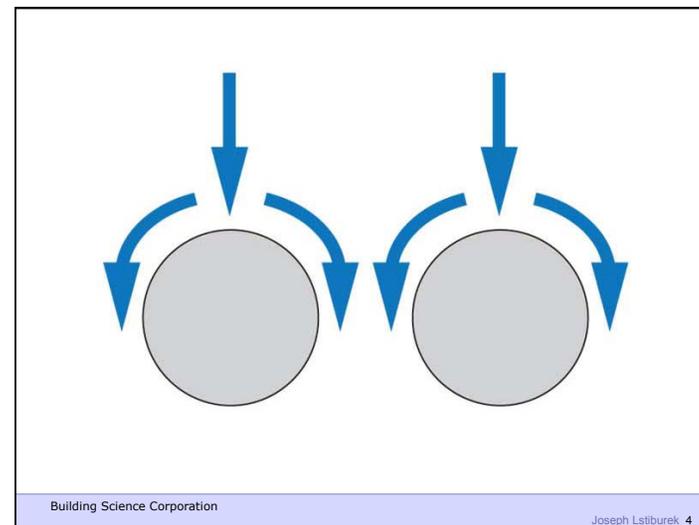
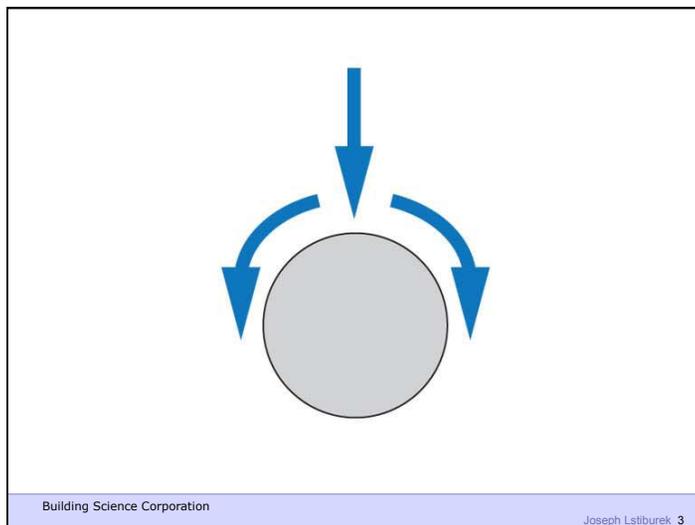


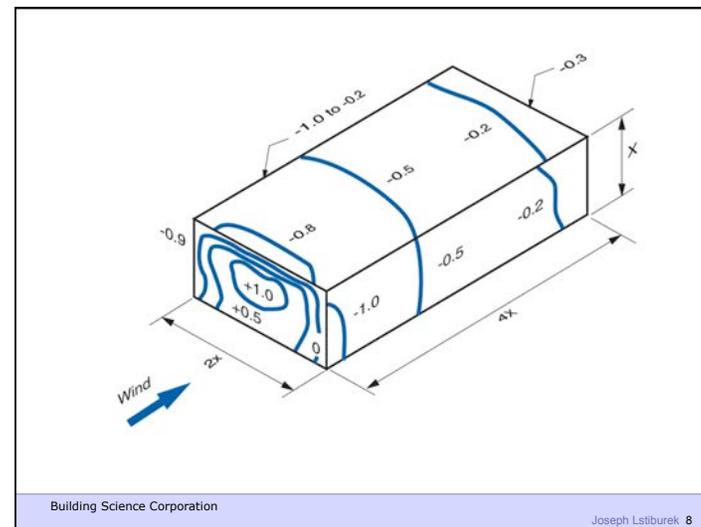
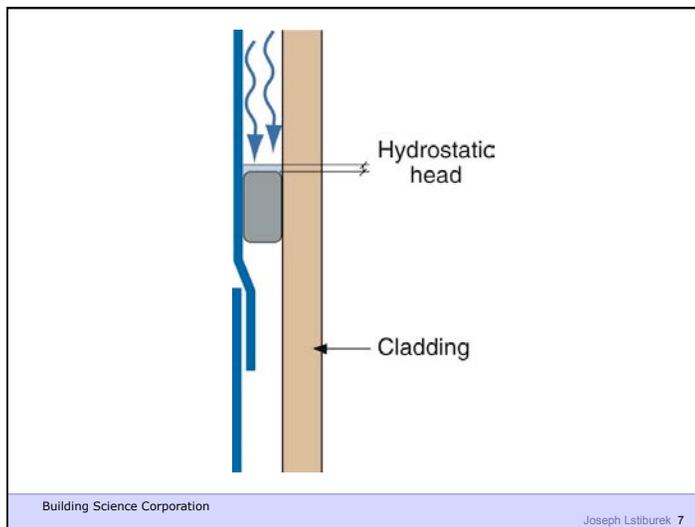
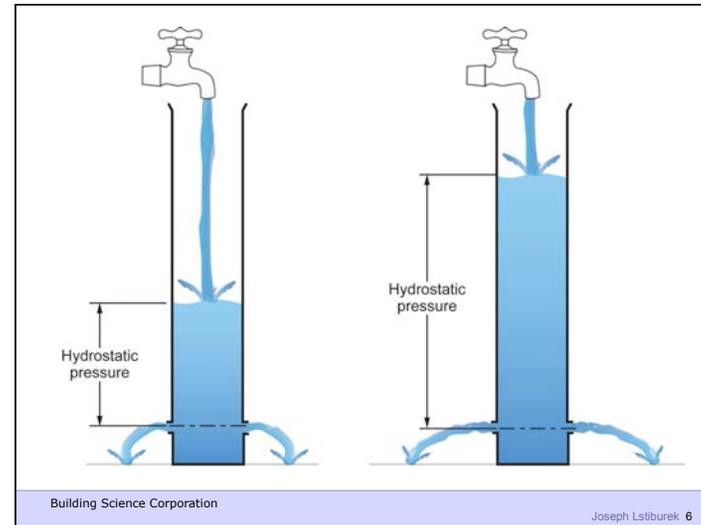
