

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

Building Science

Adventures In Building Science

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Life is Tough Enough As it Is...

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Life is Tough Enough As it Is...
It's Harder When You Are Stupid

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Don't Do Stupid Things

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What Is A Building?

It is an environmental separator

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- Control heat flow
- Control airflow
- Control water vapor flow
- Control rain
- Control ground water
- Control light and solar radiation
- Control noise and vibrations
- Control contaminants, environmental hazards and odors
- Control insects, rodents and vermin
- Control fire
- Provide strength and rigidity
- Be durable
- Be aesthetically pleasing
- Be economical

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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

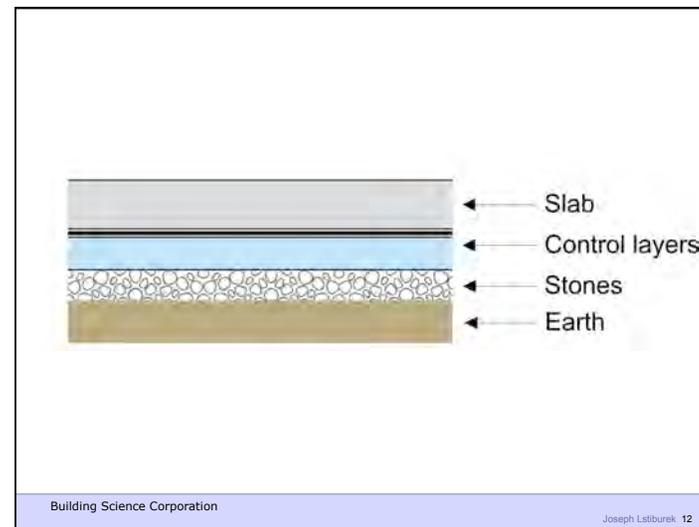
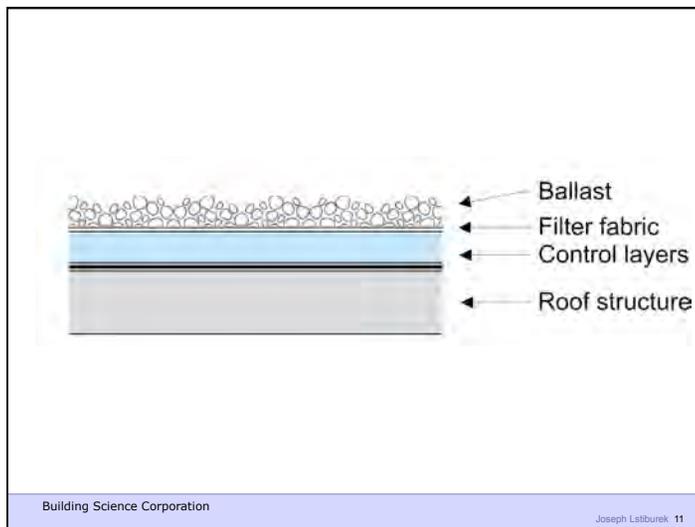
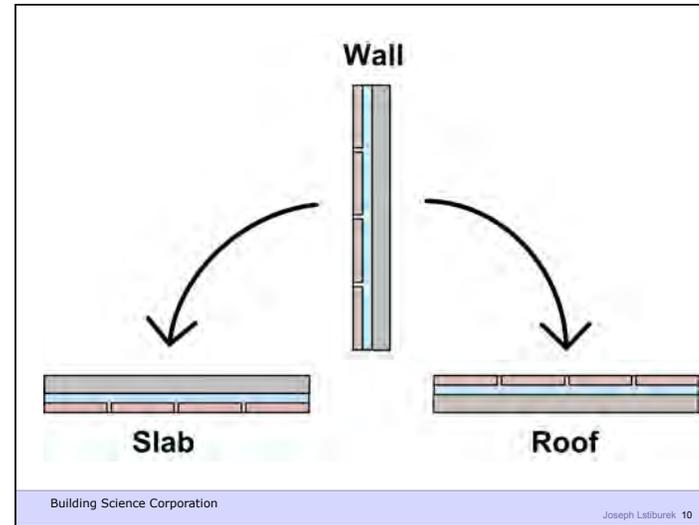
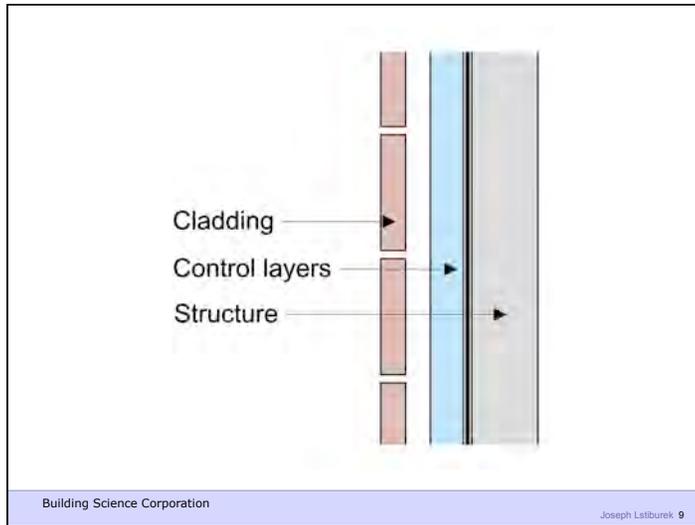
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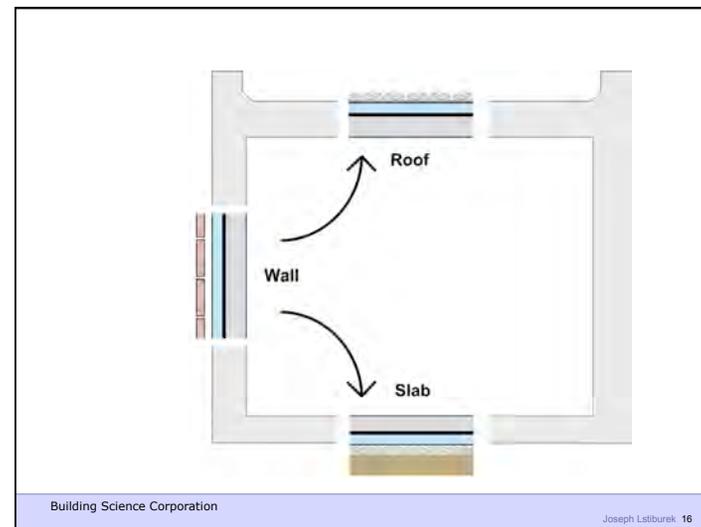
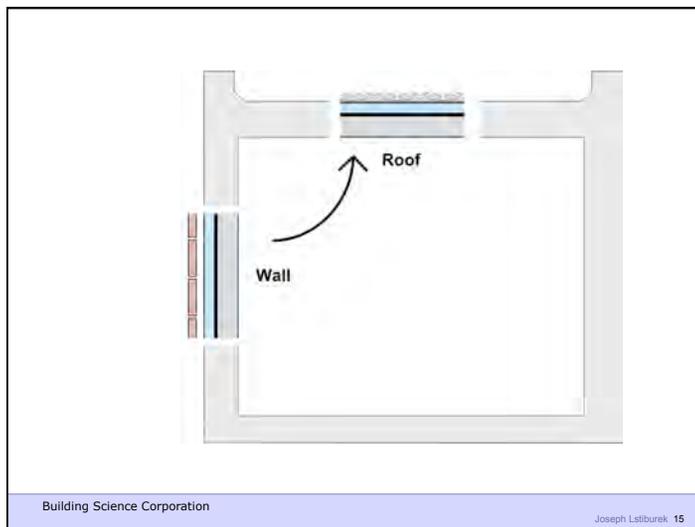
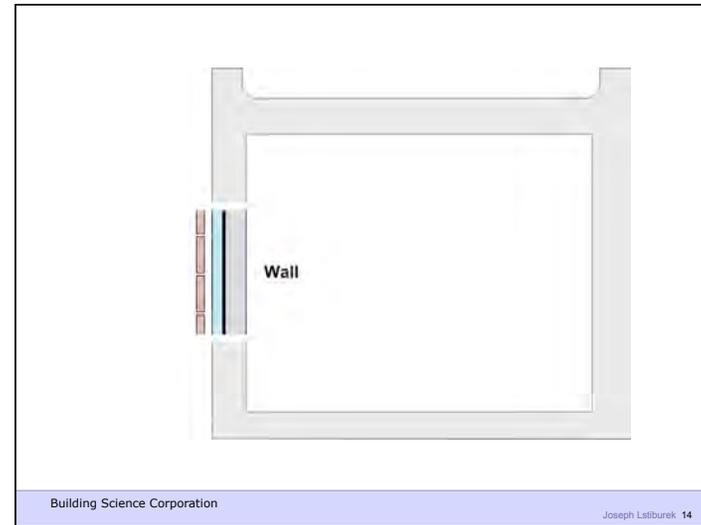
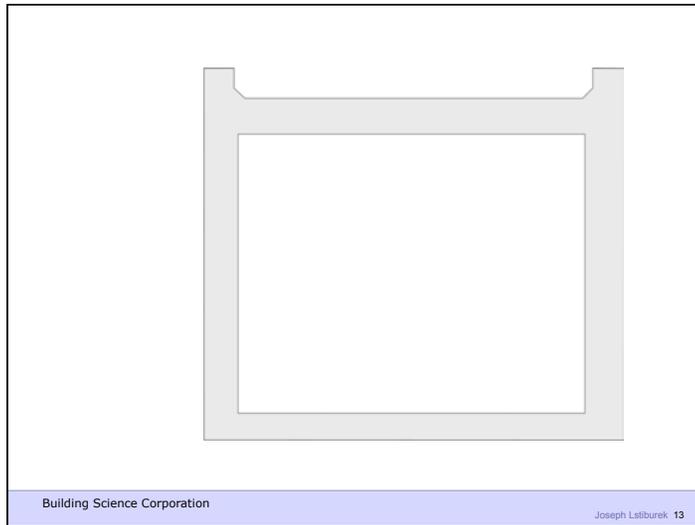
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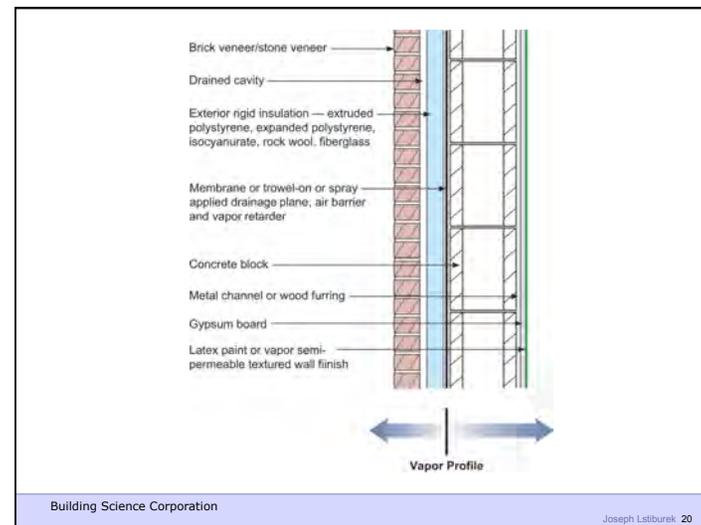
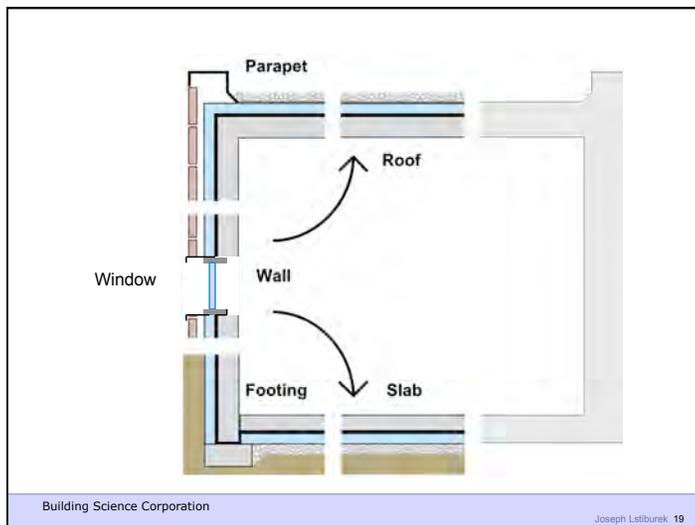
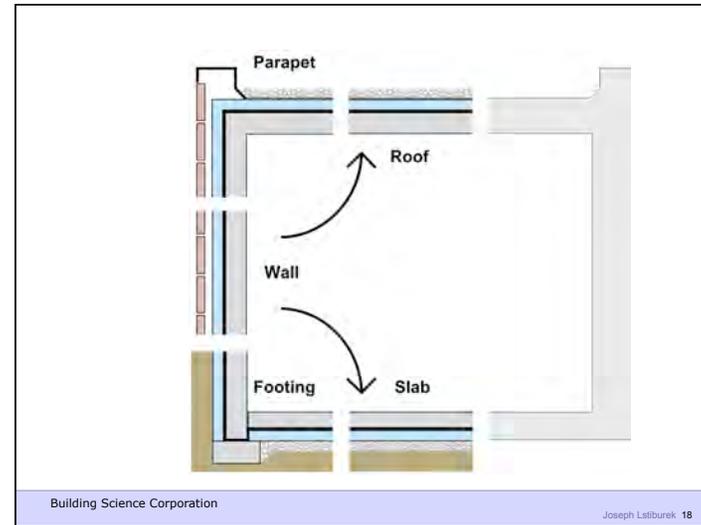
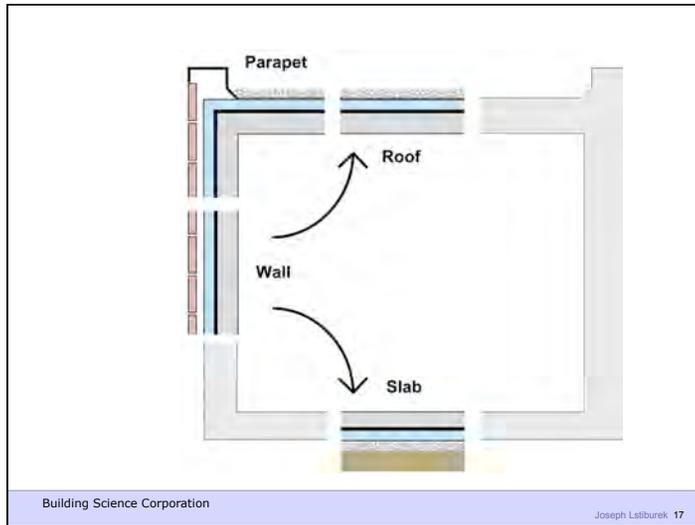
Water Control Layer
Air Control Layer
Vapor Control Layer
Thermal Control Layer

