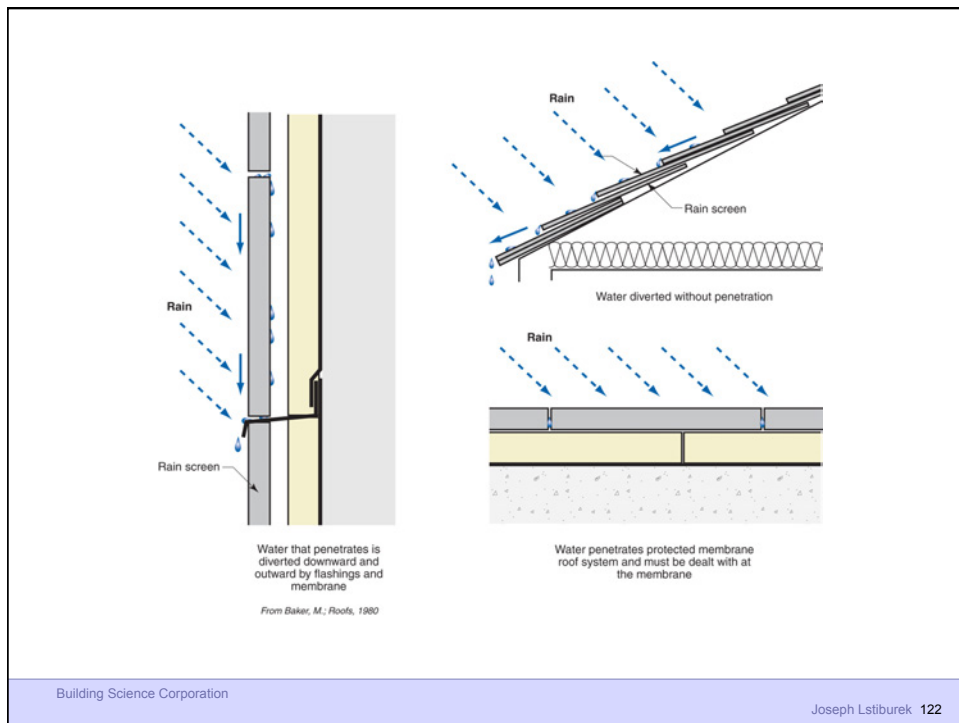
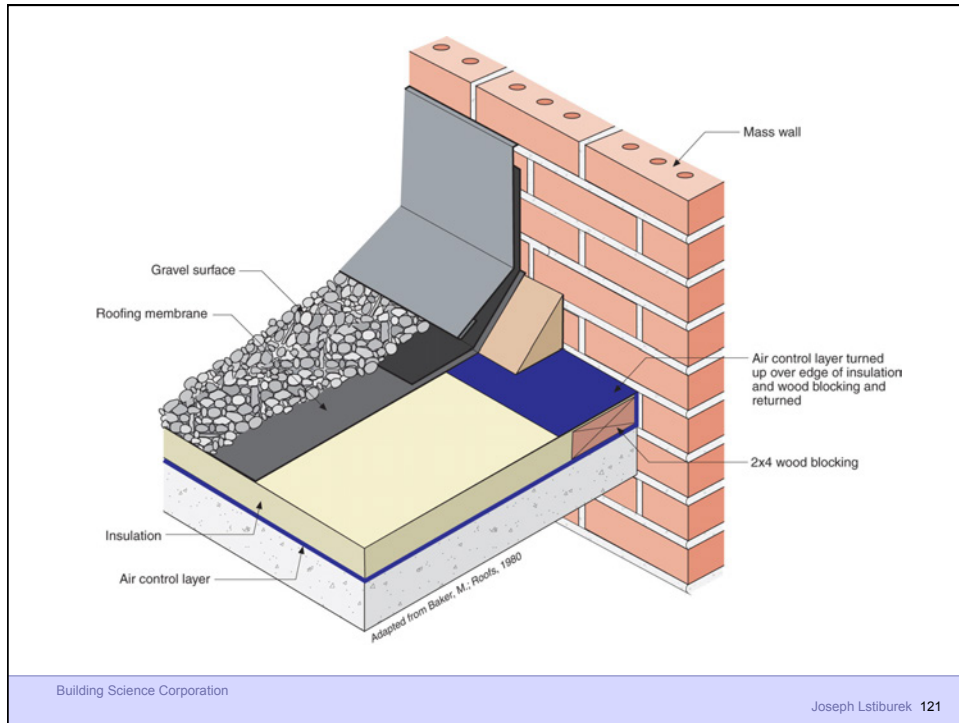


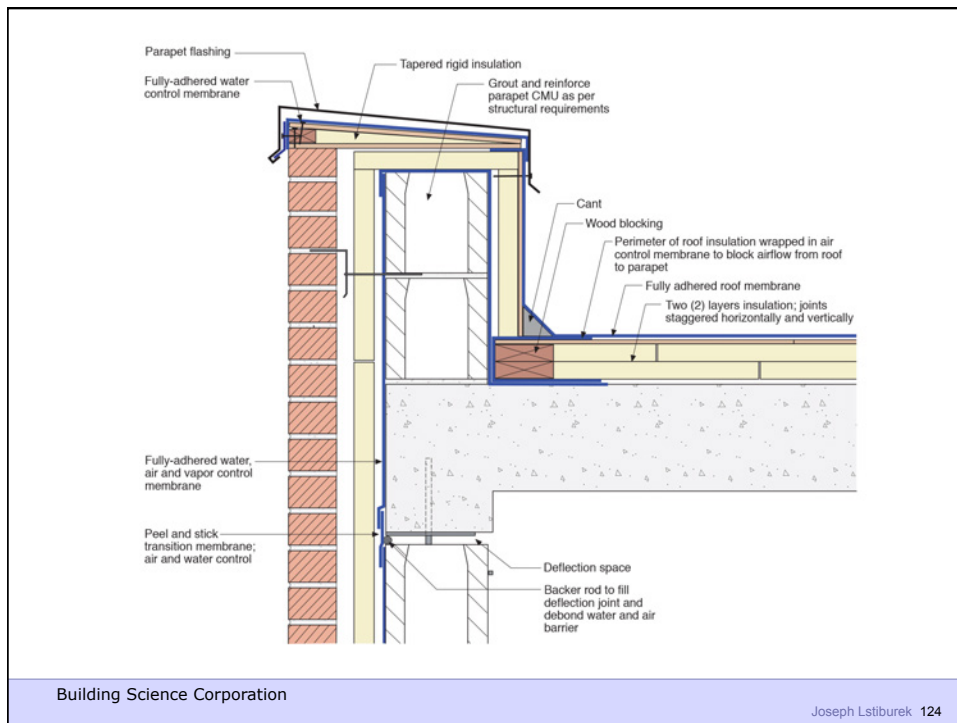
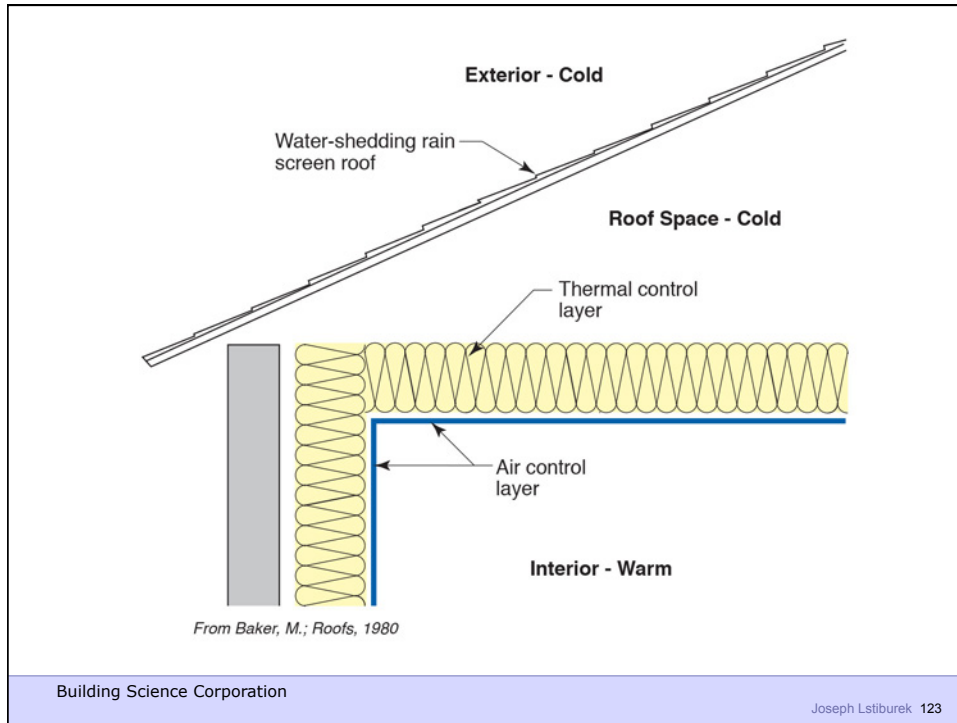


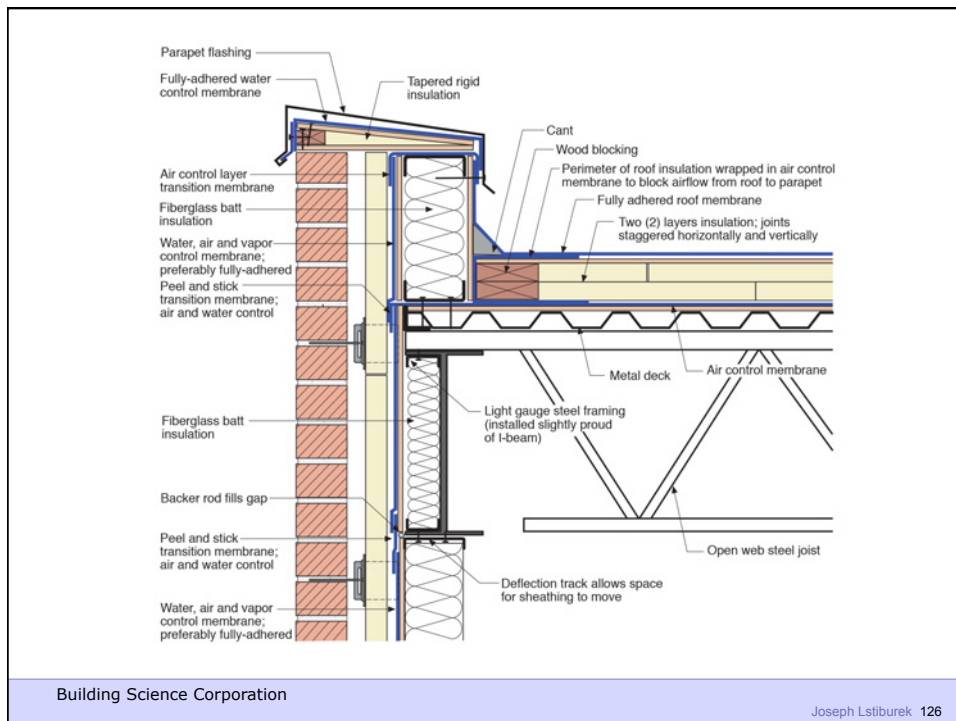
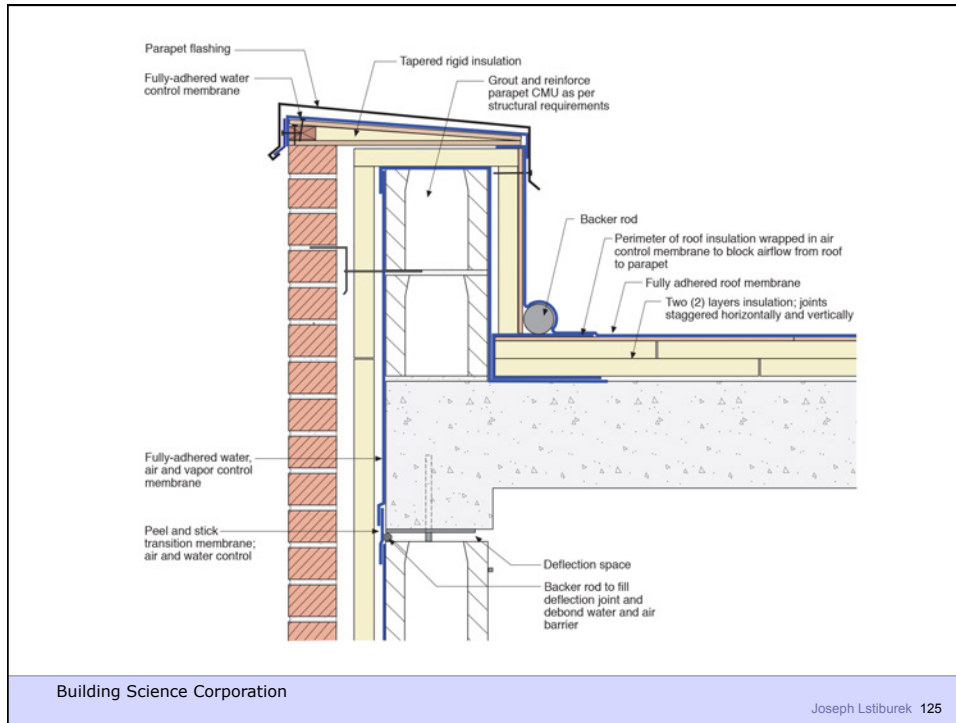