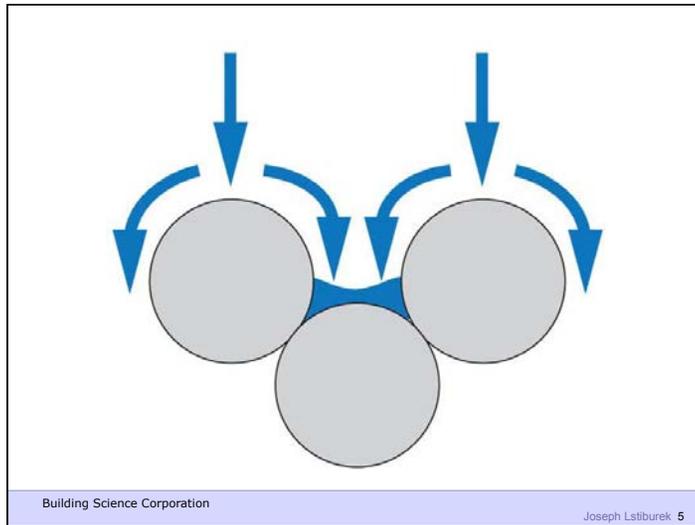
Joseph Lstiburek, Ph.D., P.Eng, ASHRAE Fellow

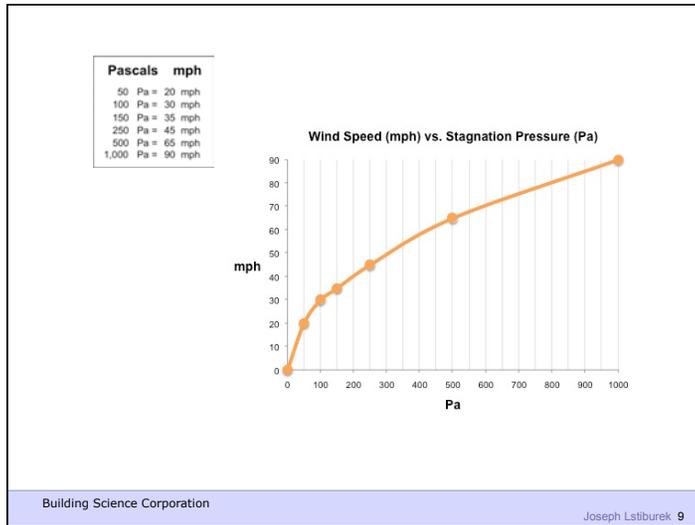
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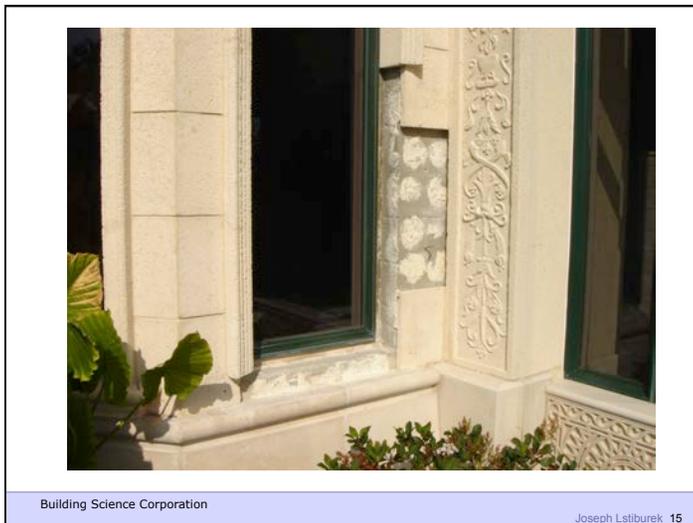