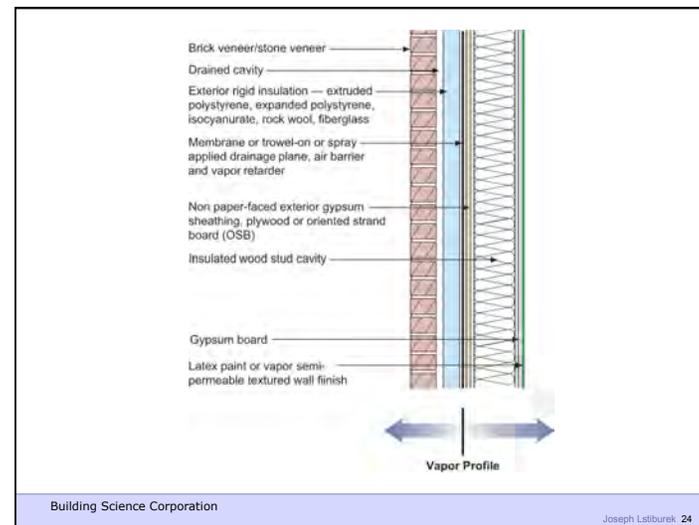
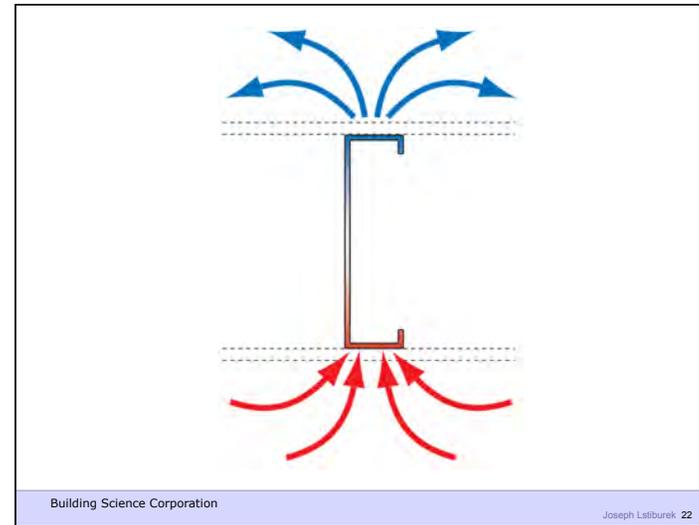
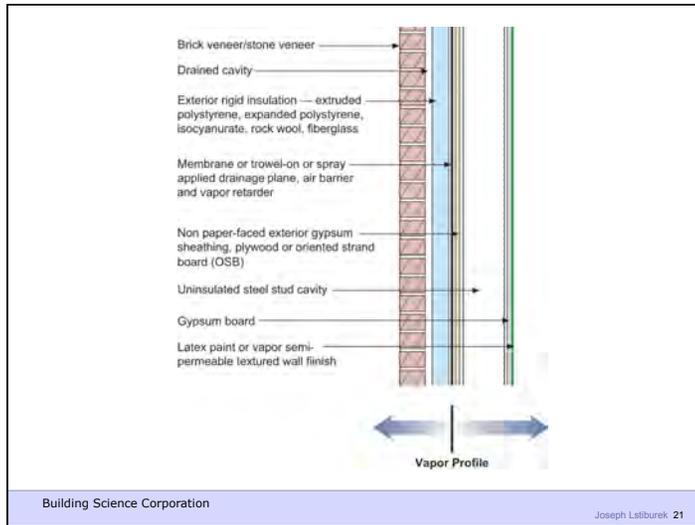
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Commercial Enclosure: Simple Layers



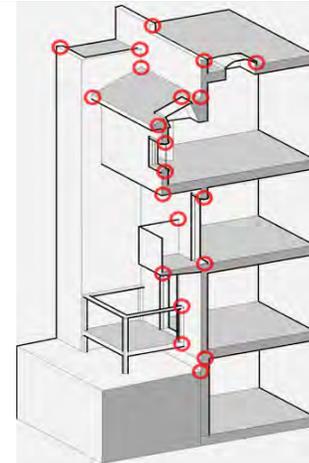
- Structure
- Rain/Air/Vapor
- Insulation
- Finish

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Enclosure Design: Details

- Details demand the same approach as the enclosure.
- Scaled drawings required at 



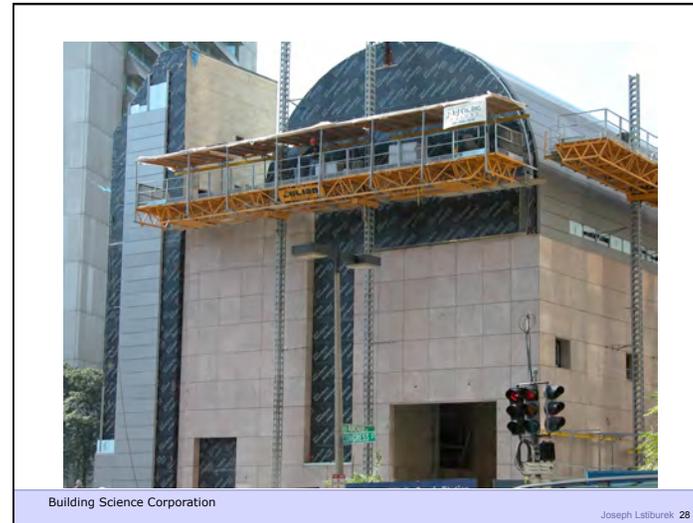
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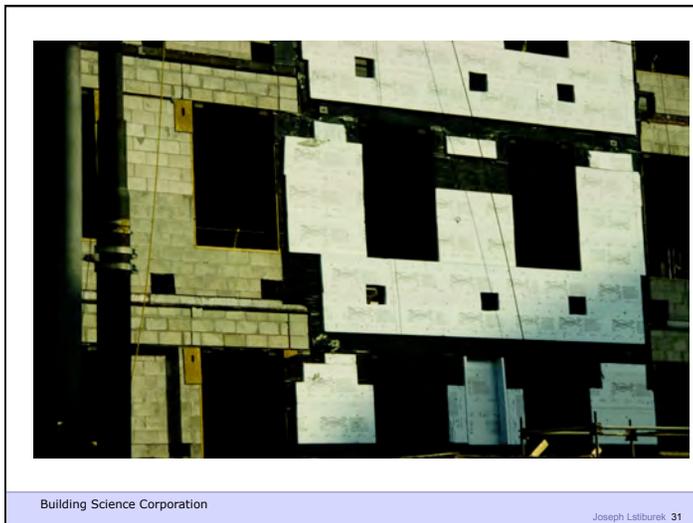
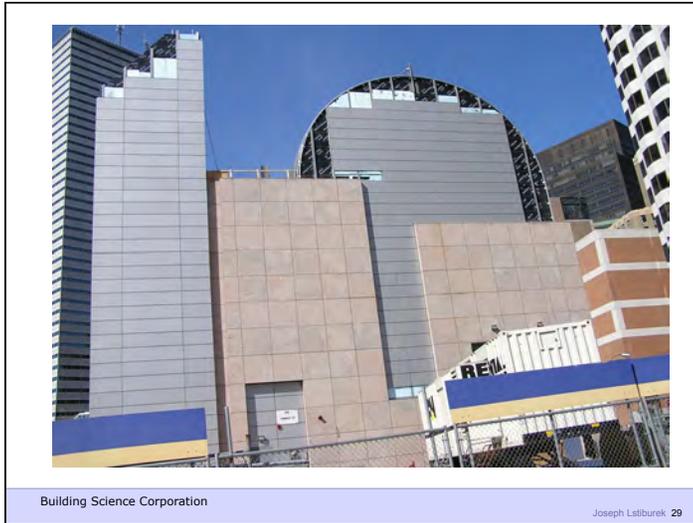
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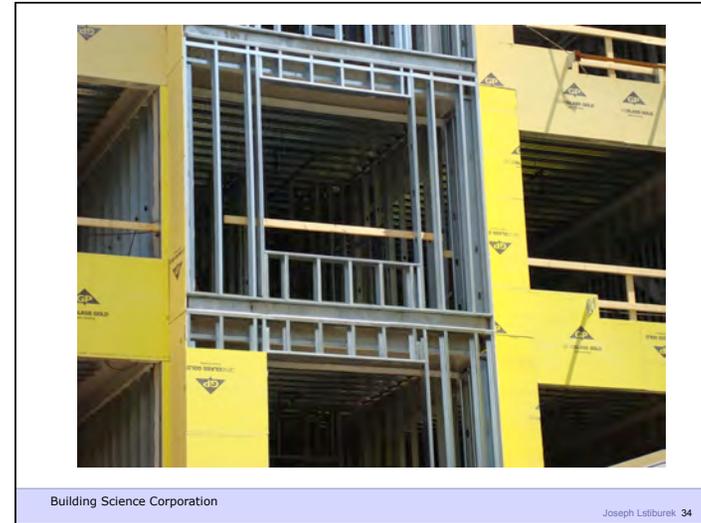
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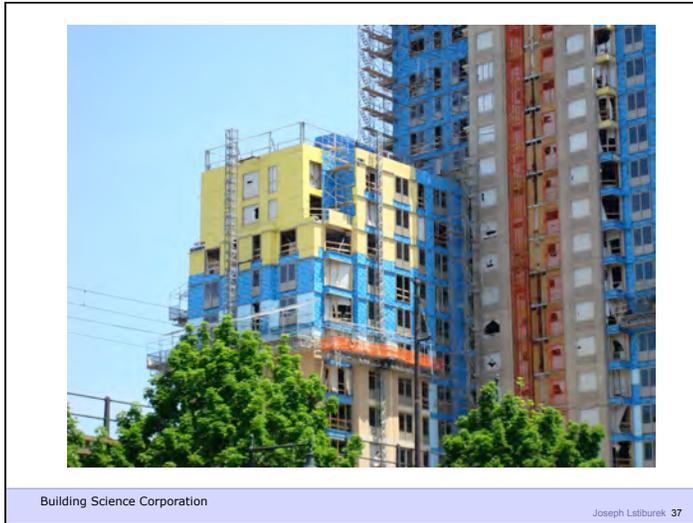