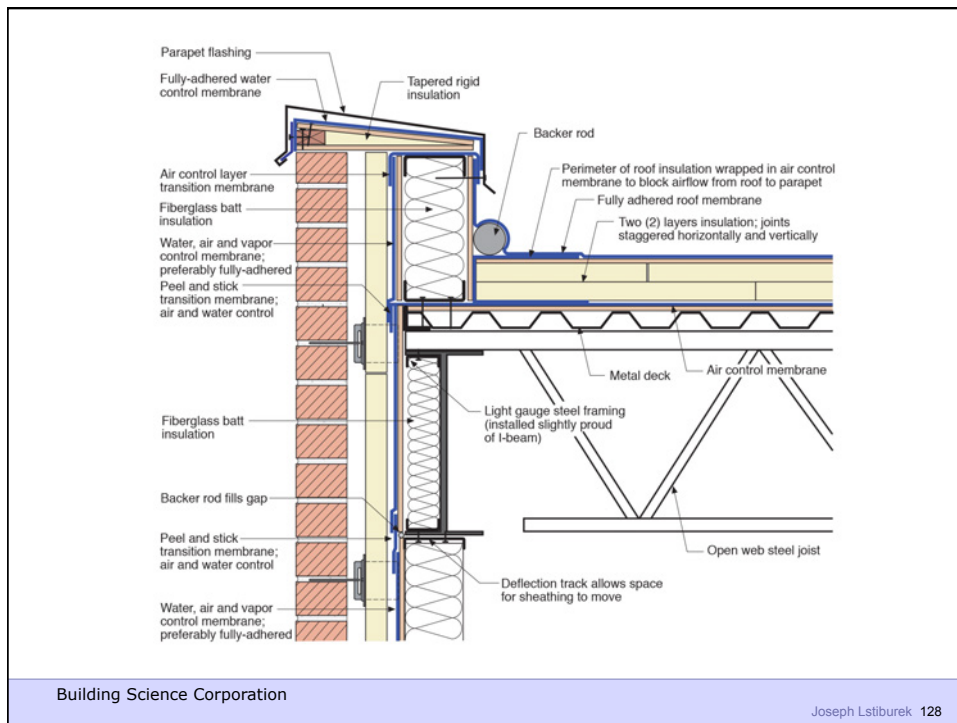
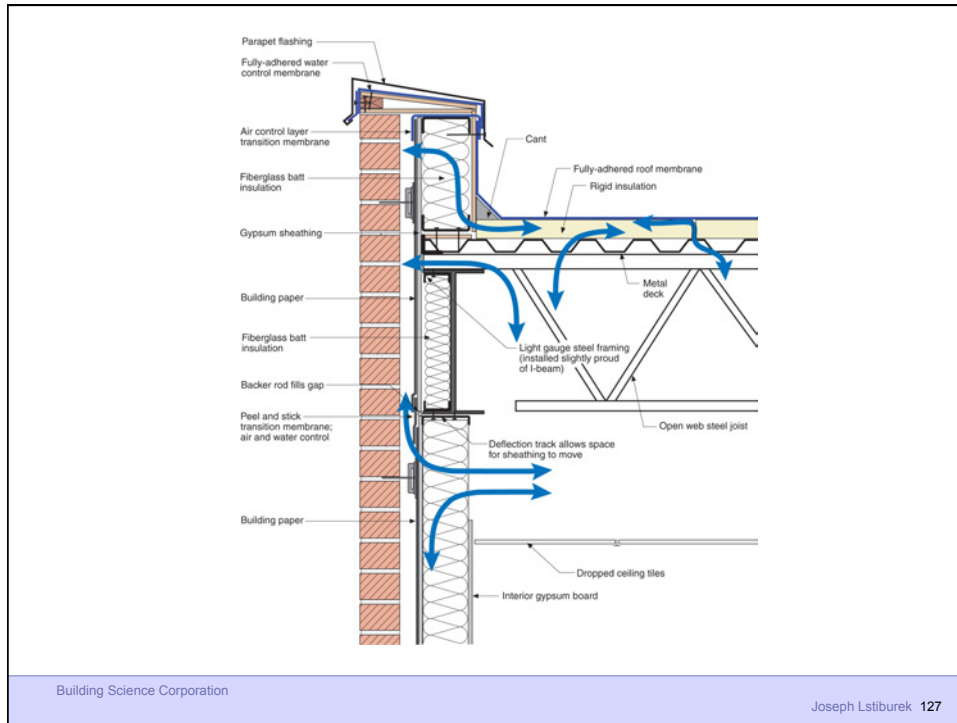


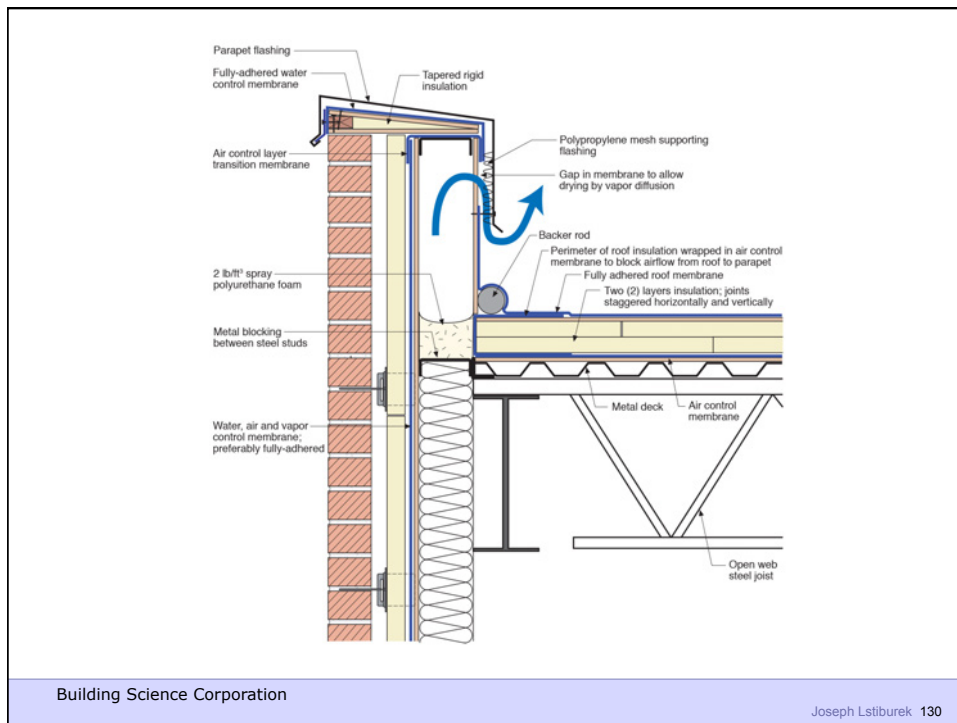
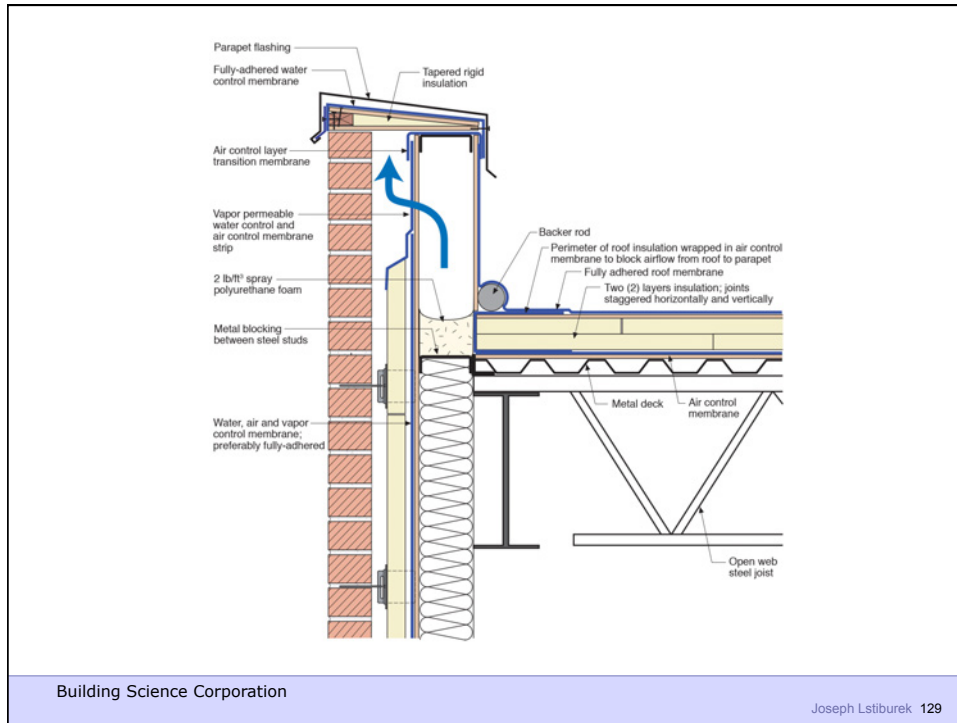


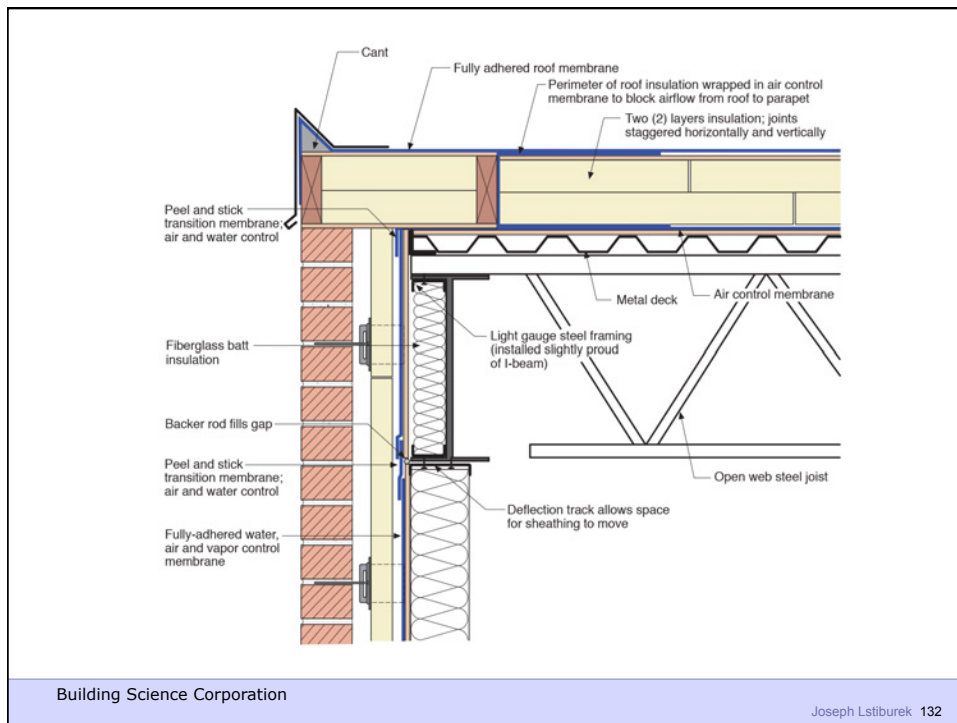
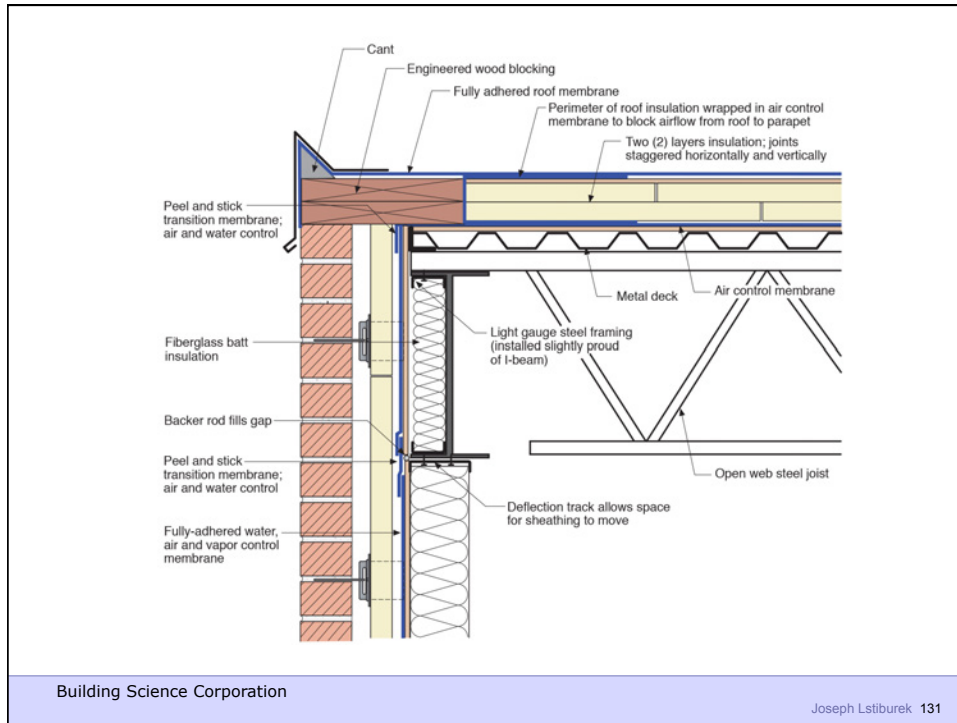