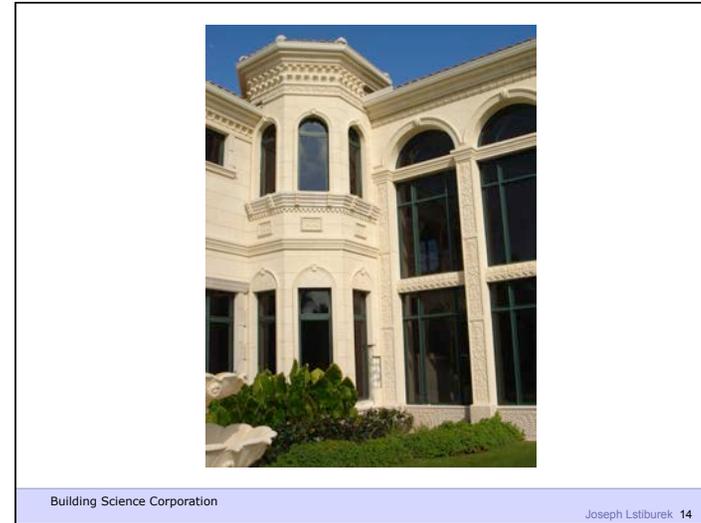
Adventures in Building Science

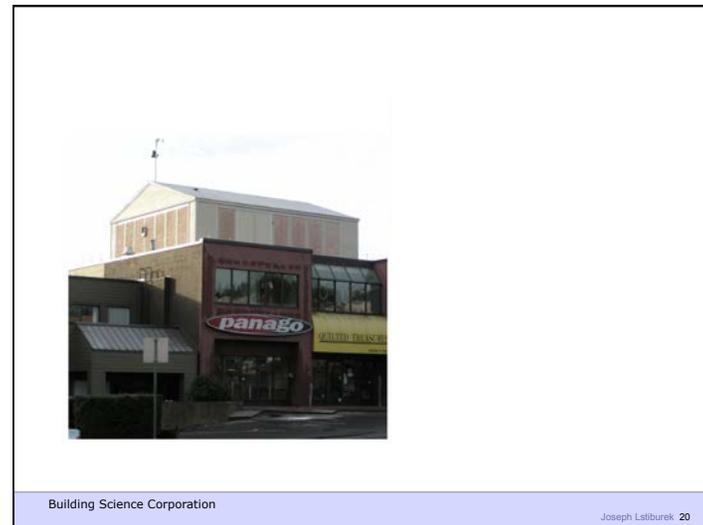
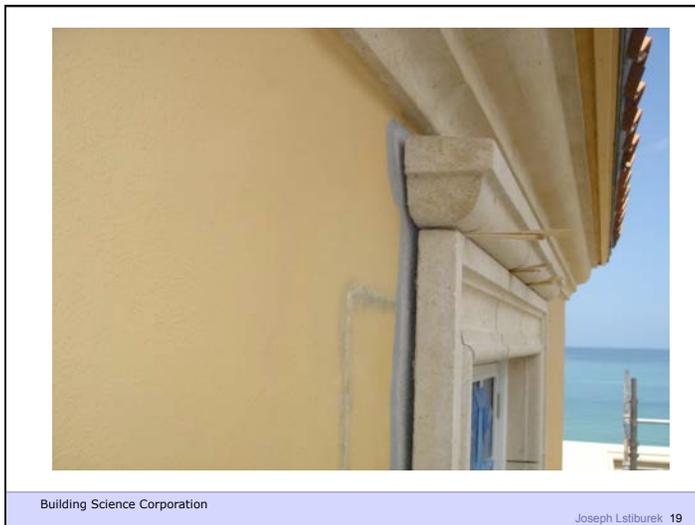
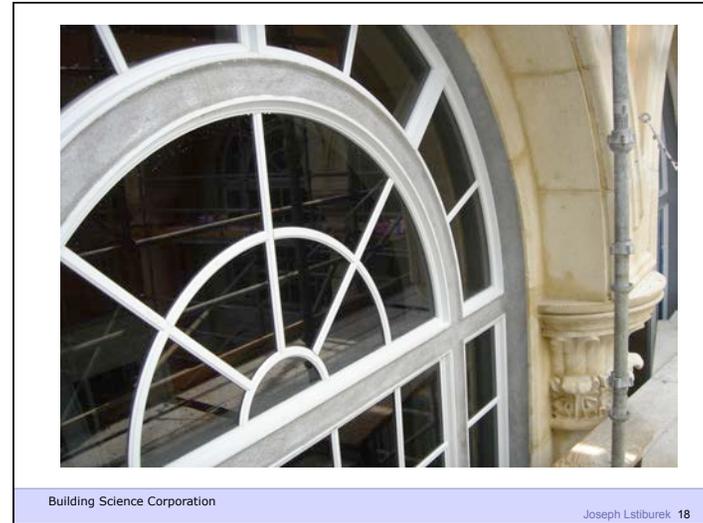