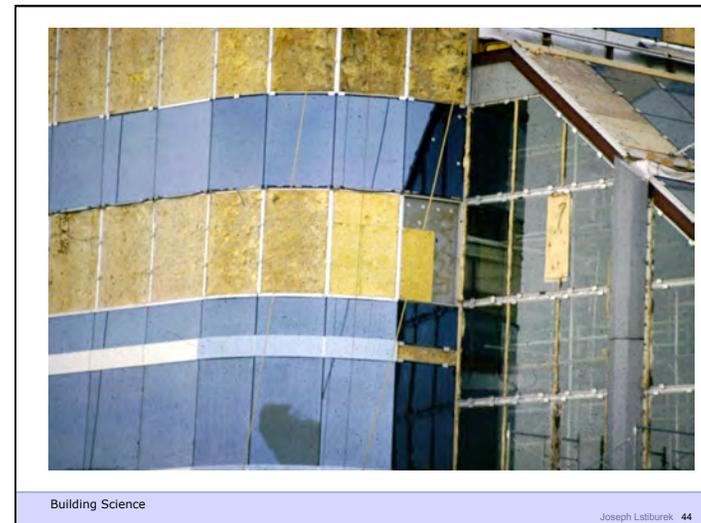
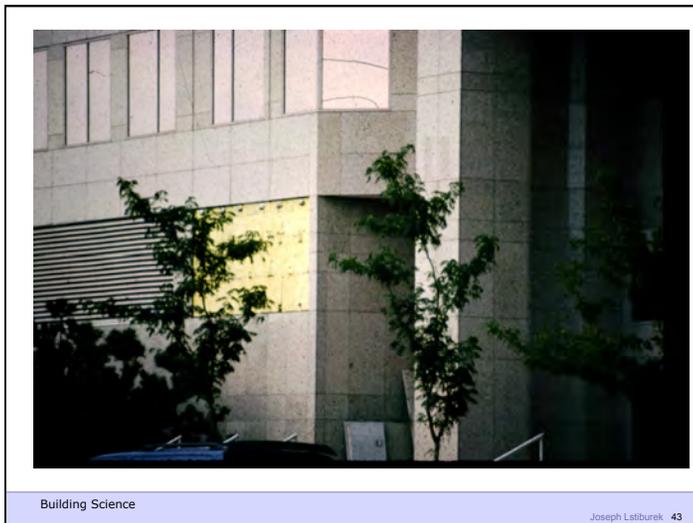
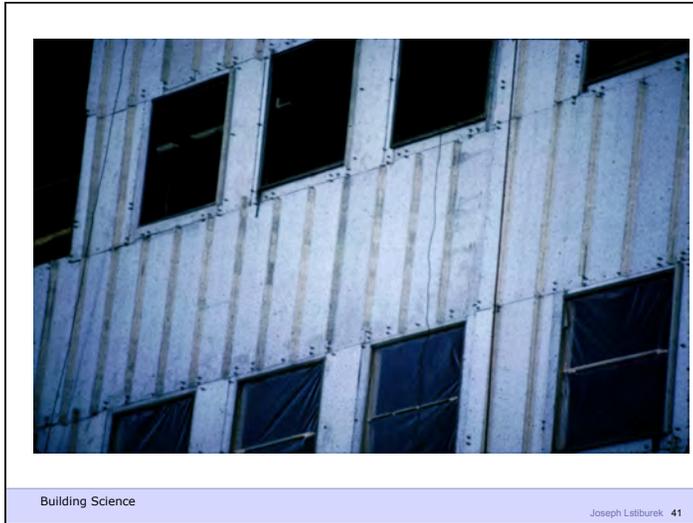
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Don't Do Stupid Things

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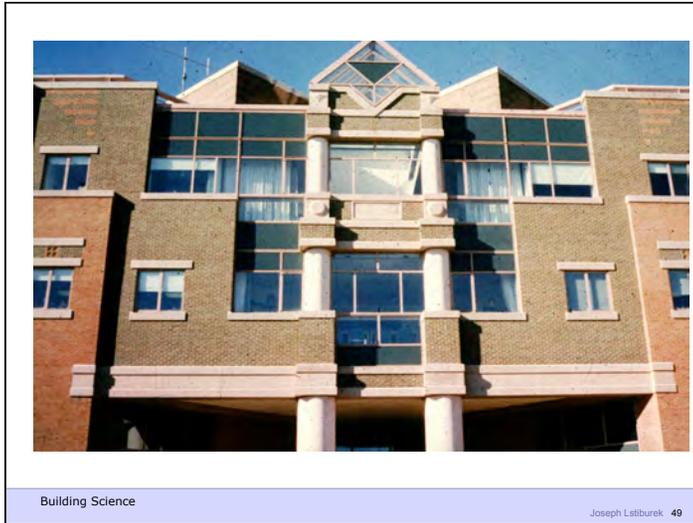
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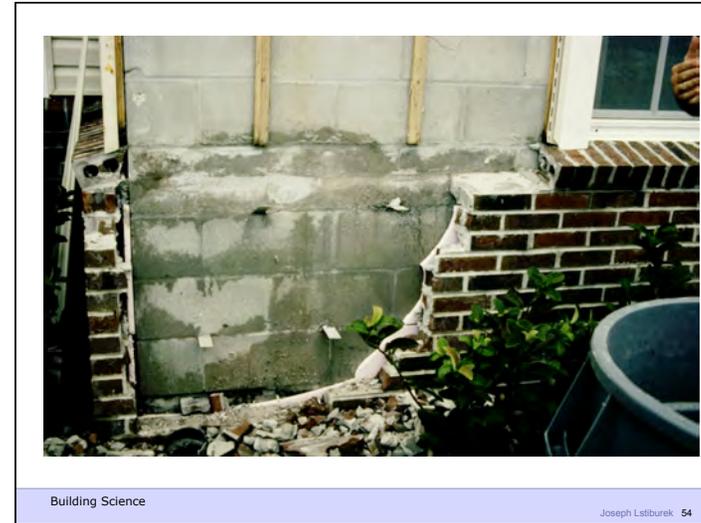
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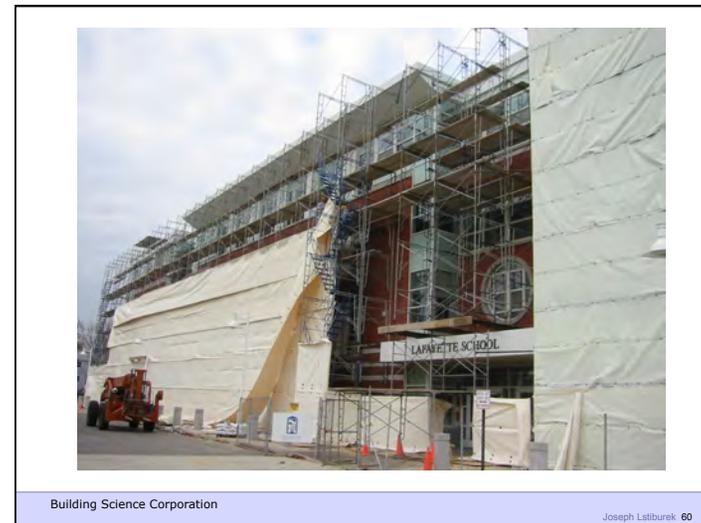
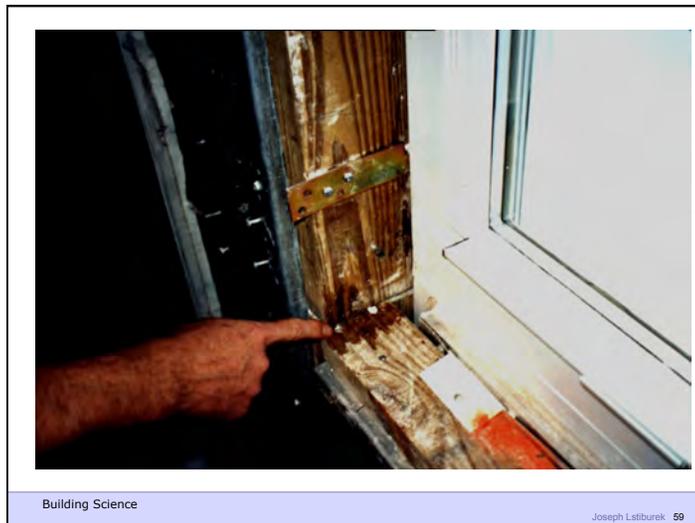
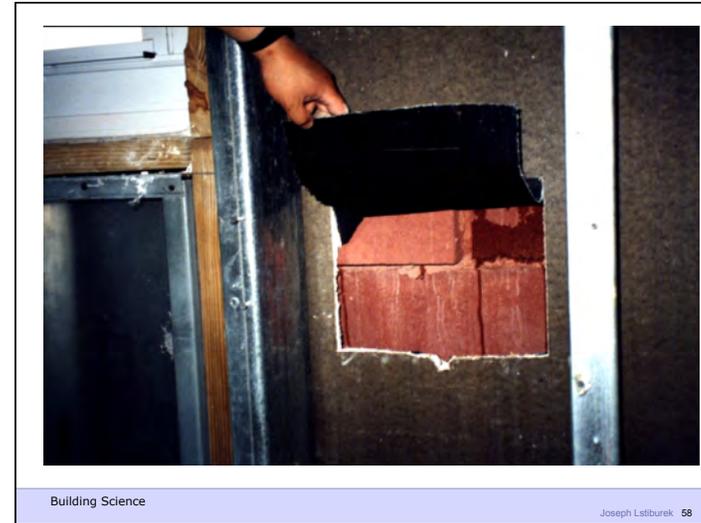