It's a Case of Black or White

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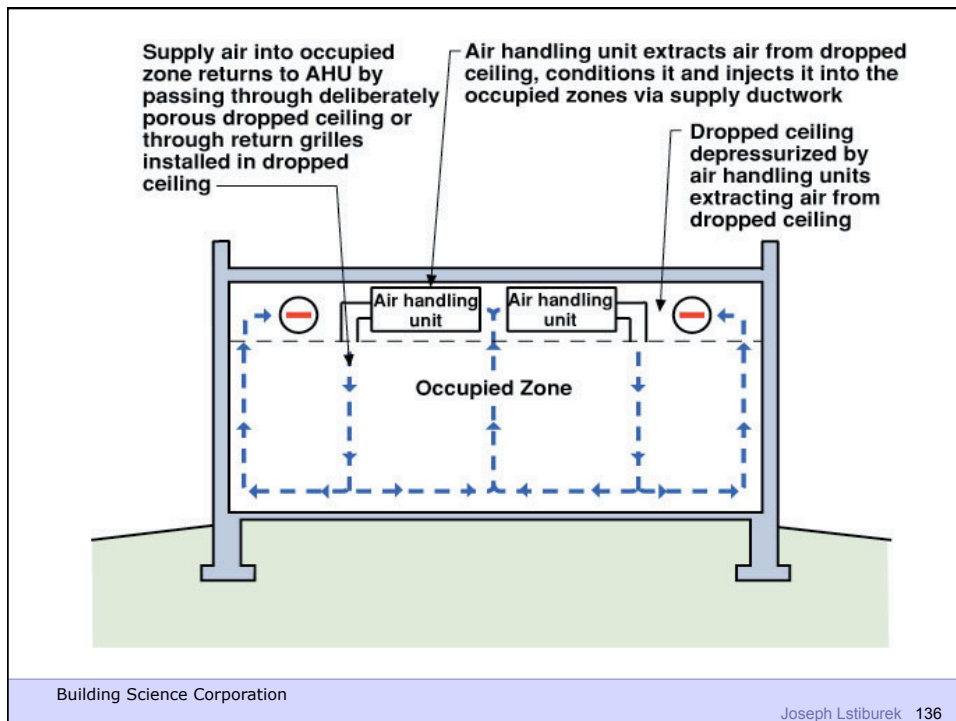
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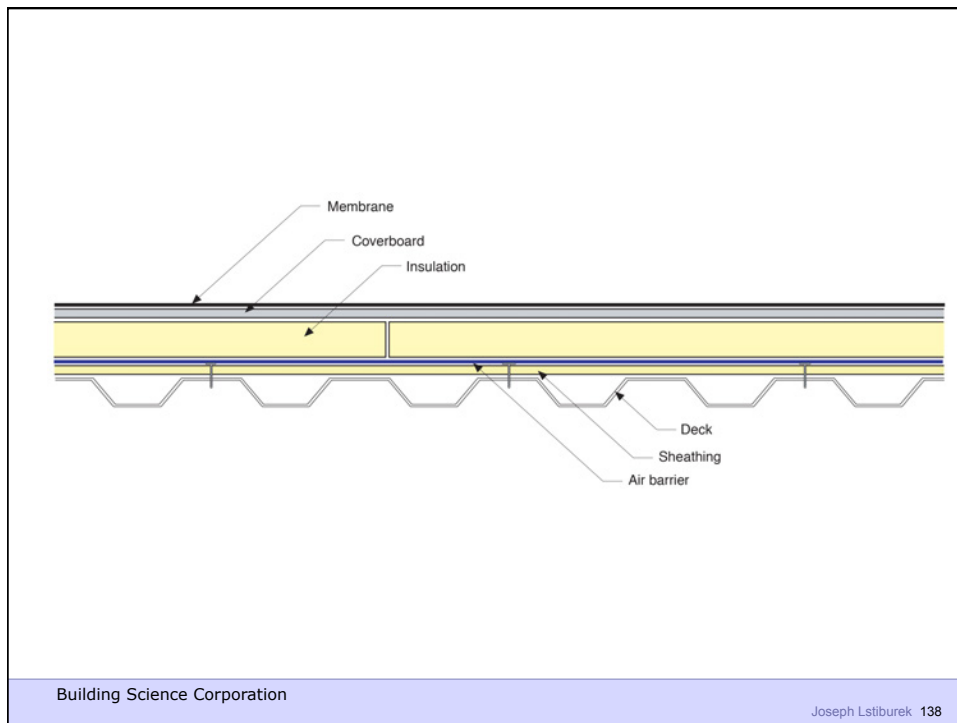
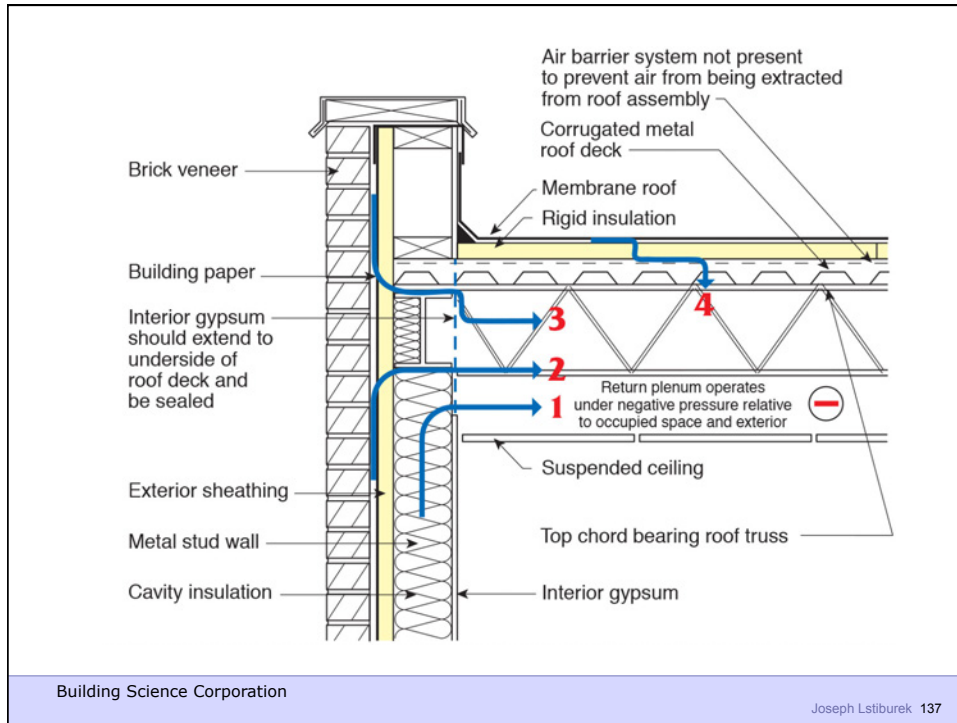
It's a Case of Black or White Arrhenius

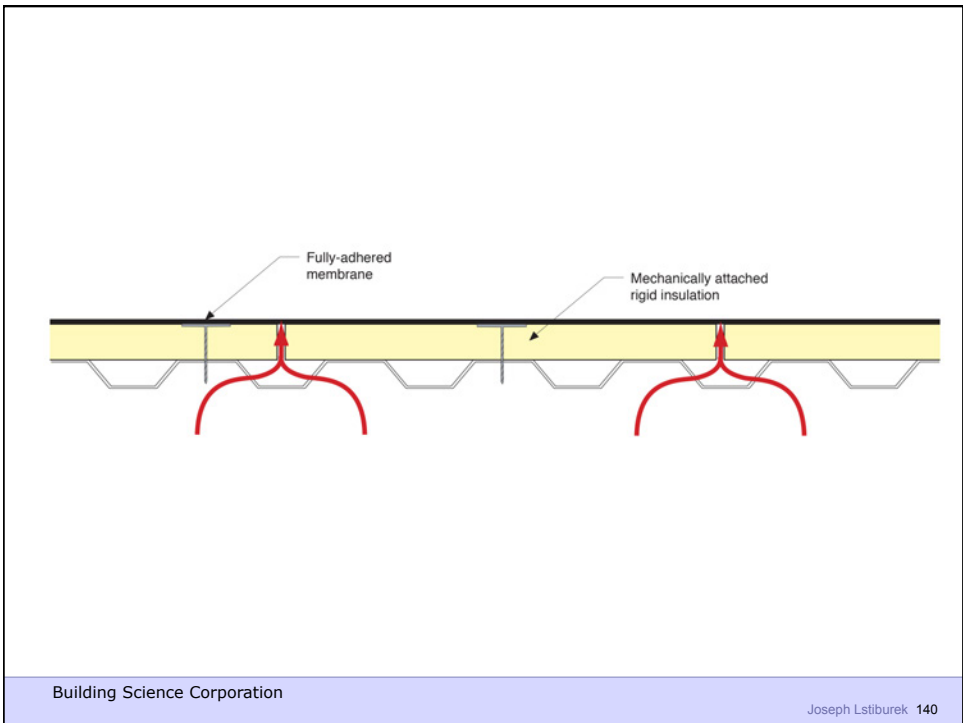
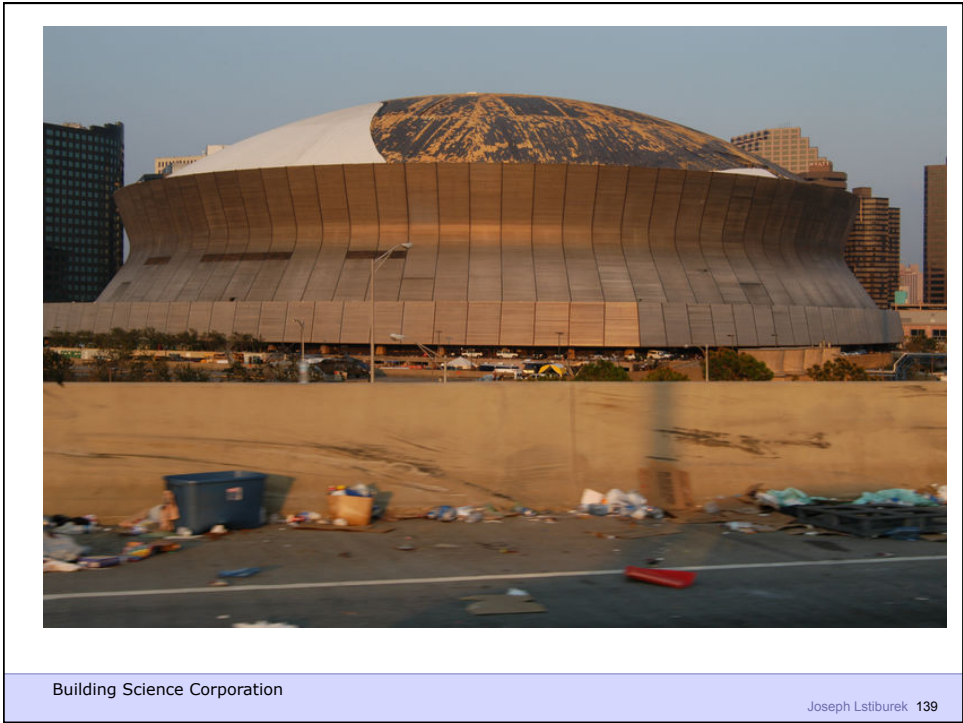
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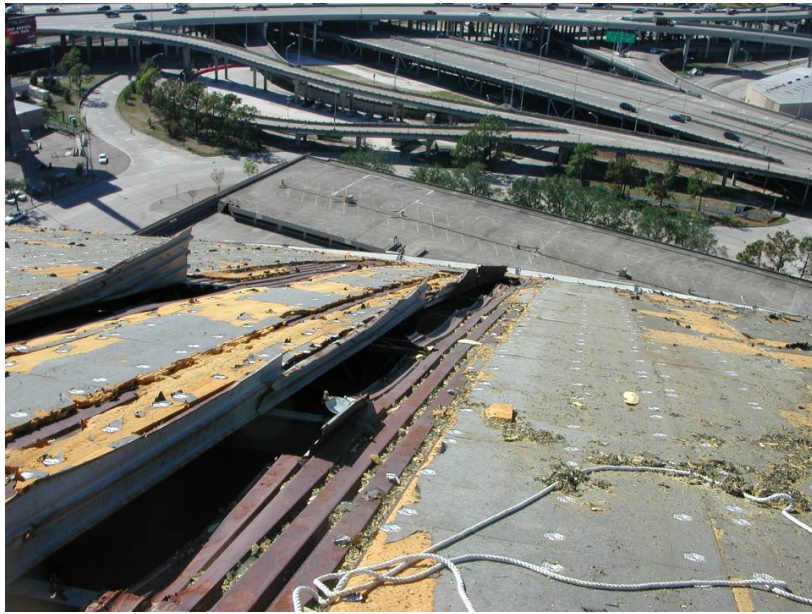
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It's a Case of Black or White
 Arrhenius
 Every 10 degrees C – double the “badness”