www.buildingscience.com

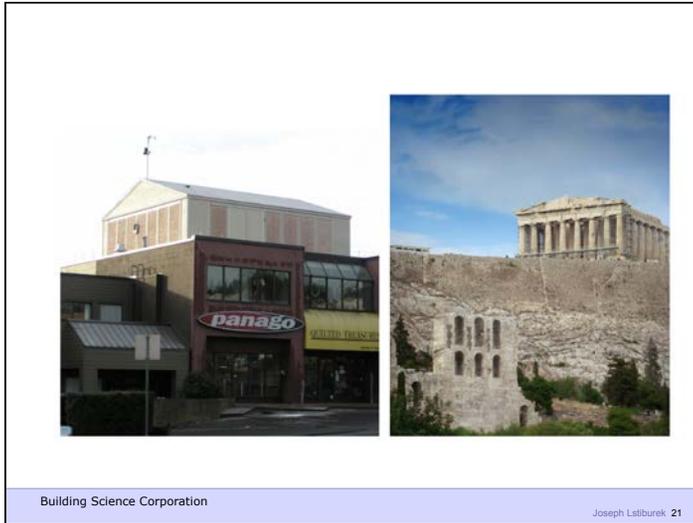


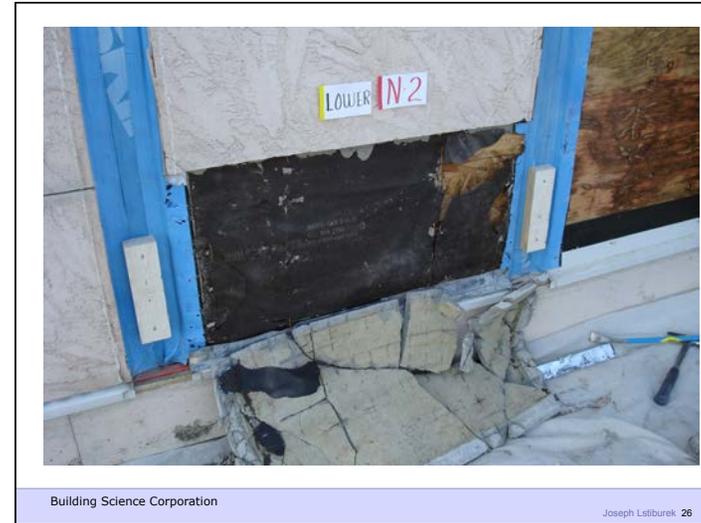
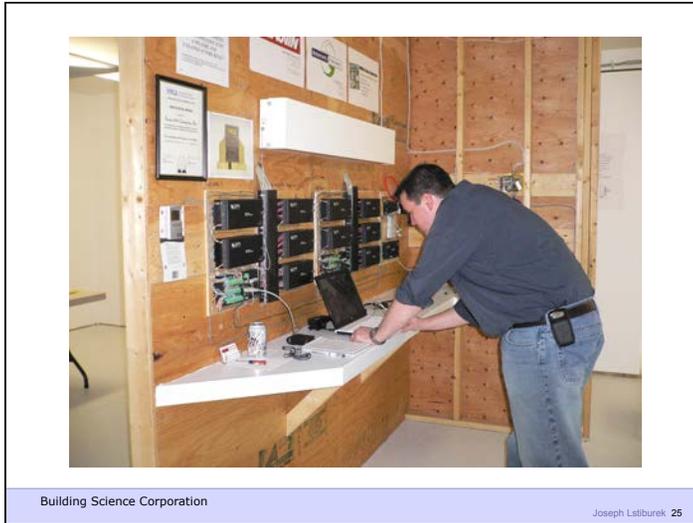


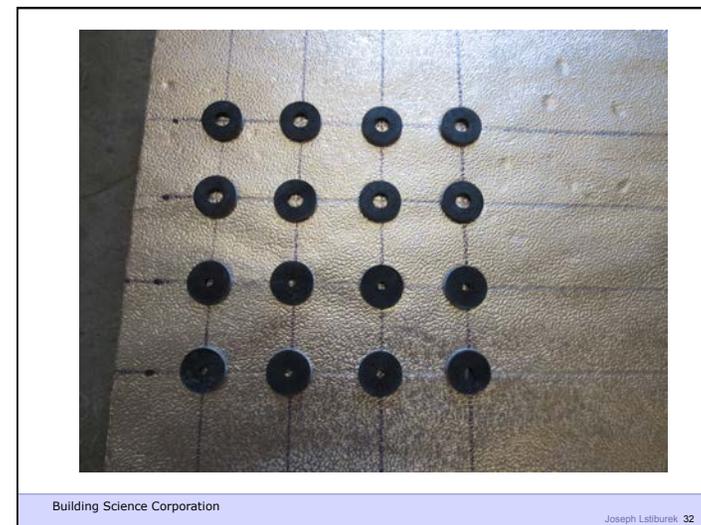