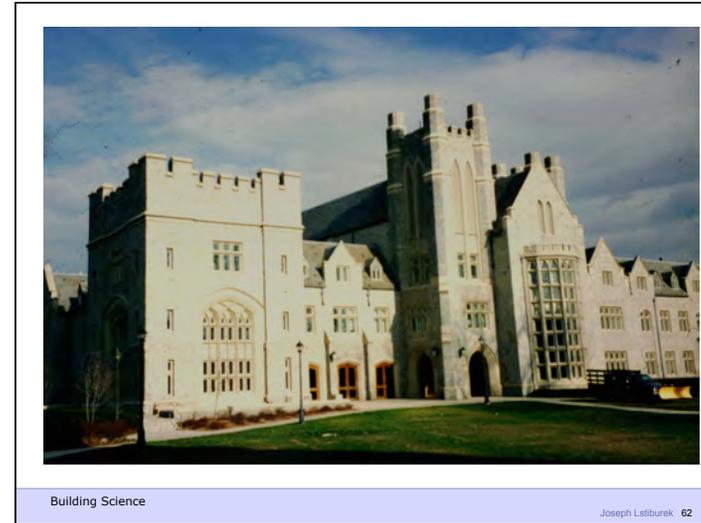
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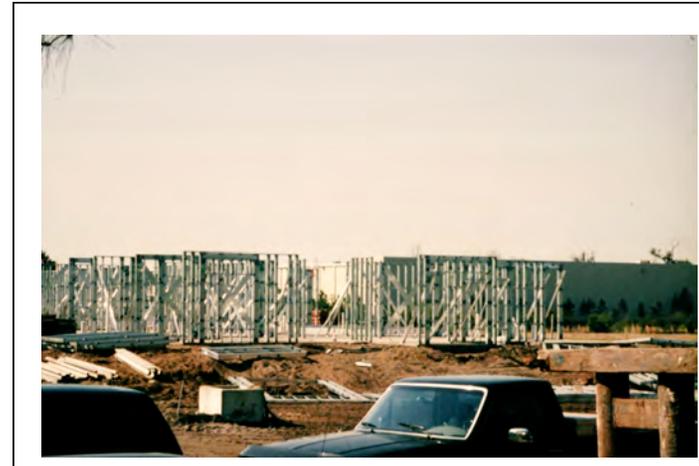






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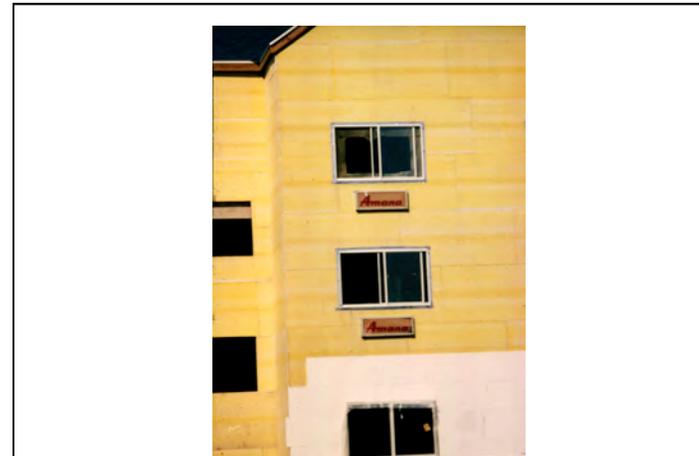
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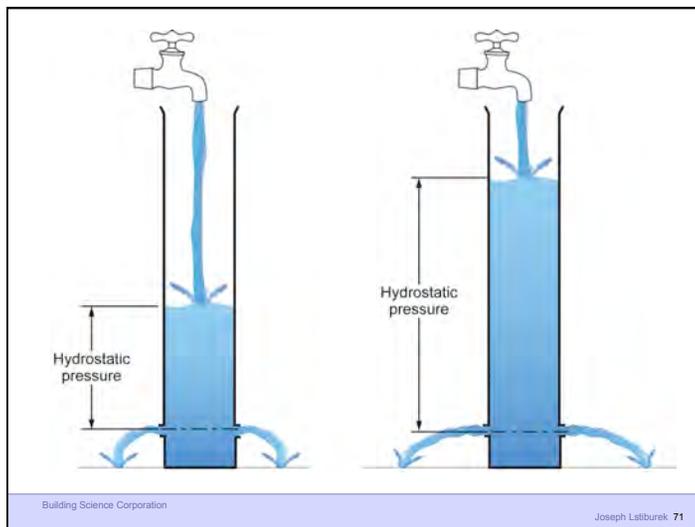
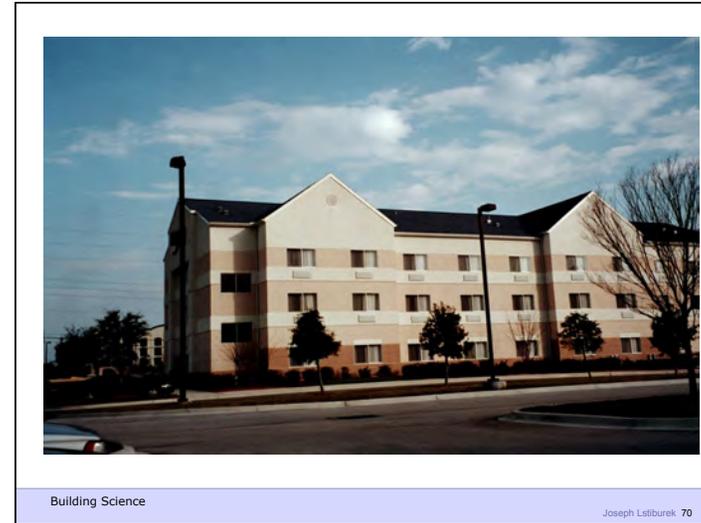
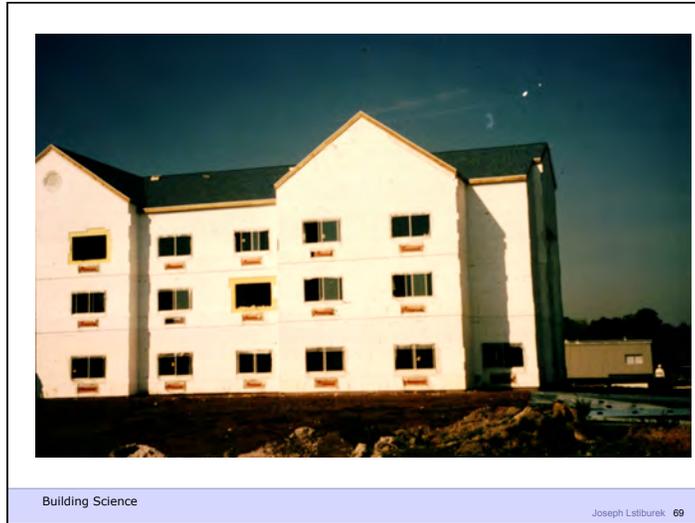
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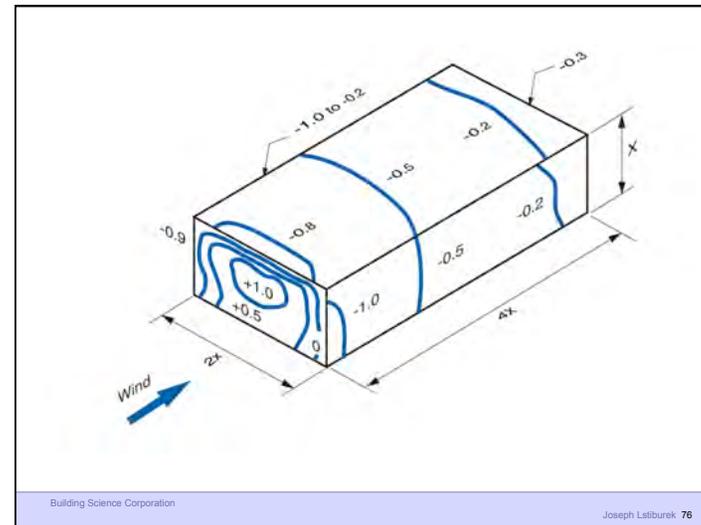
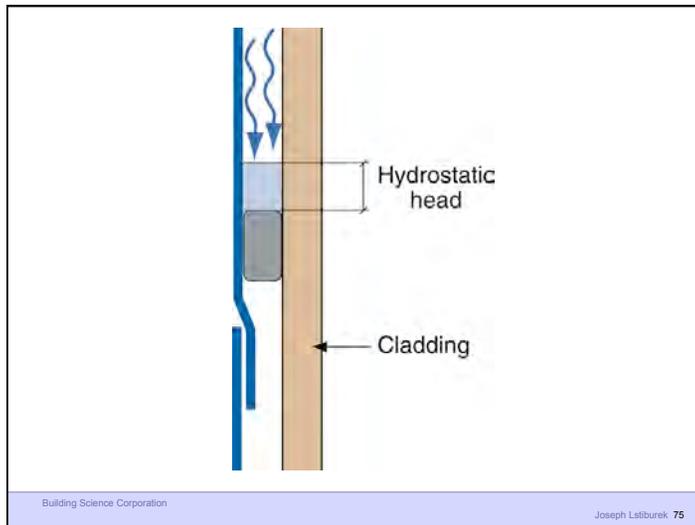
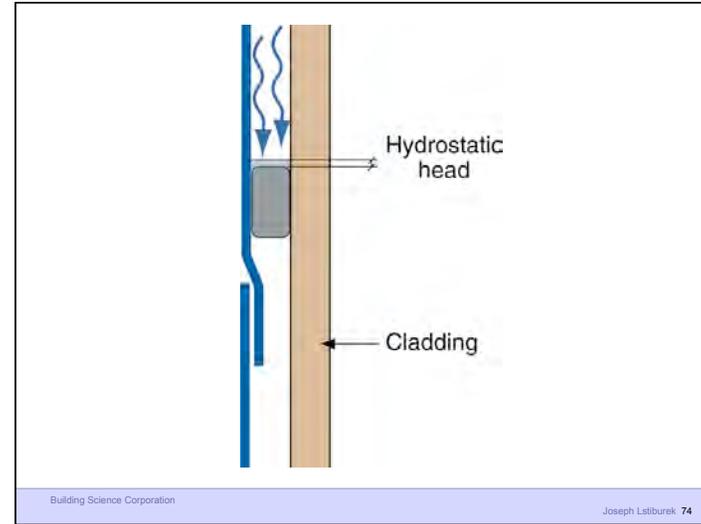
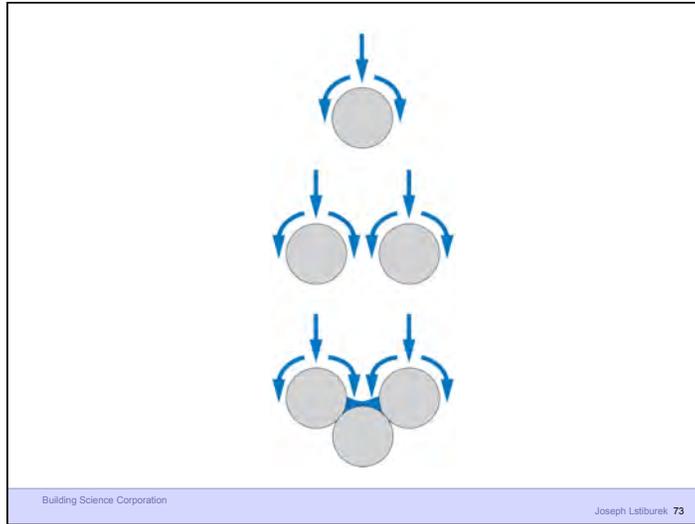
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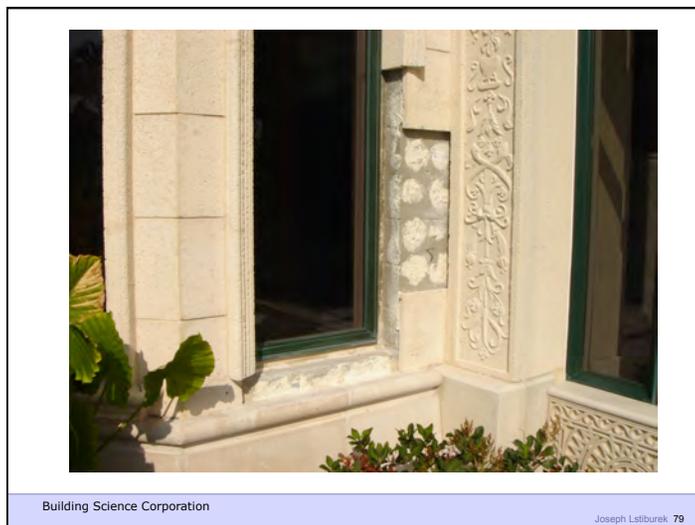
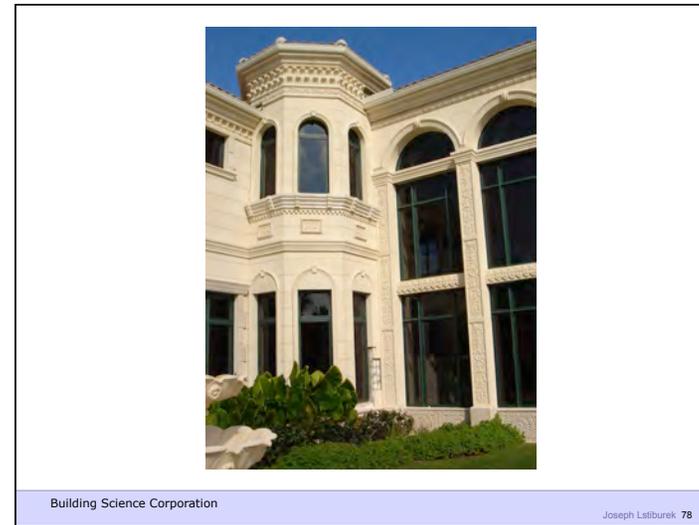
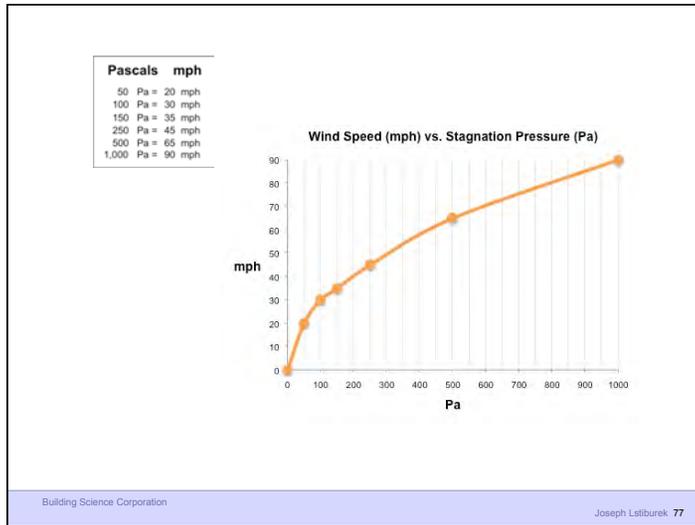