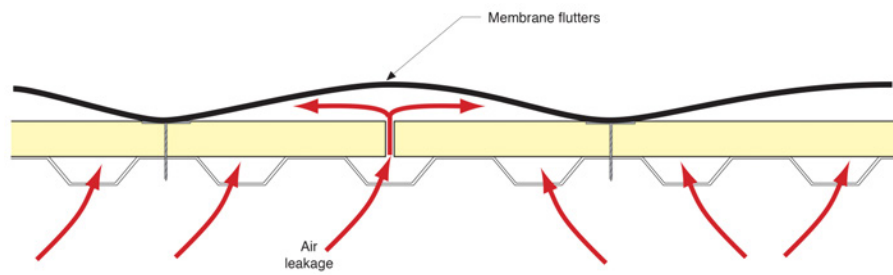






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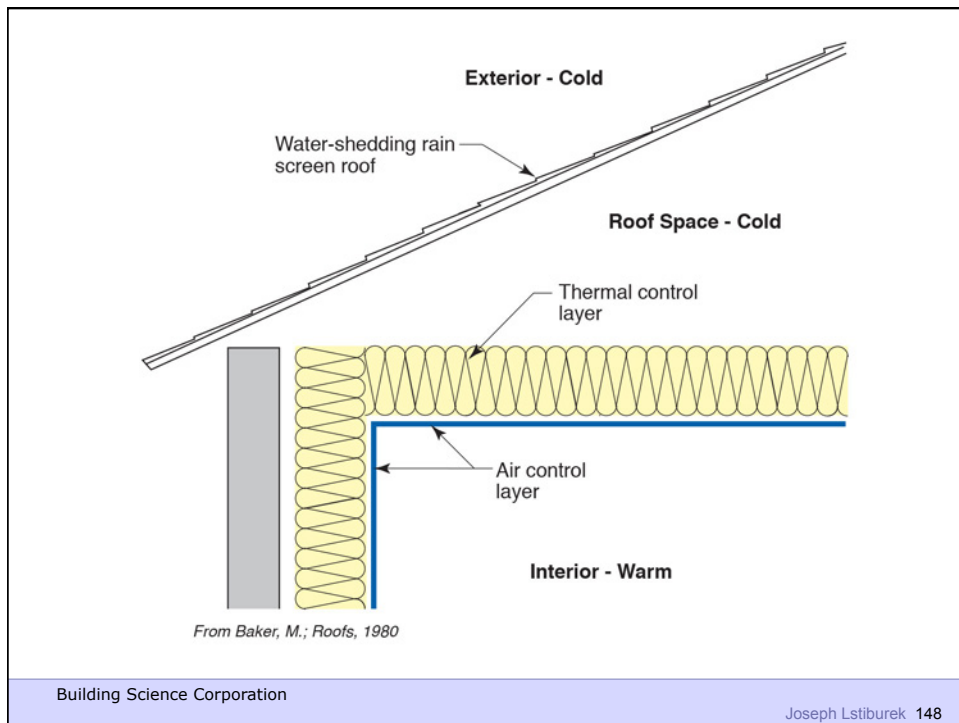
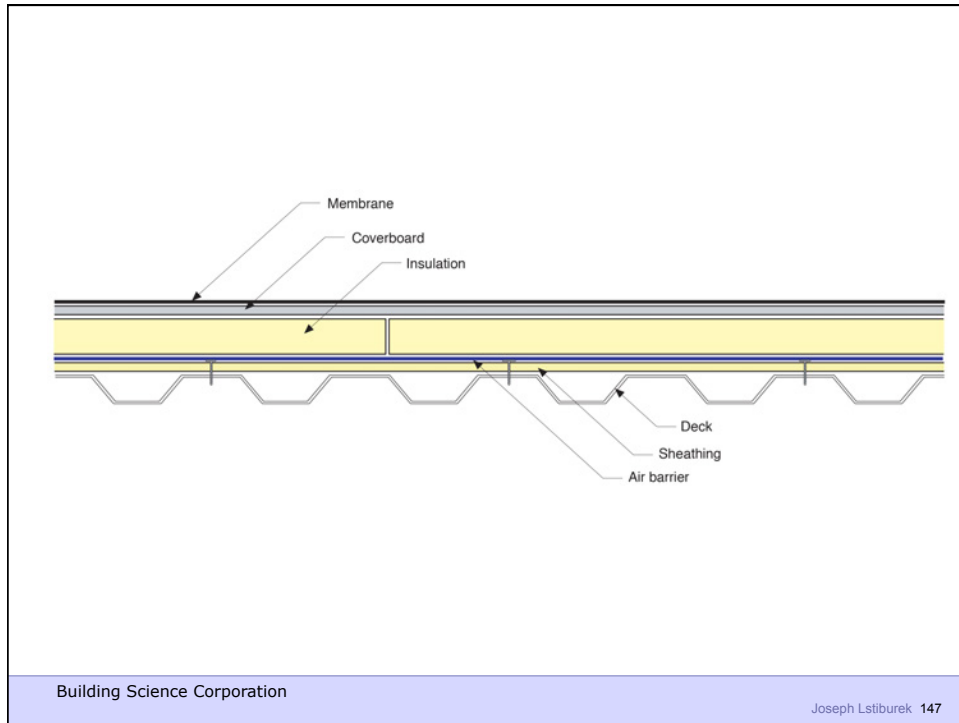
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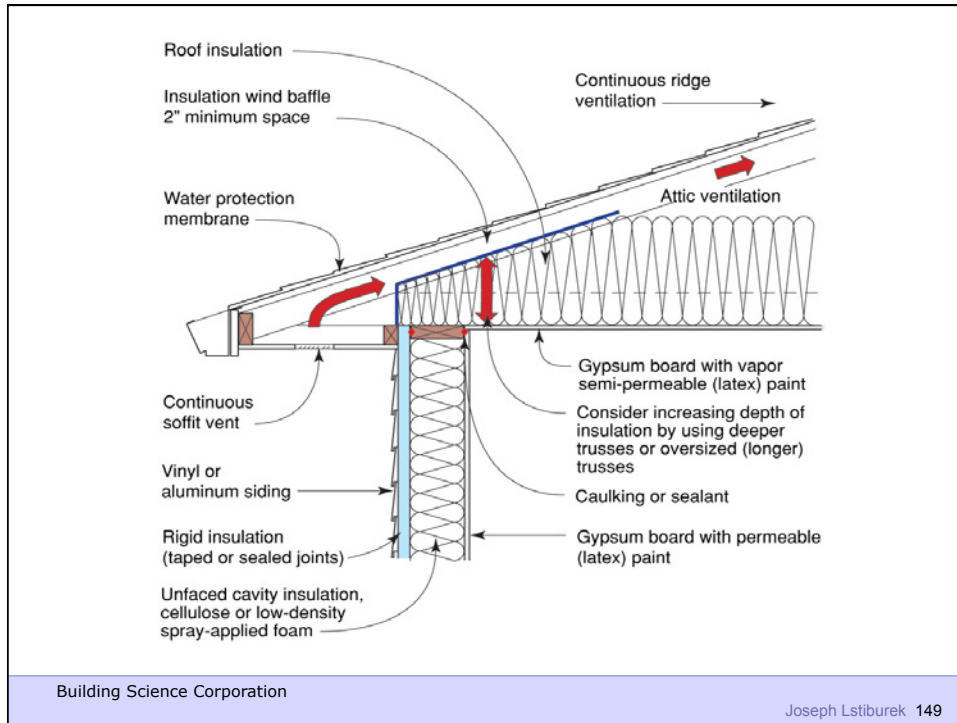
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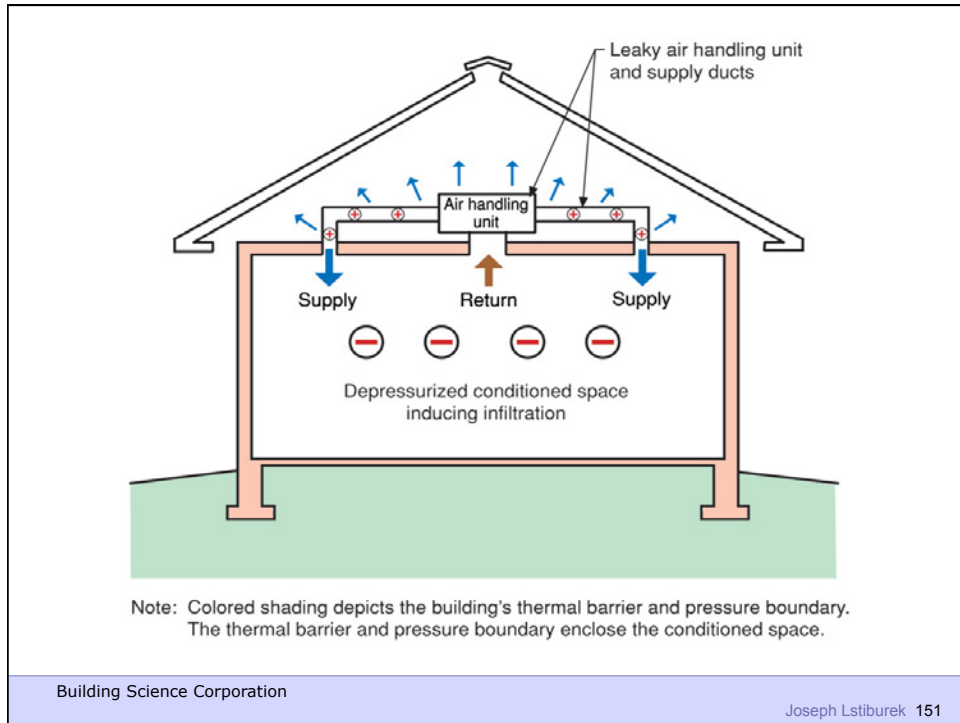