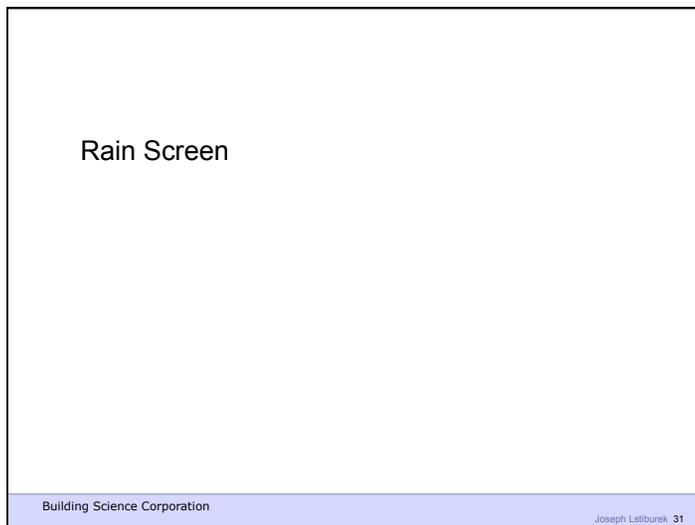
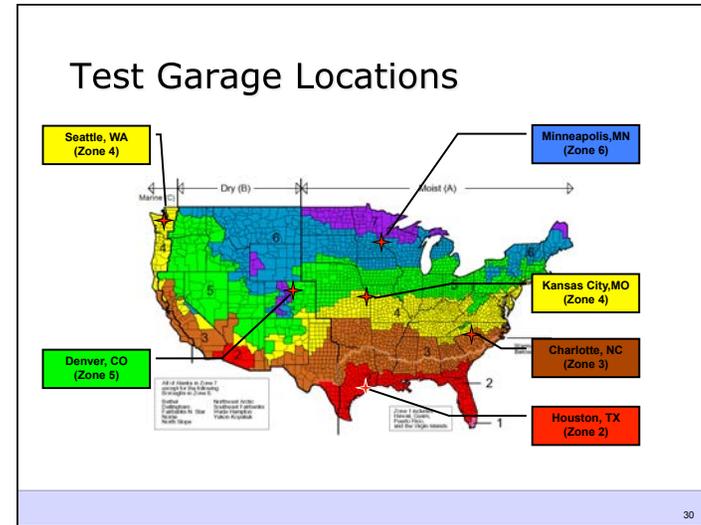
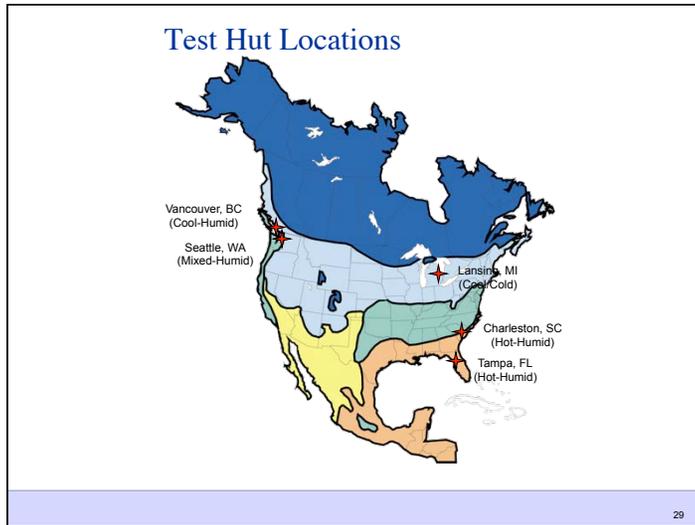






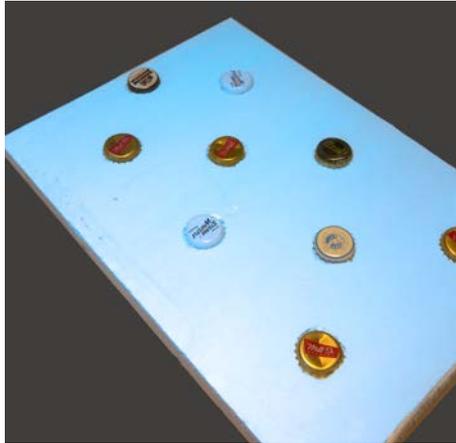






Beer Screen?

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Building Science Corporation 2010 Joseph Lstiburek 35

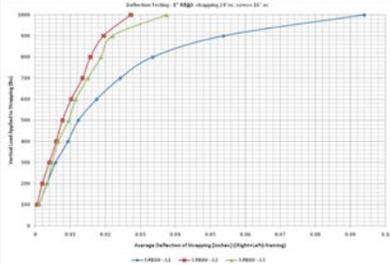


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Rockwool

1x3 furring @ 24" o.c.