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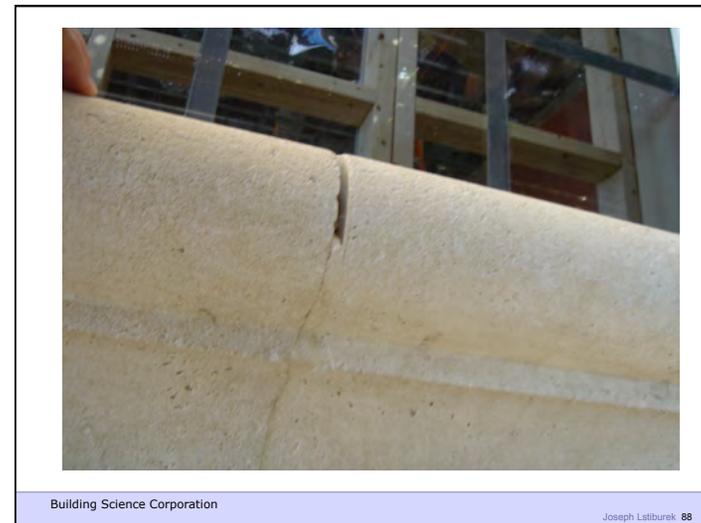
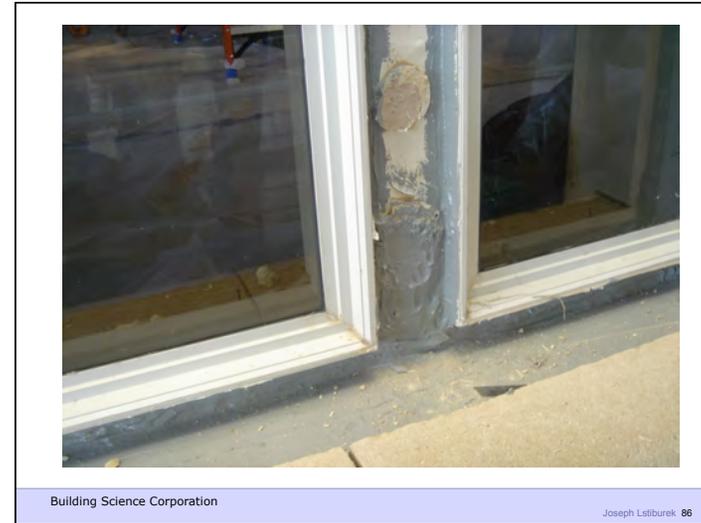
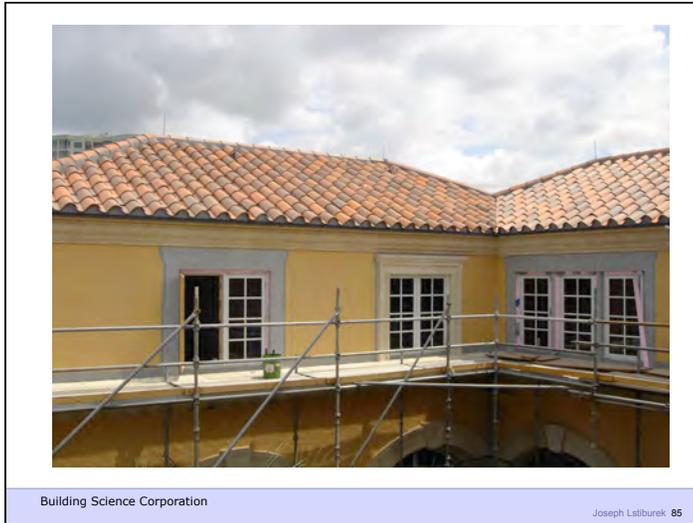
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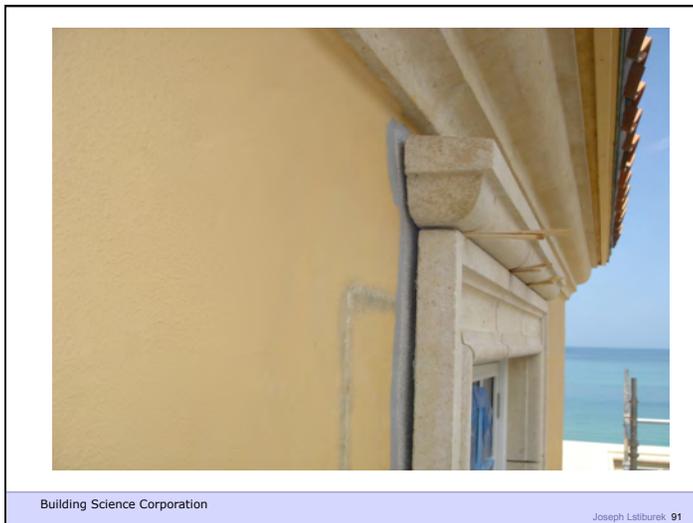
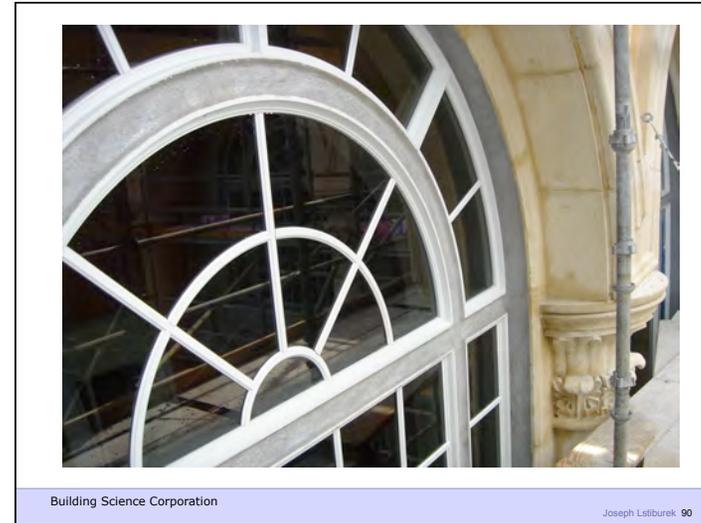
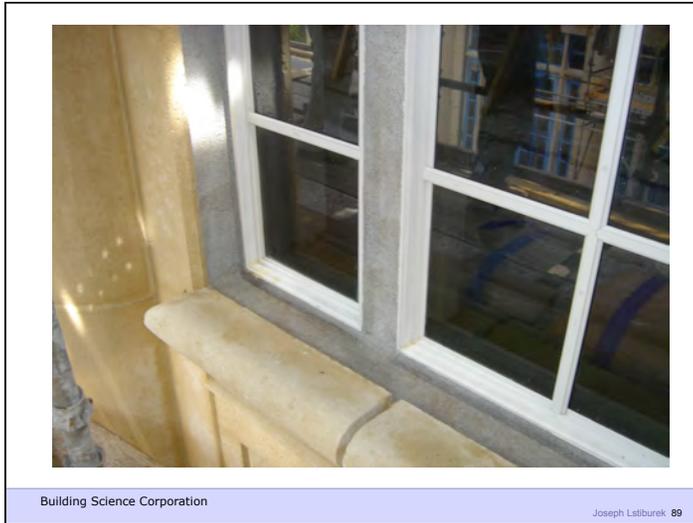