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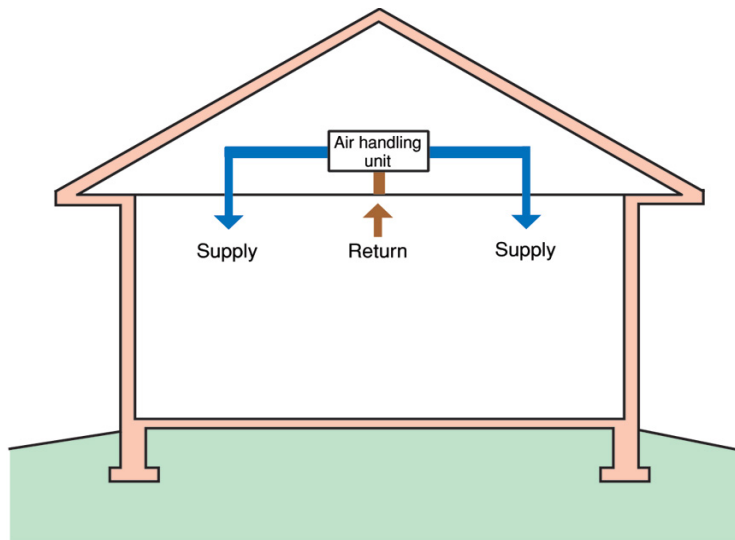






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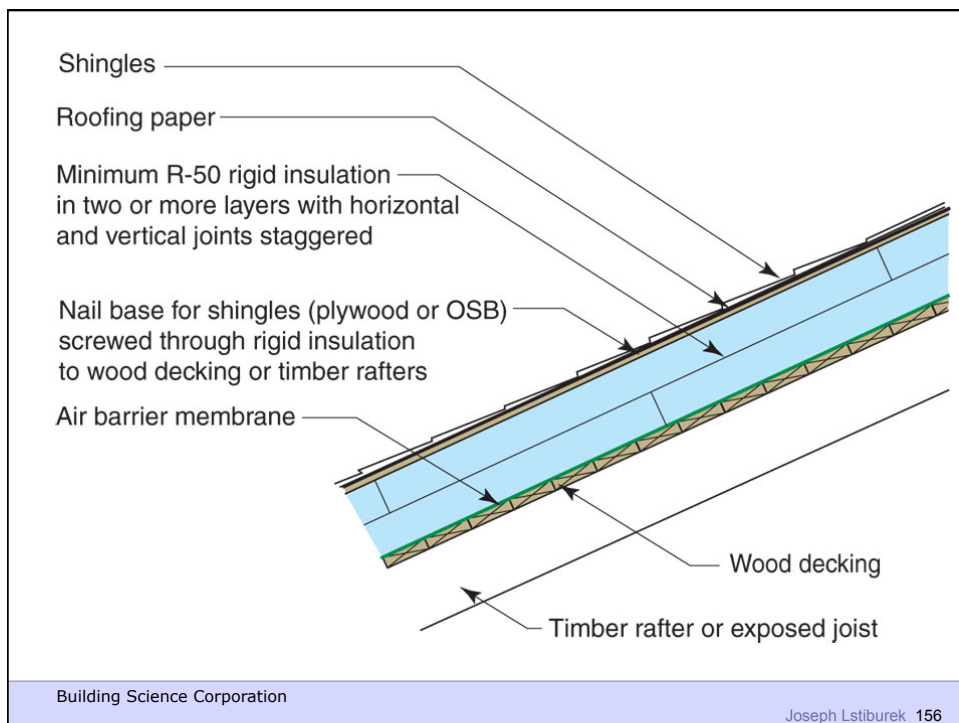
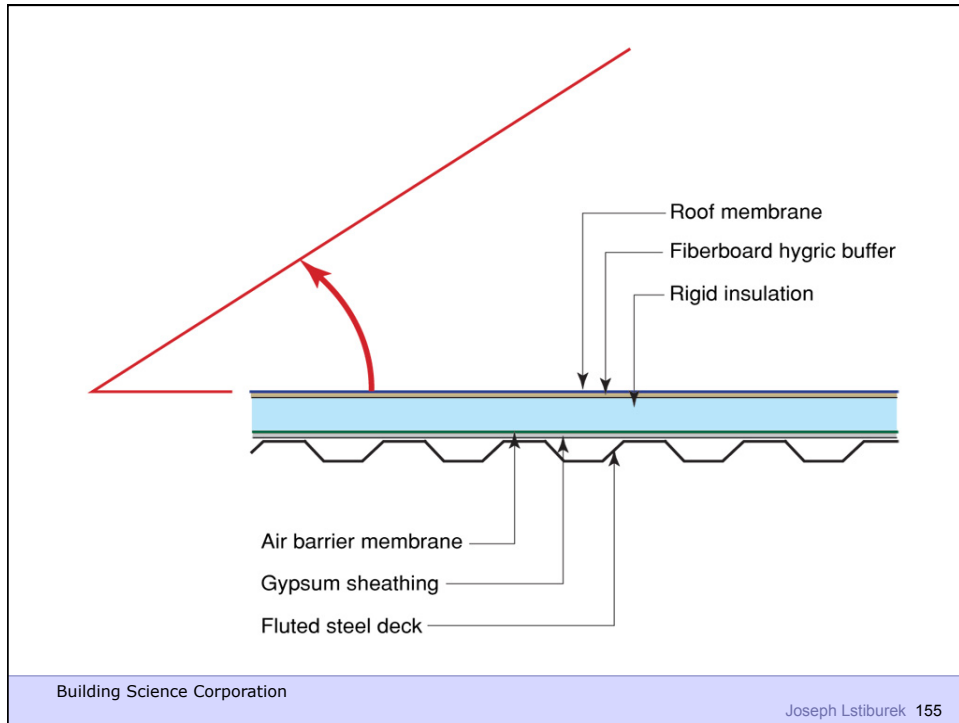
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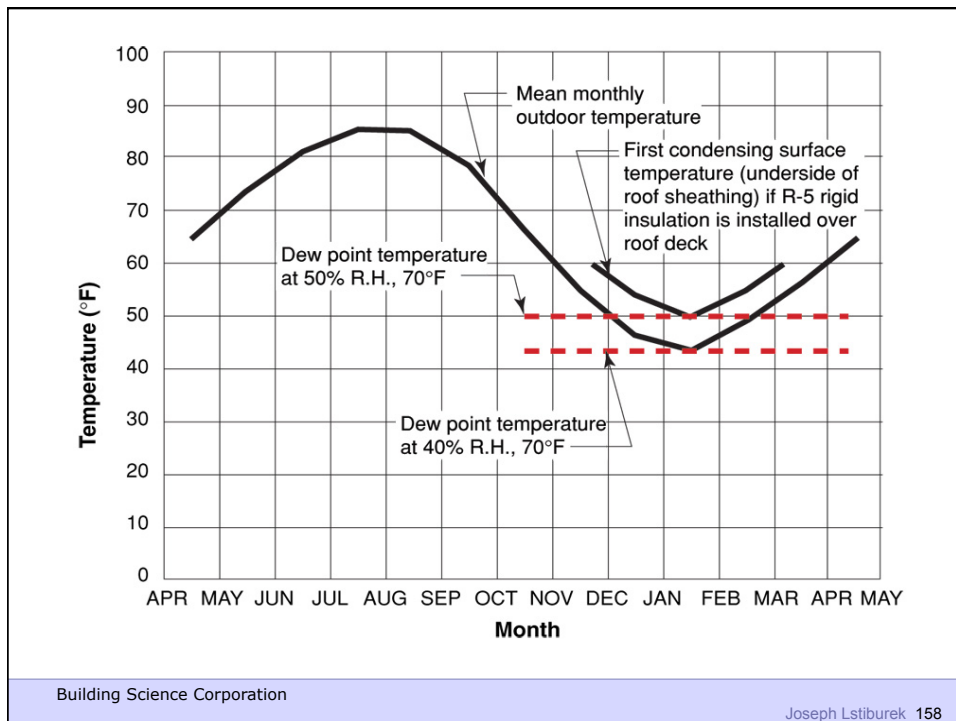
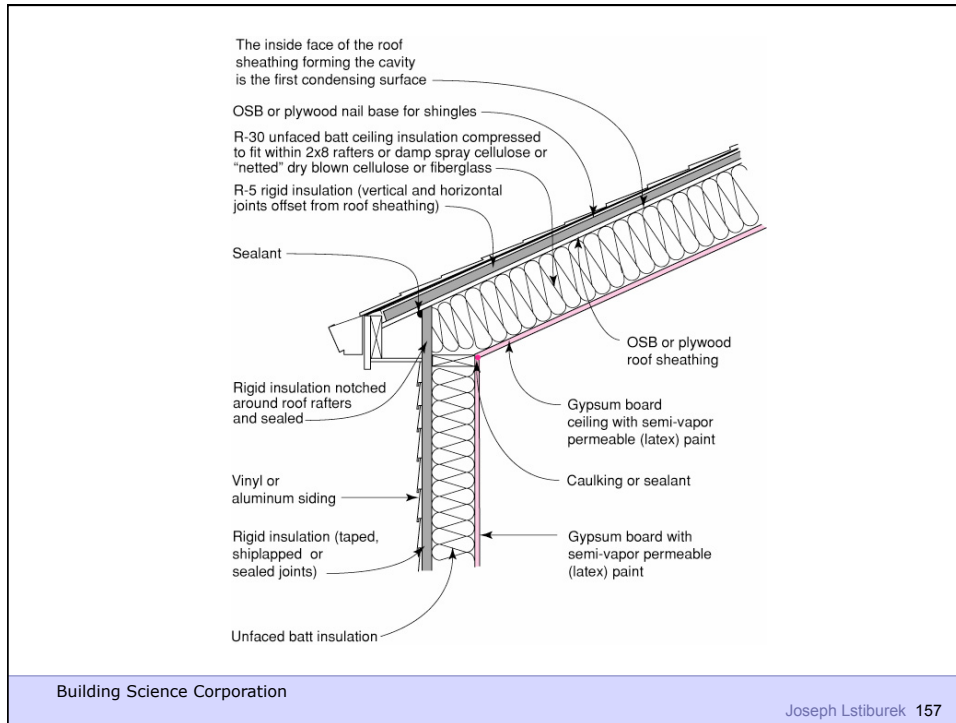


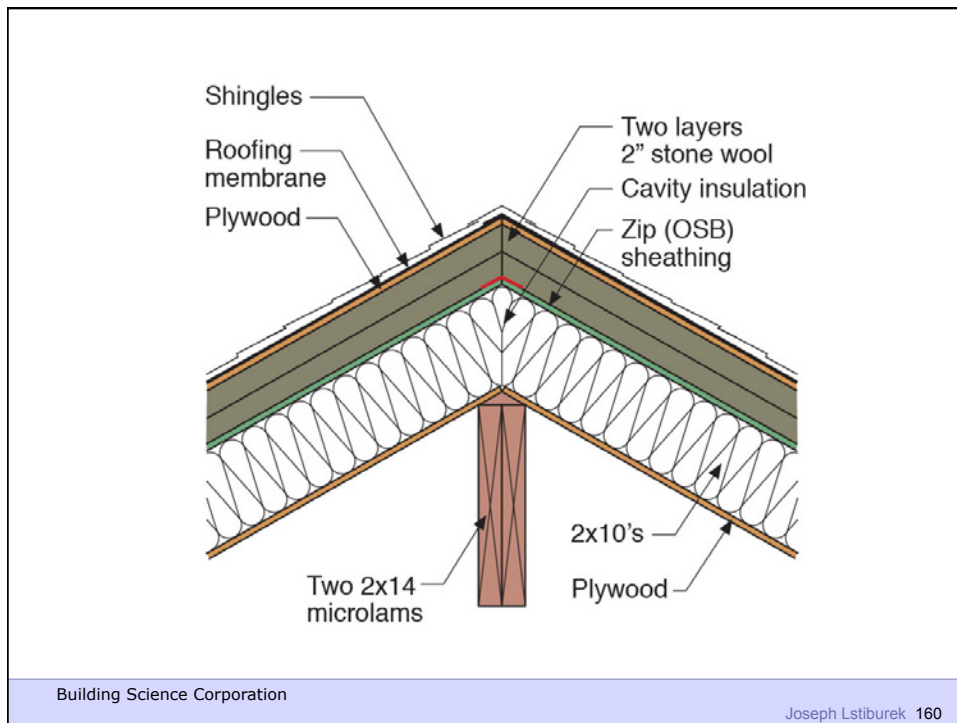
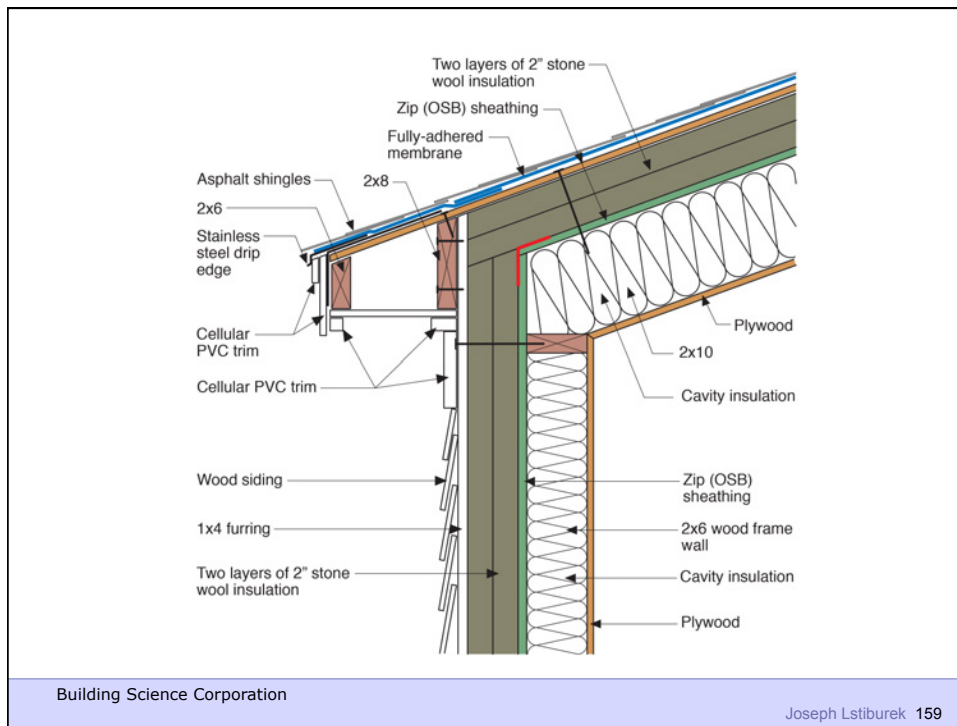
Note: Colored shading depicts the building's thermal barrier and pressure boundary. The thermal barrier and pressure boundary enclose the conditioned space.