 #10 screws @ 16" o.c. vertically
 Result: 20 psf cladding weight
 with < 2/100" deflection

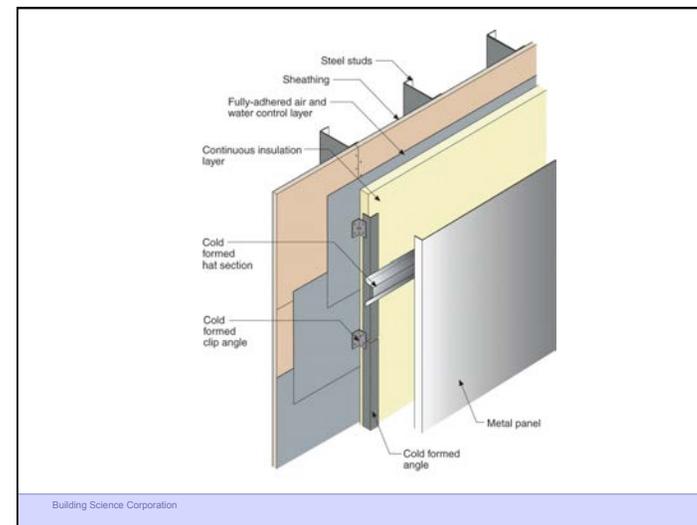
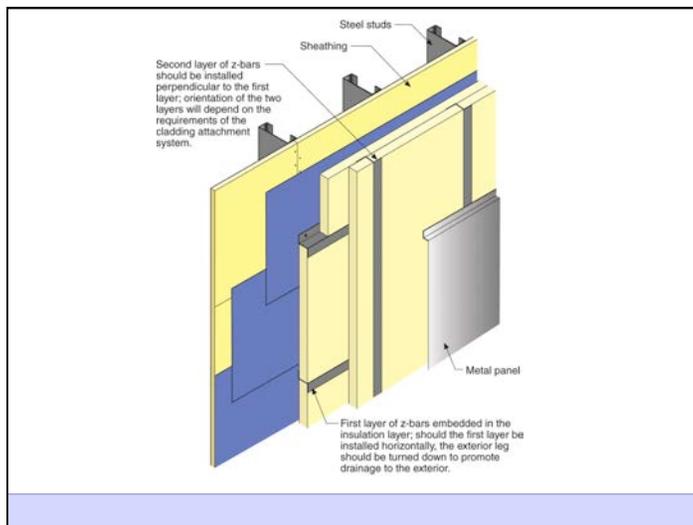


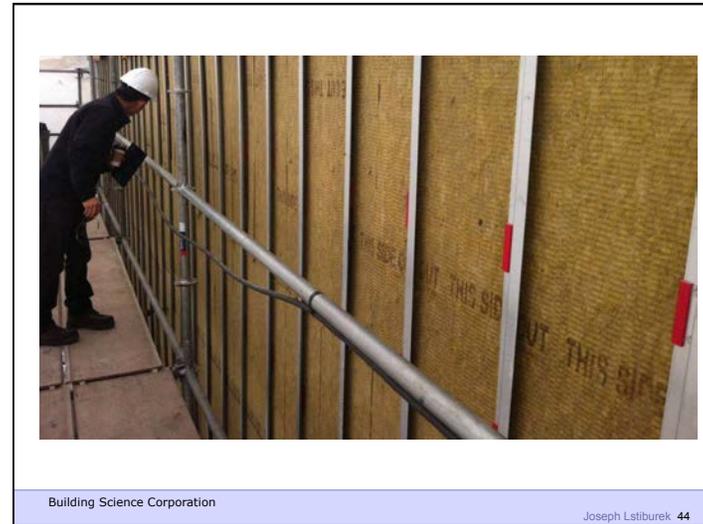