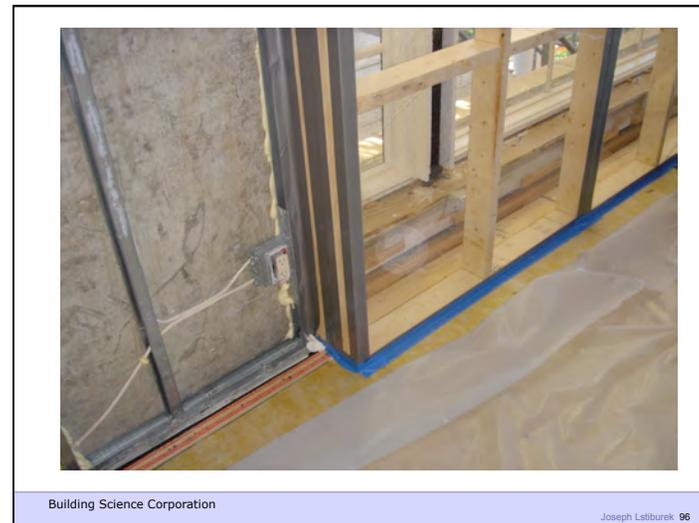


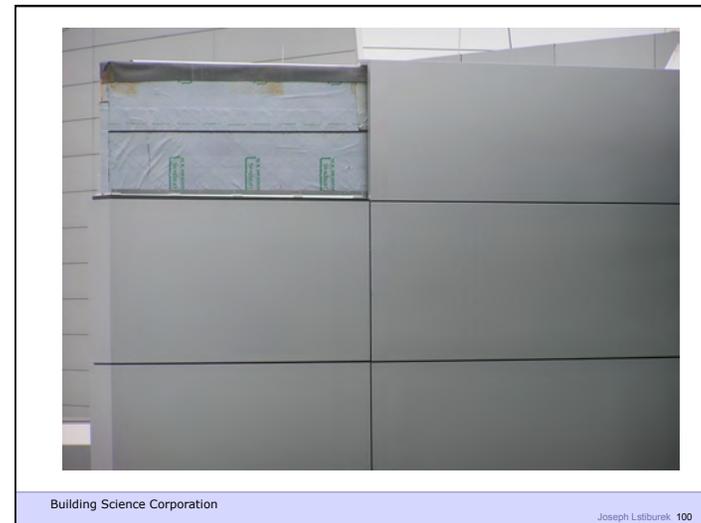
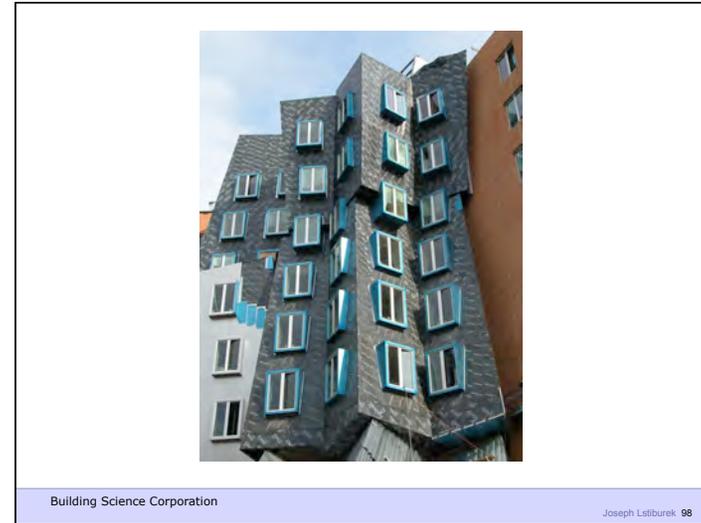


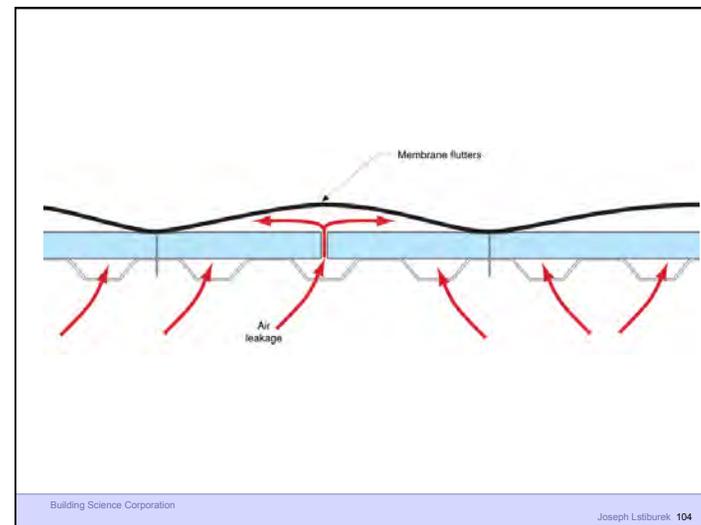
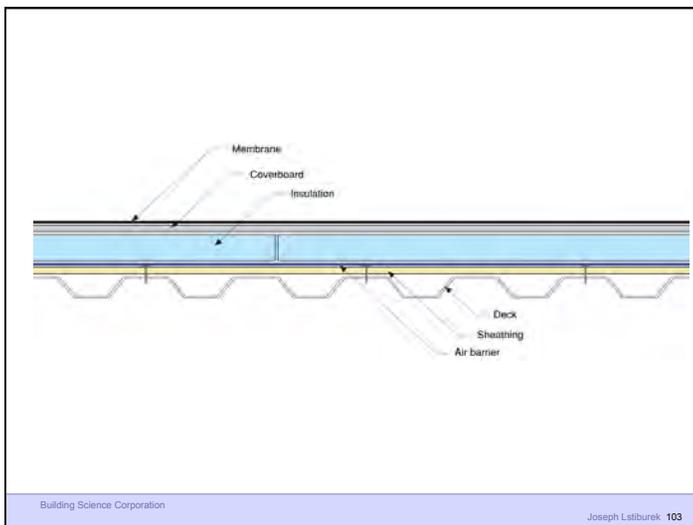
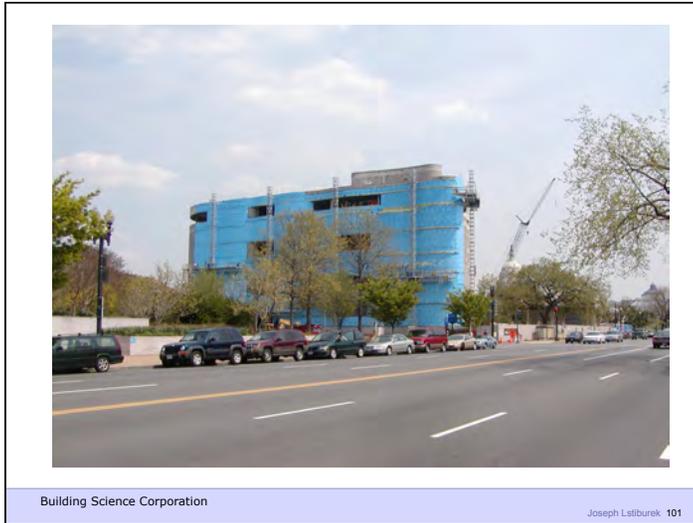