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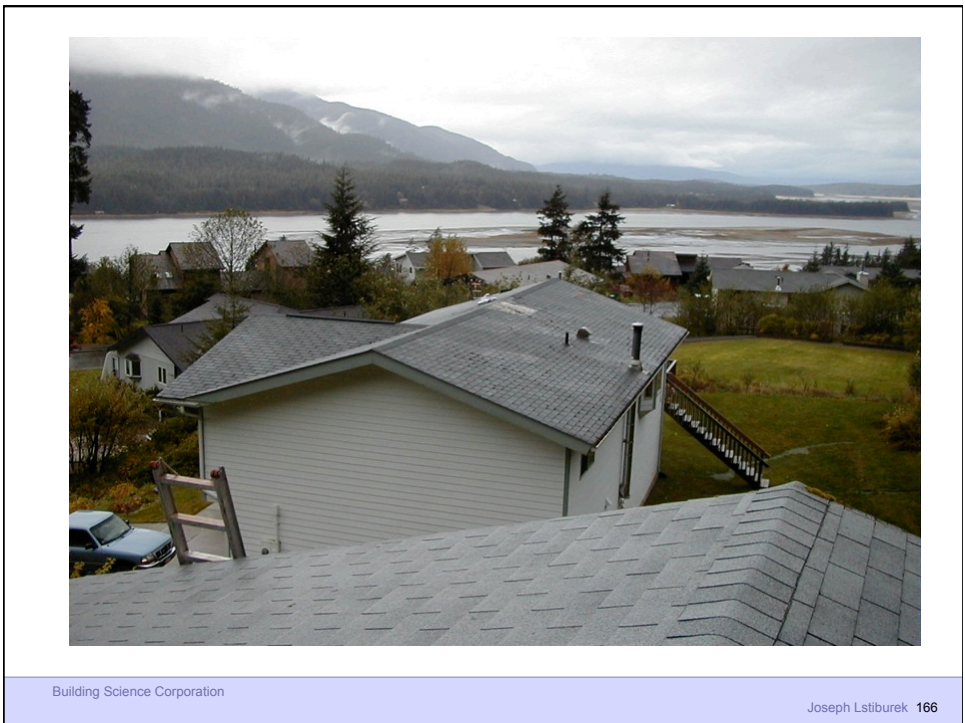
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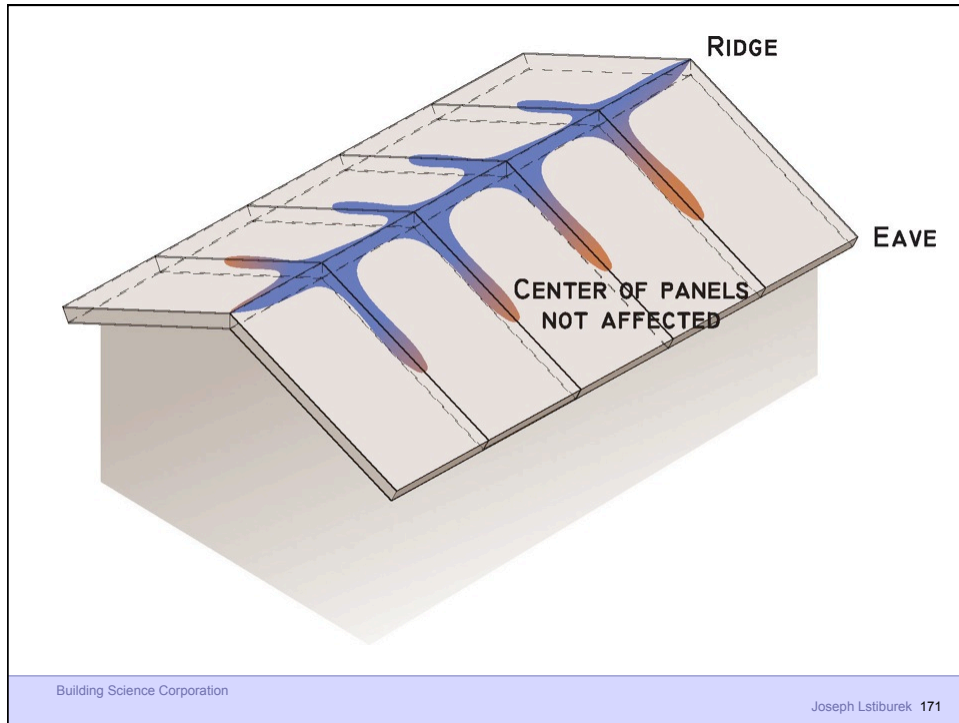
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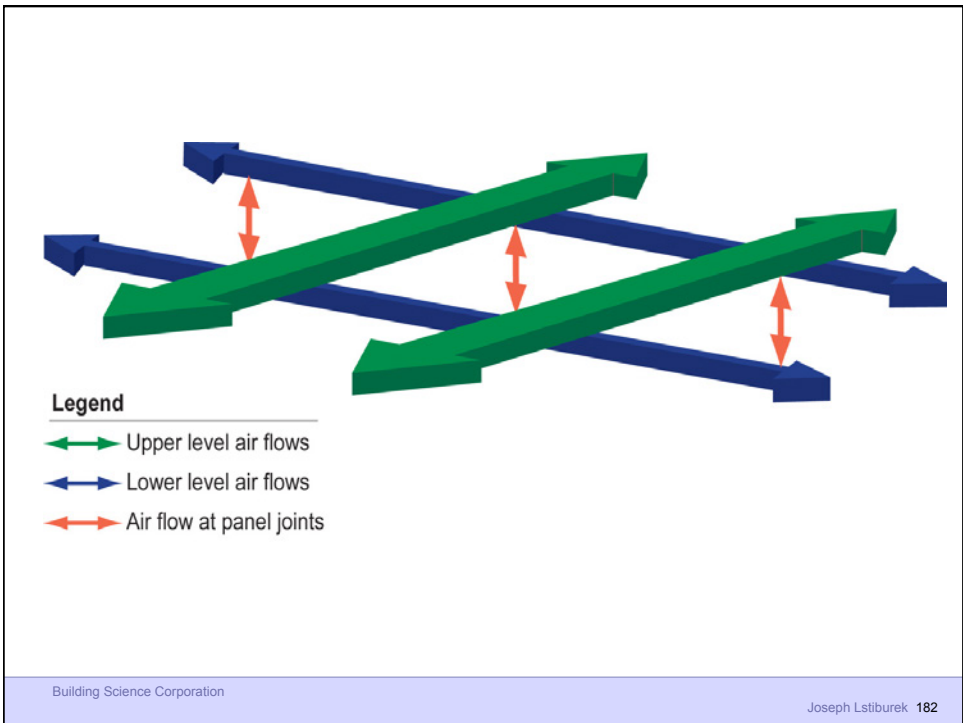
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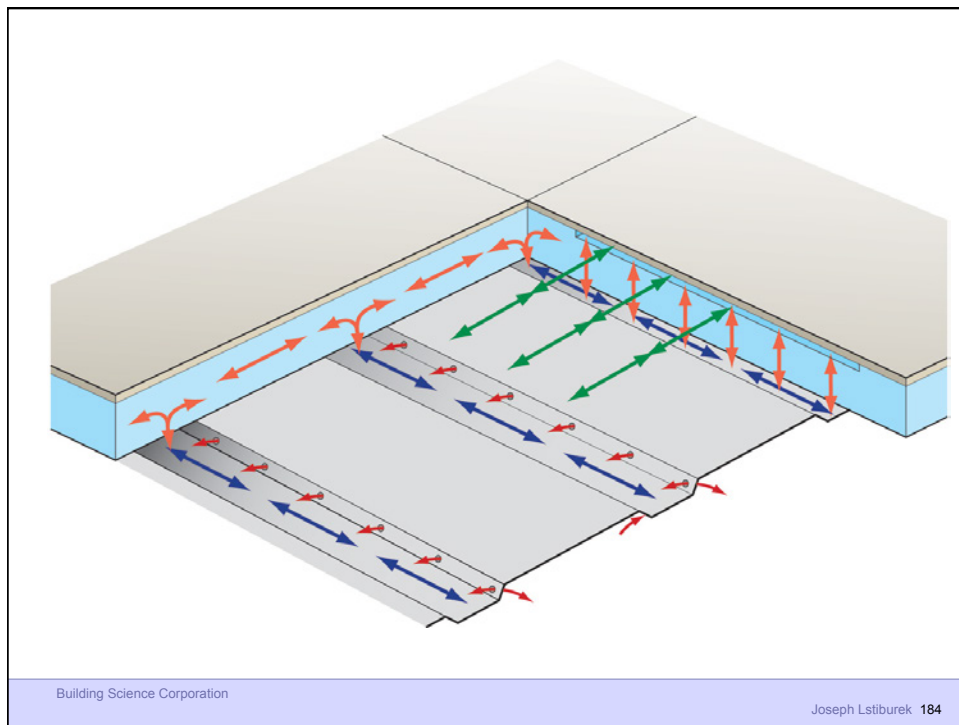
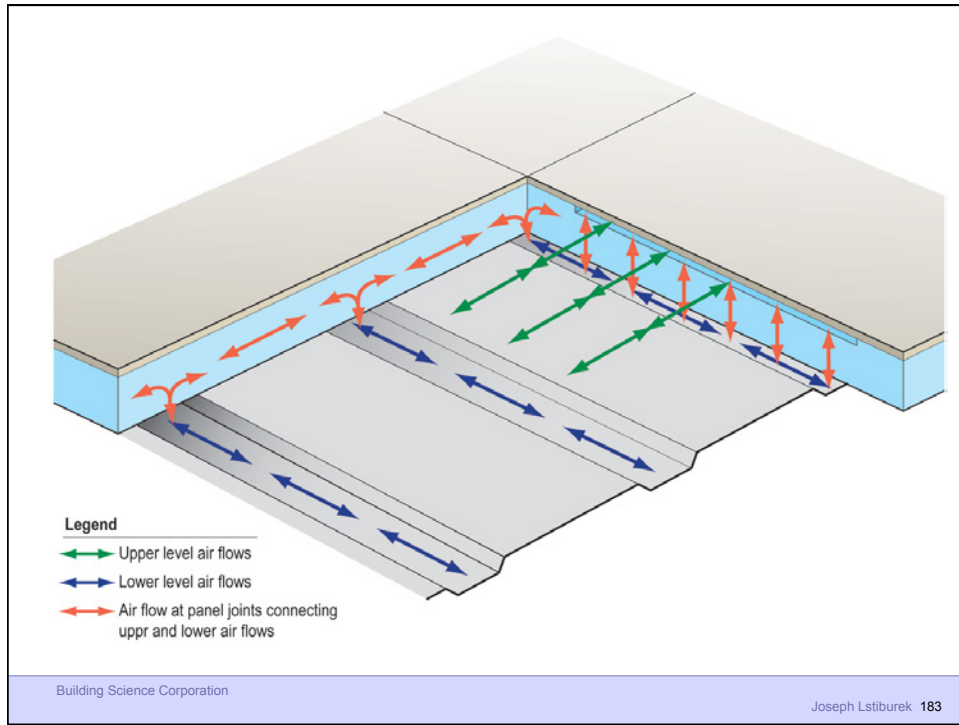


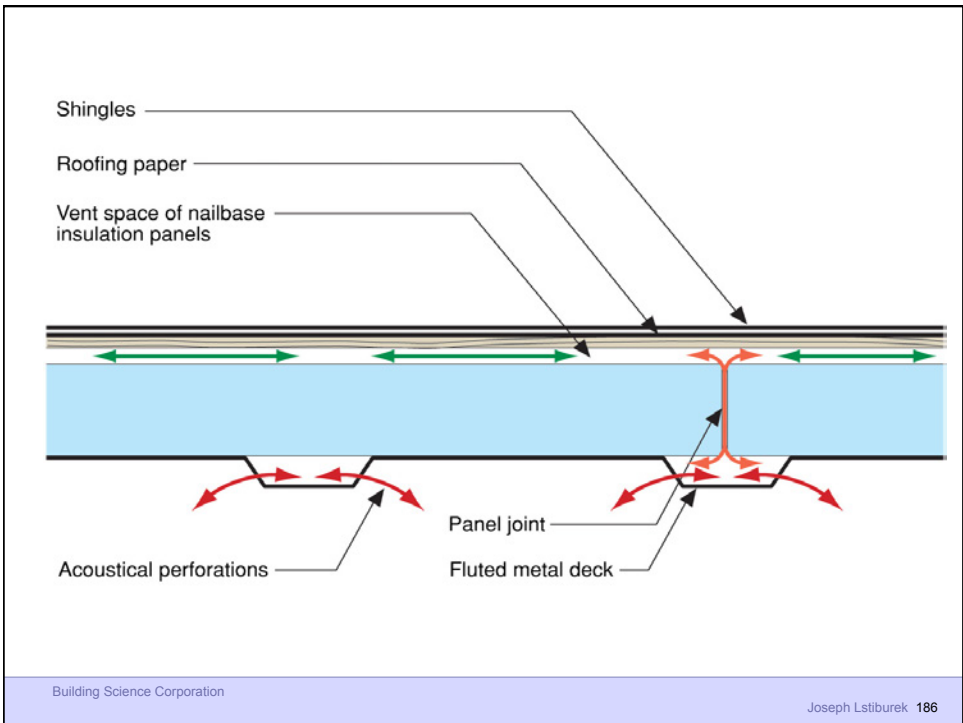
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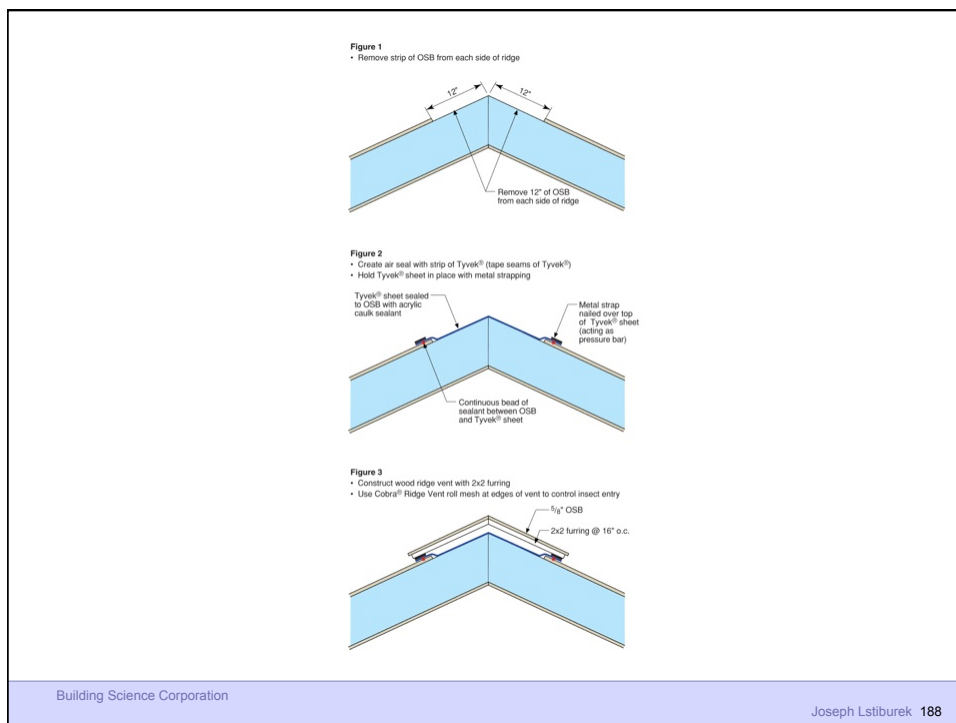
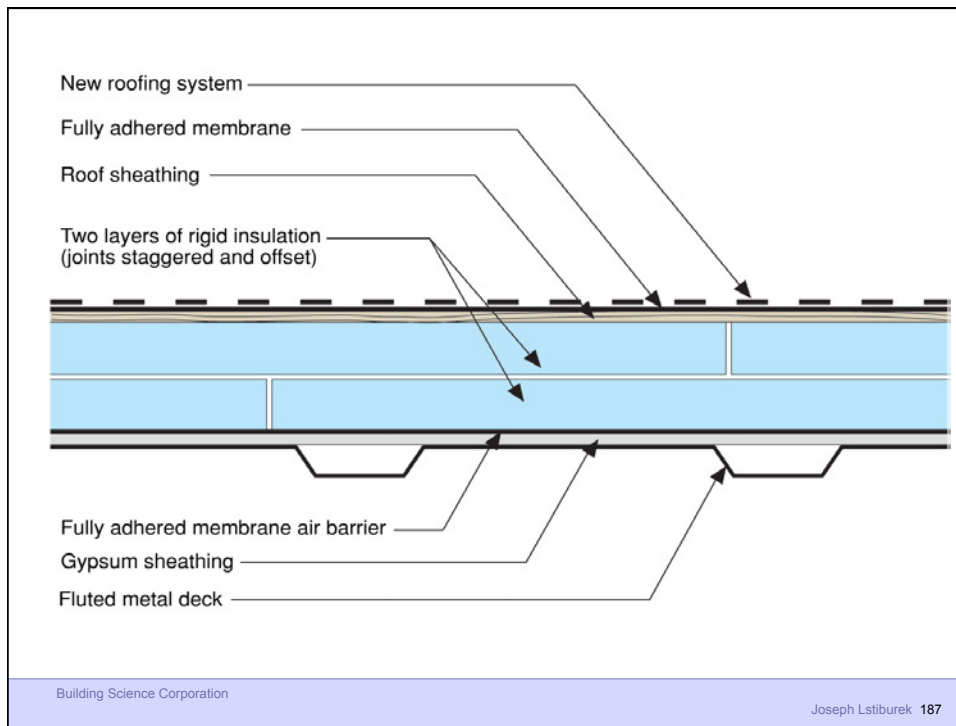
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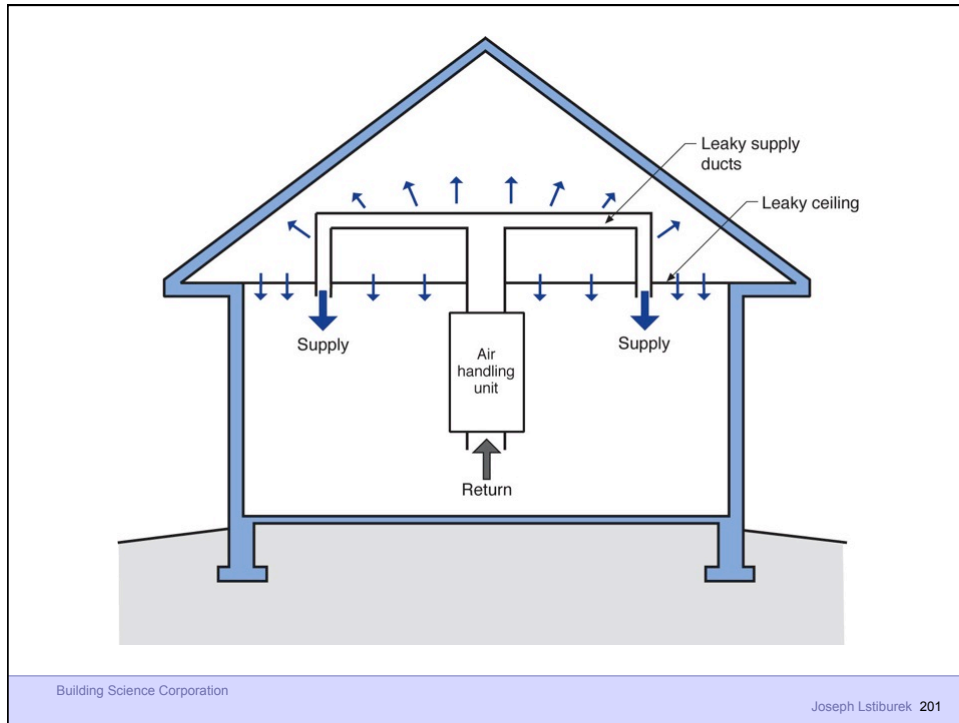
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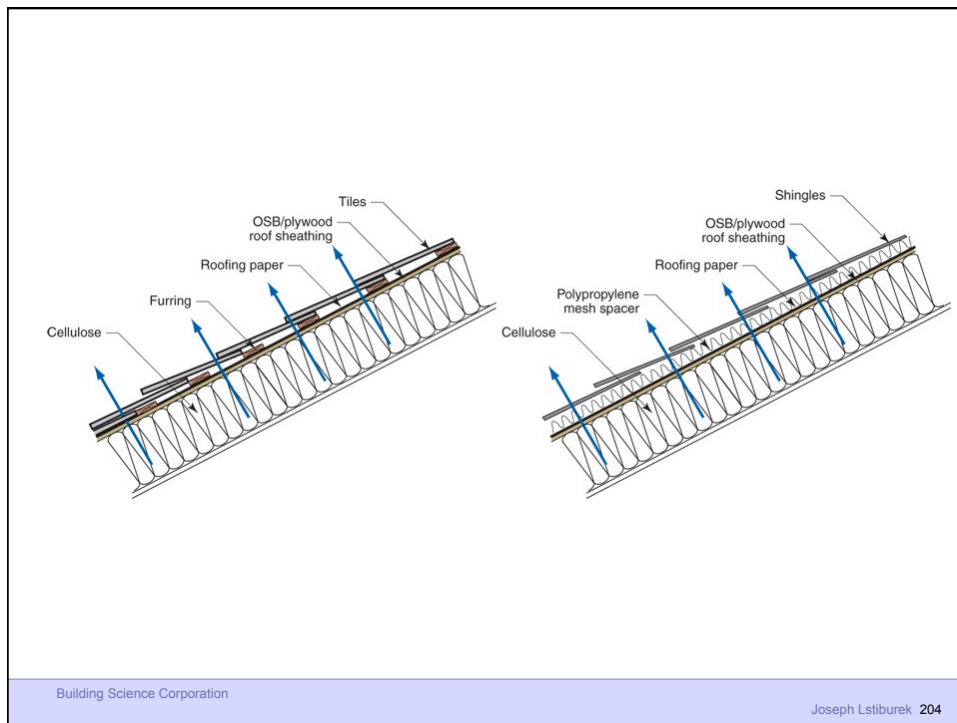
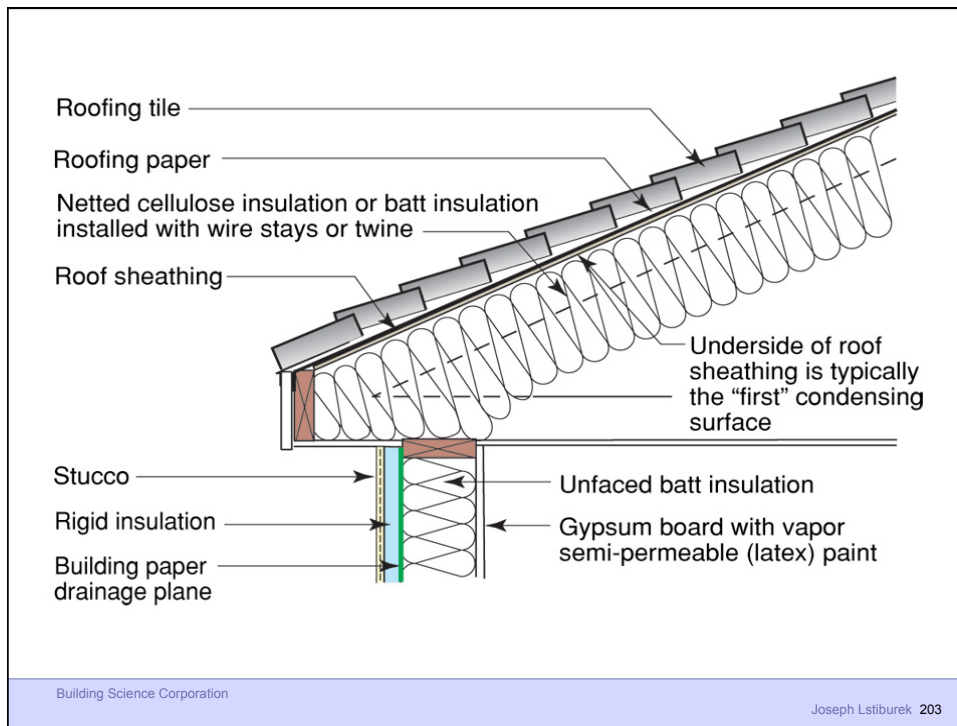
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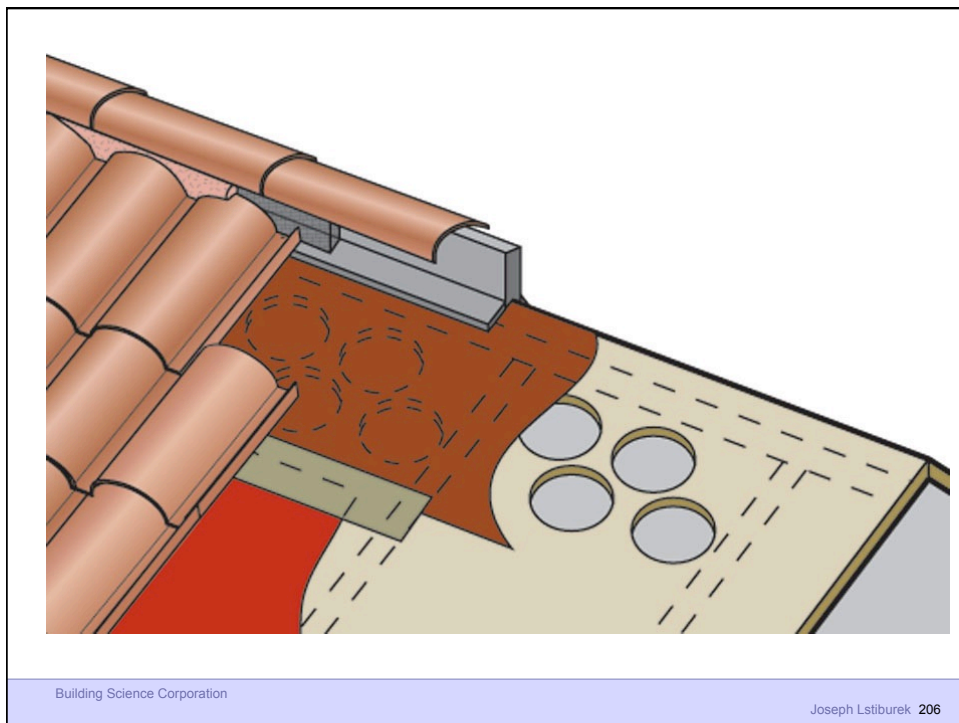
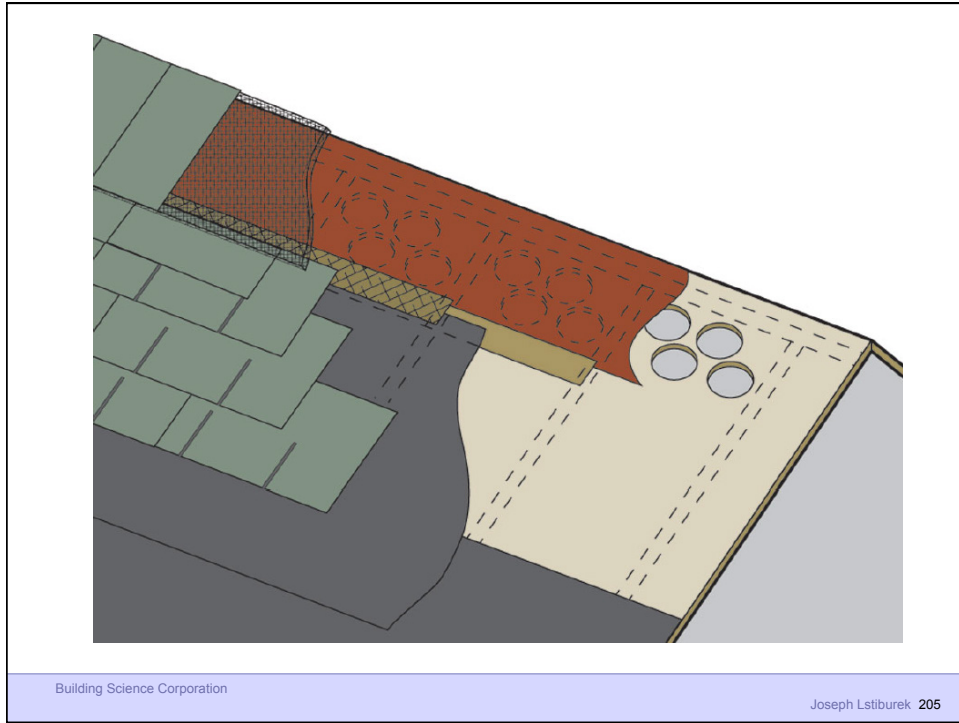