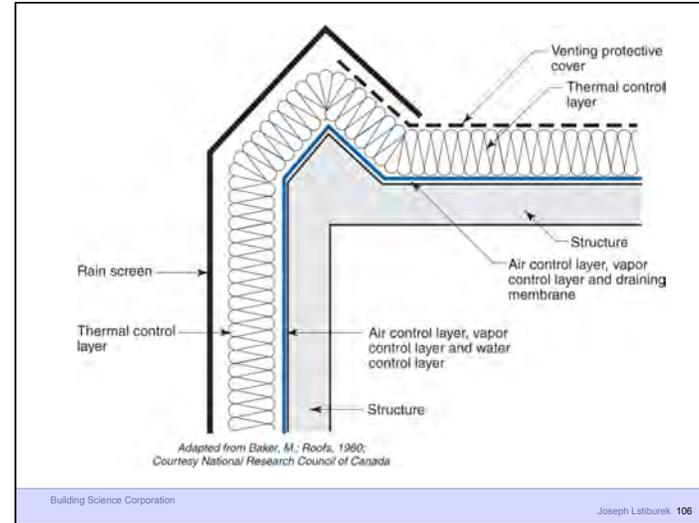






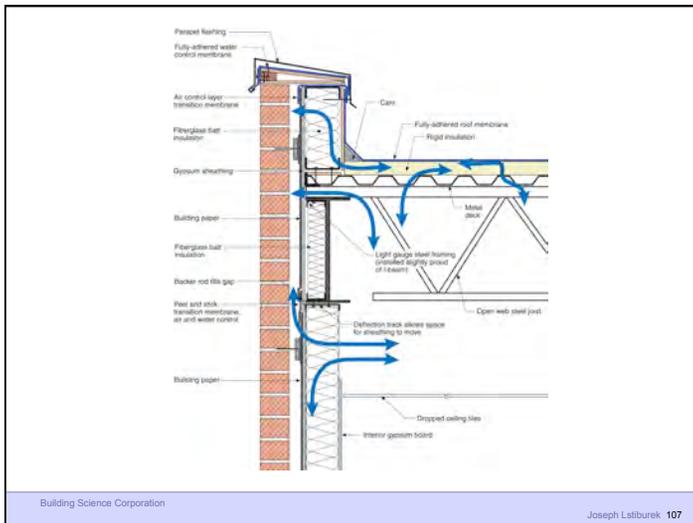
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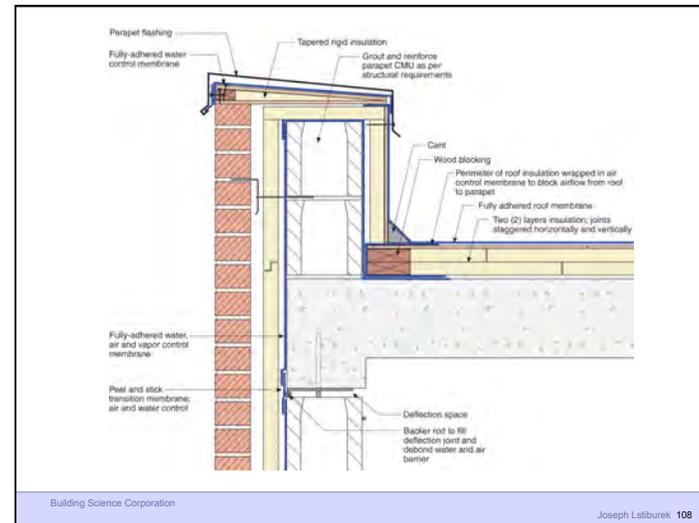
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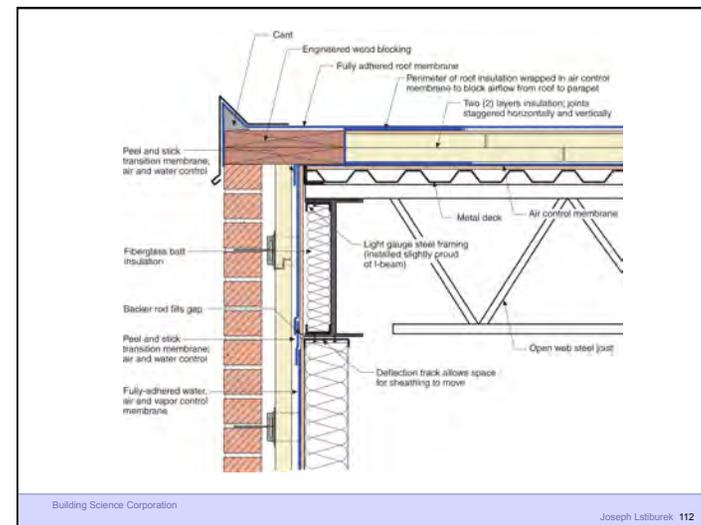
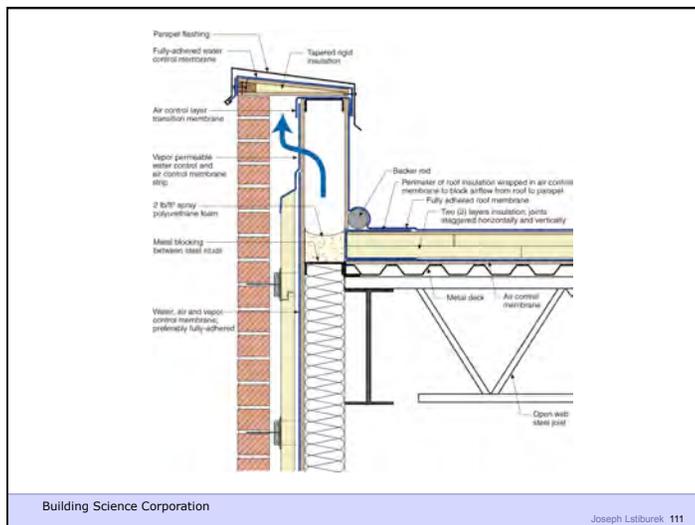
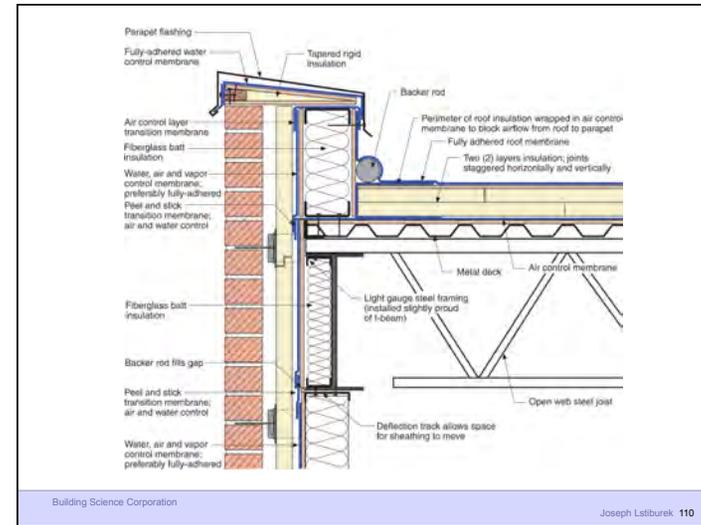
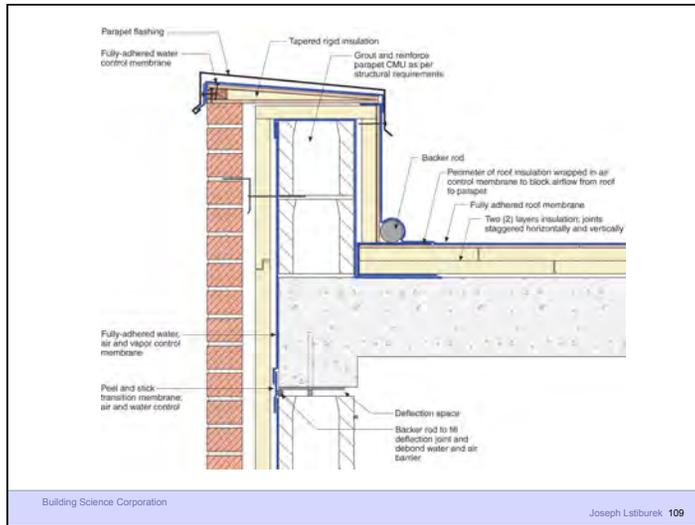
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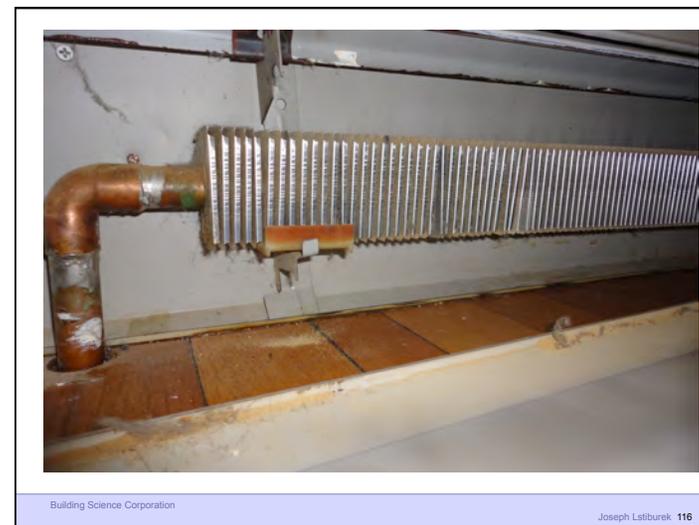
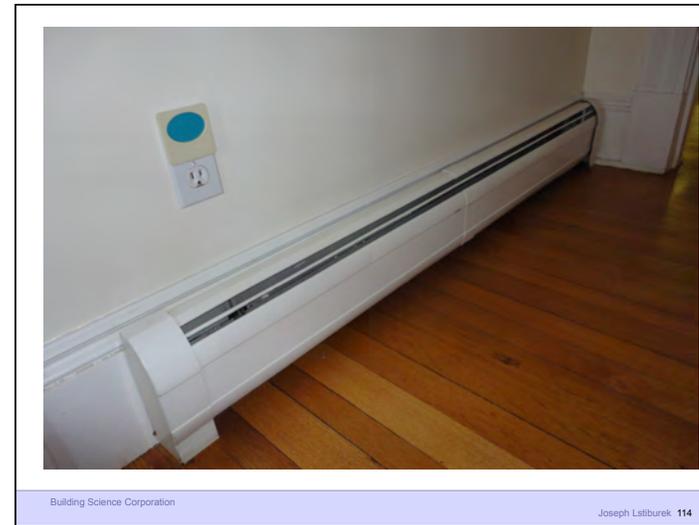
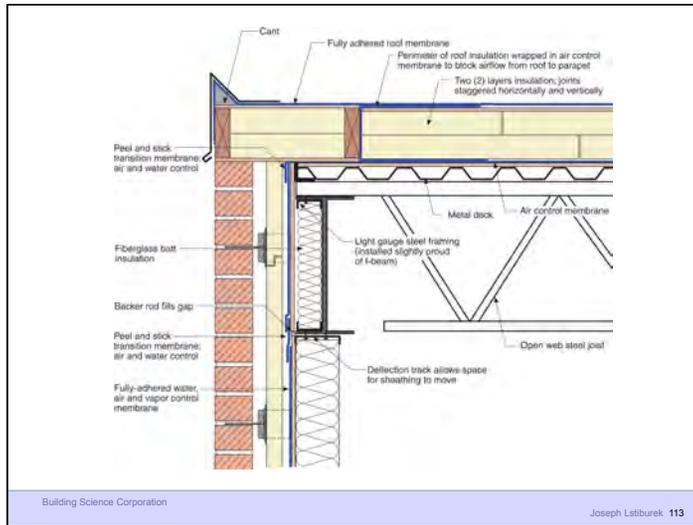
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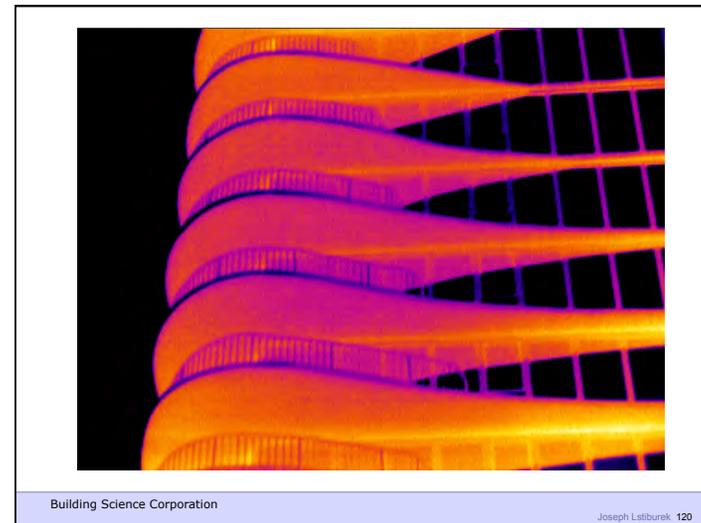
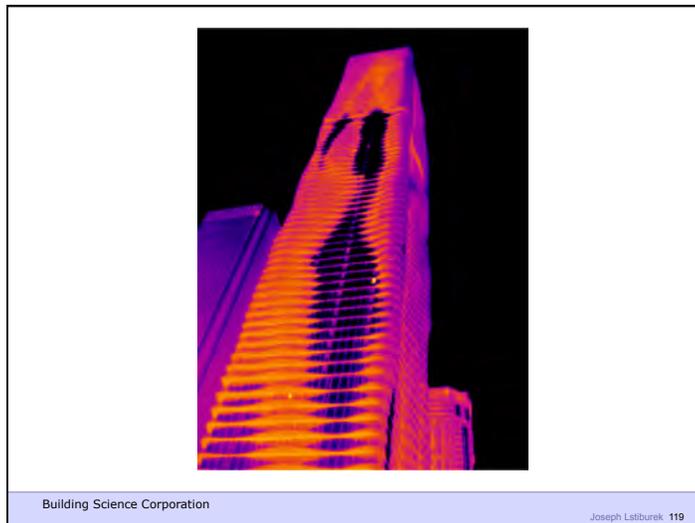