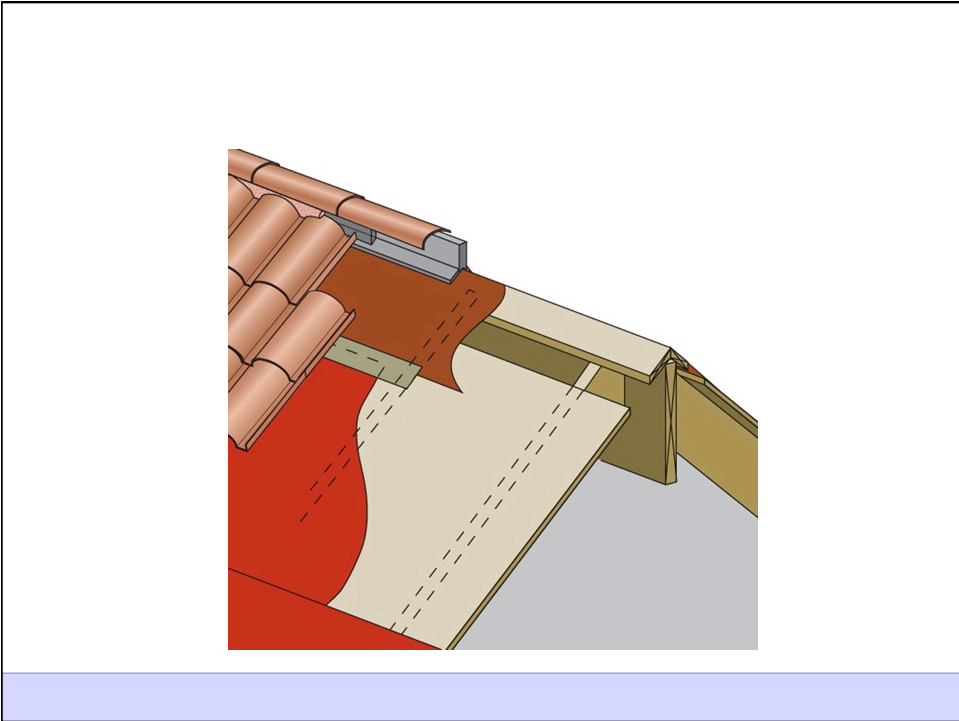
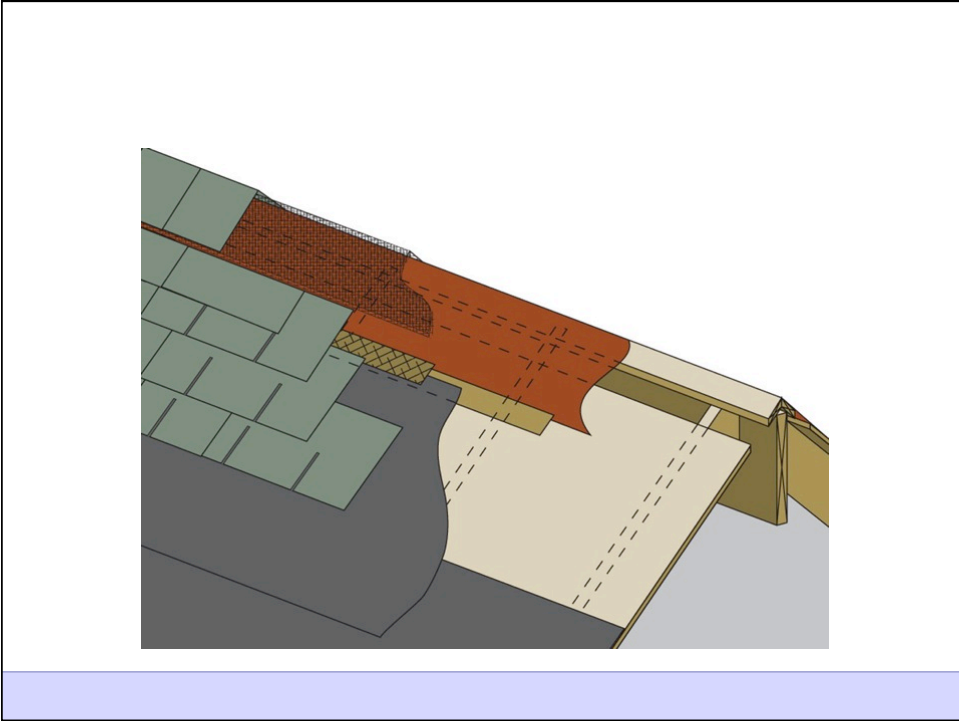
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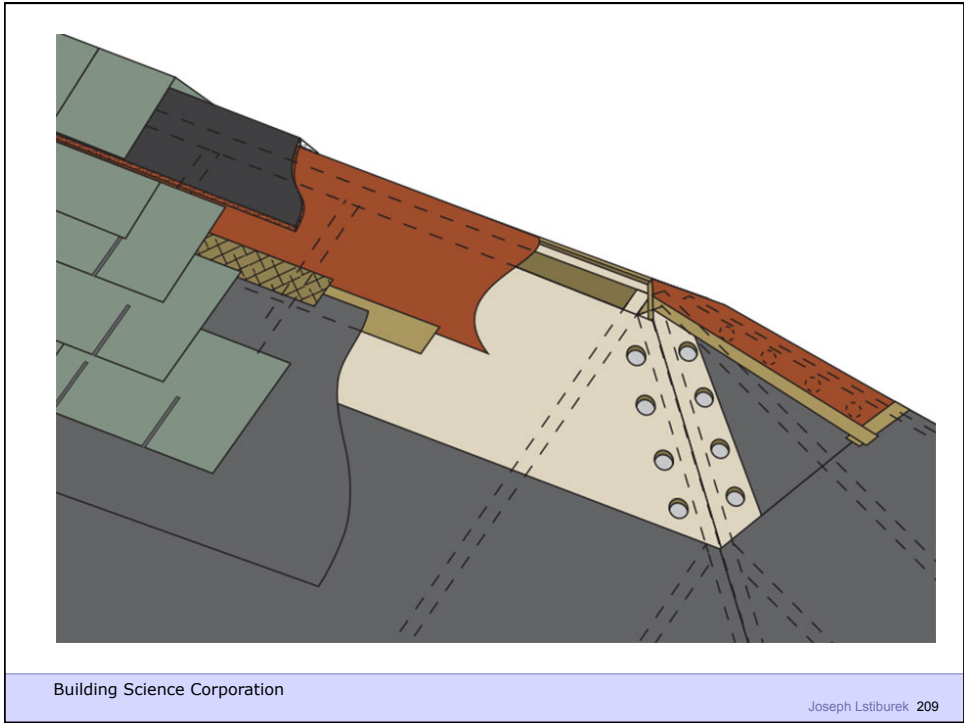
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