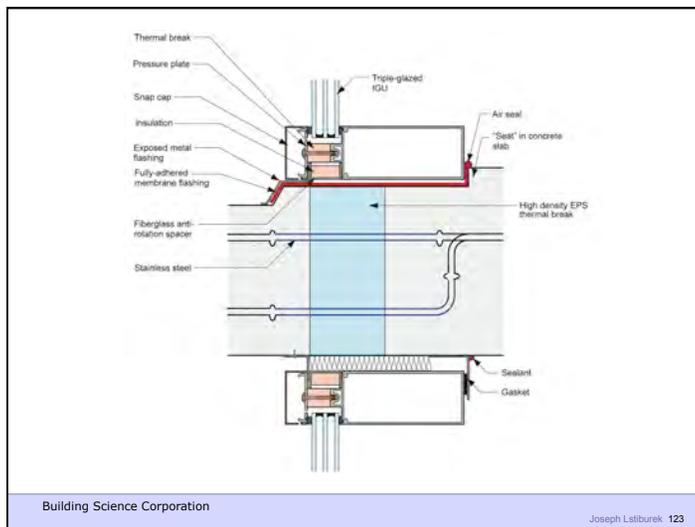
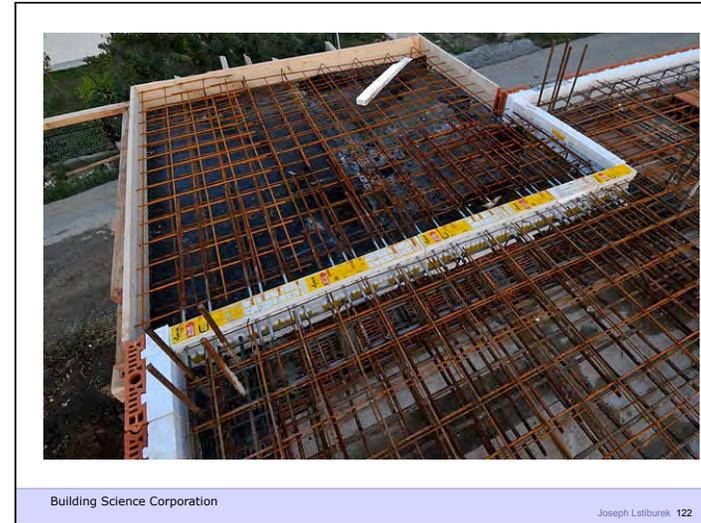
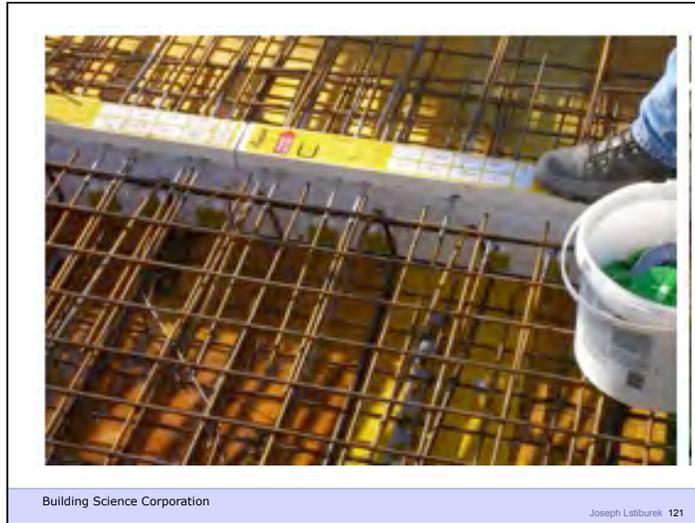
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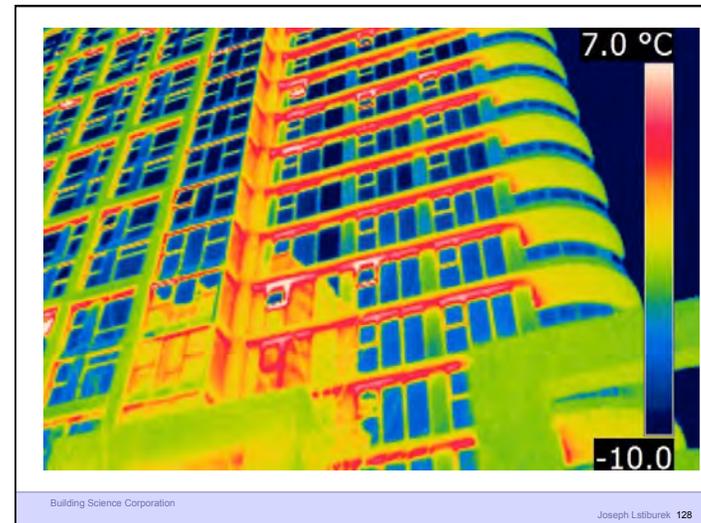
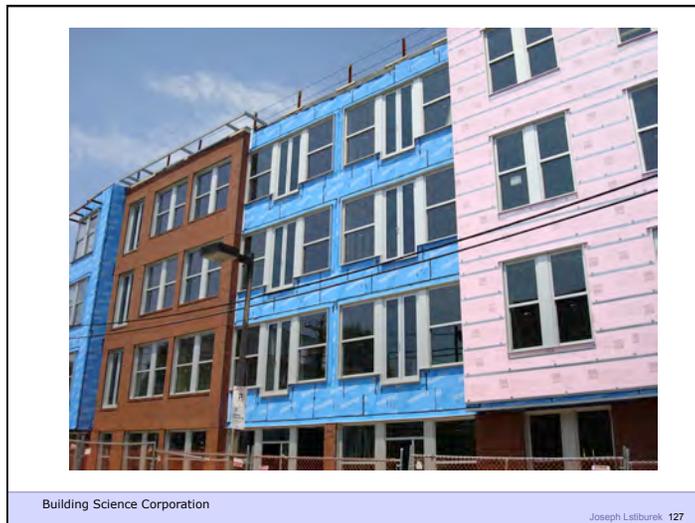
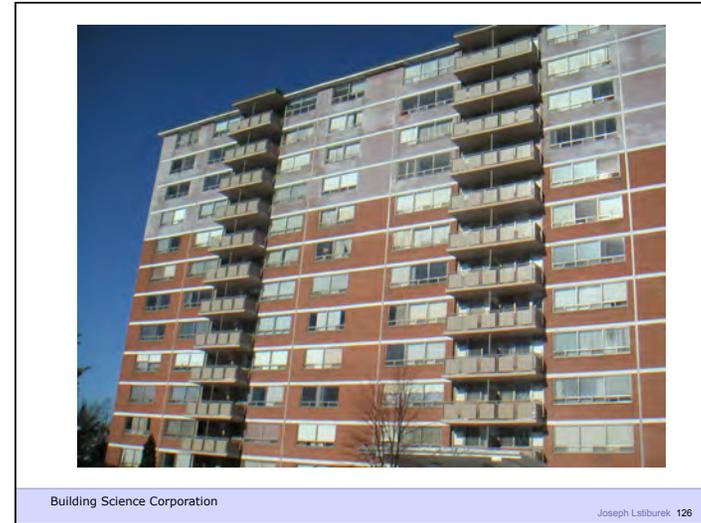
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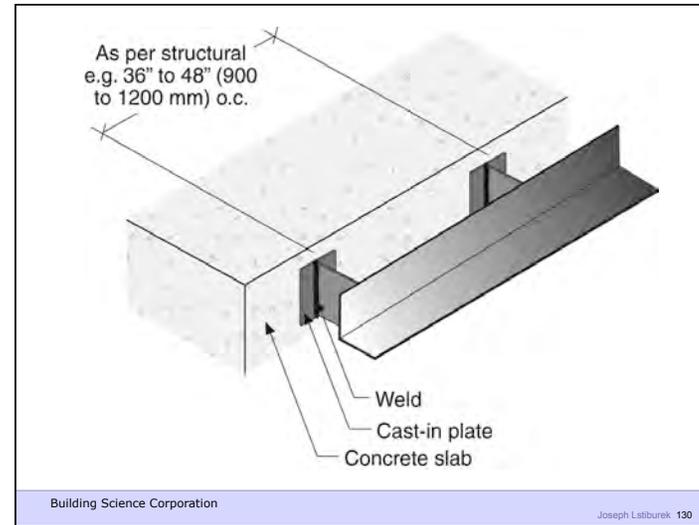
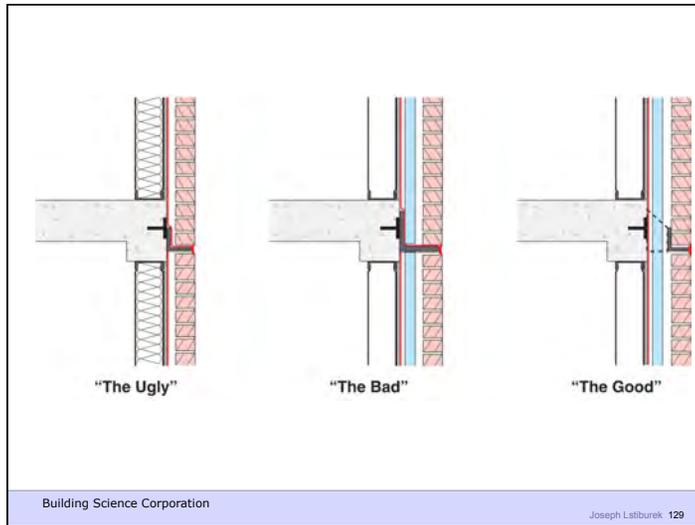


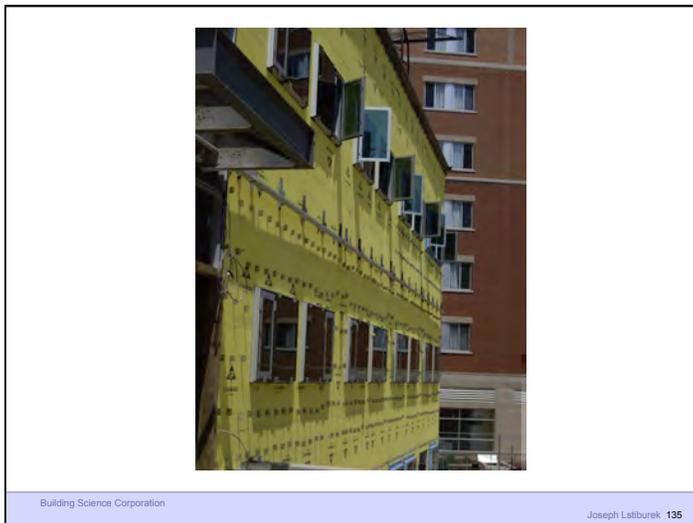
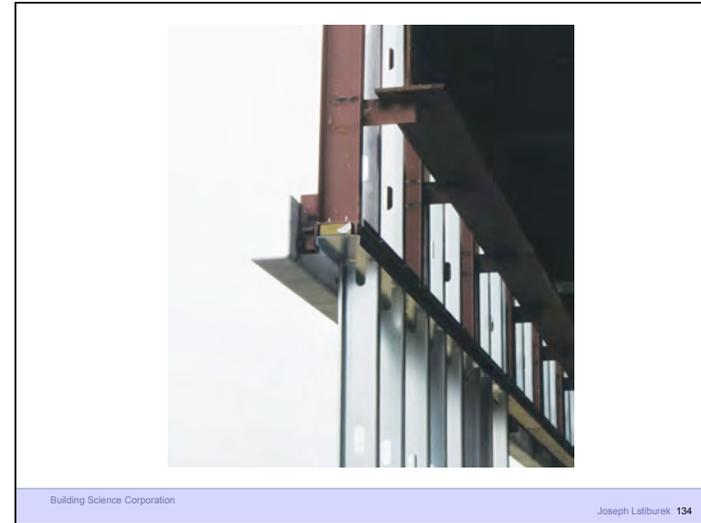
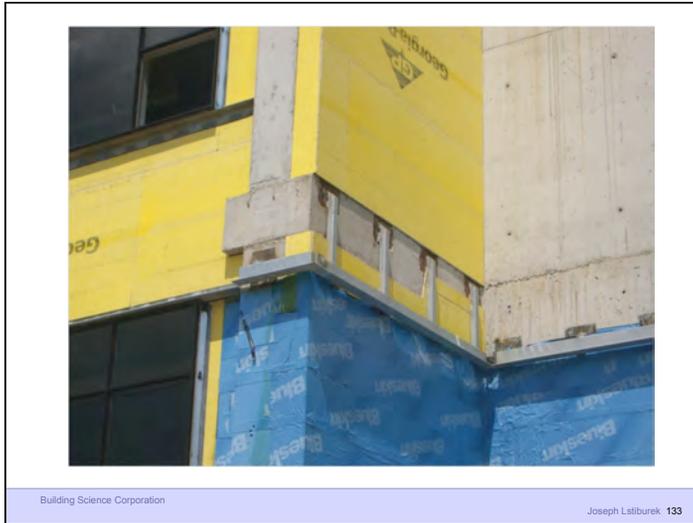












Beware Thermal Flanking

- Beware heat flow around window frame

Figure 1: Thermal Flanking

Figure 2: Flanking Reduced

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