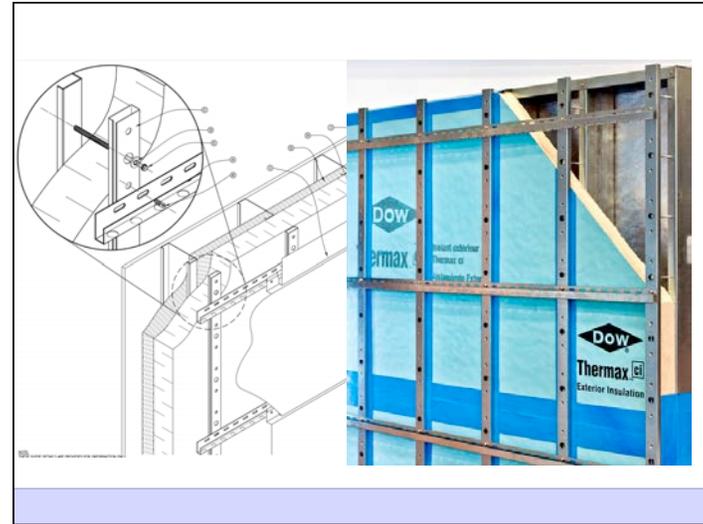
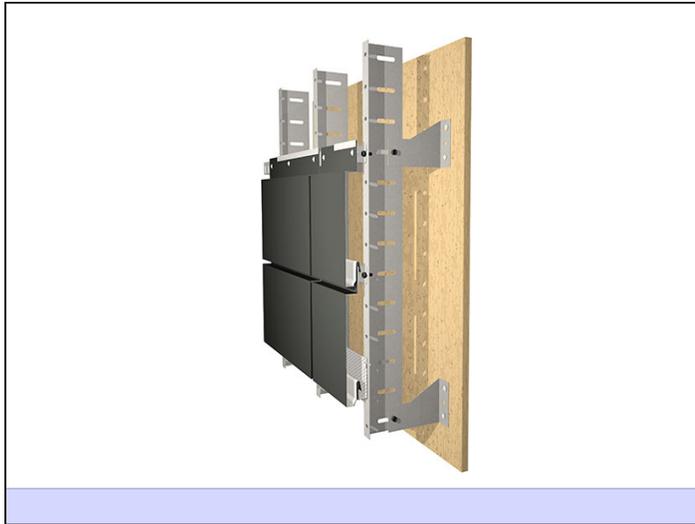
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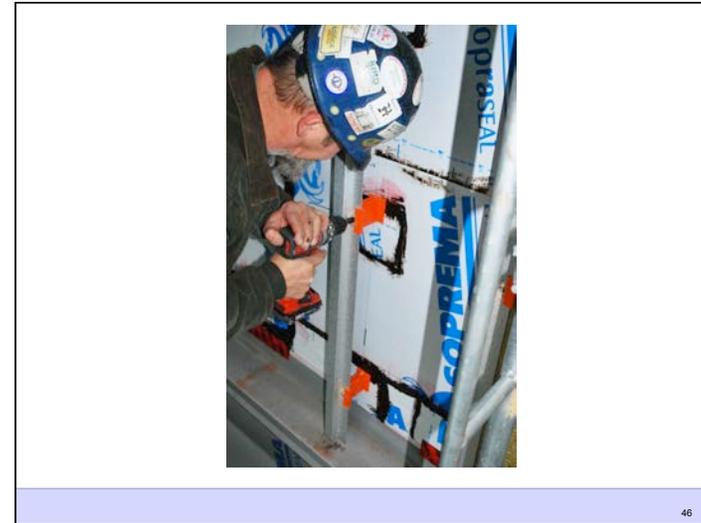
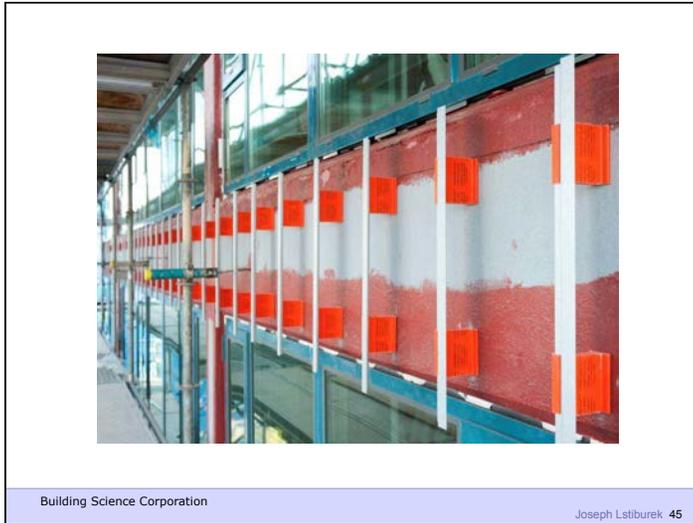
Joseph Lstiburek 38

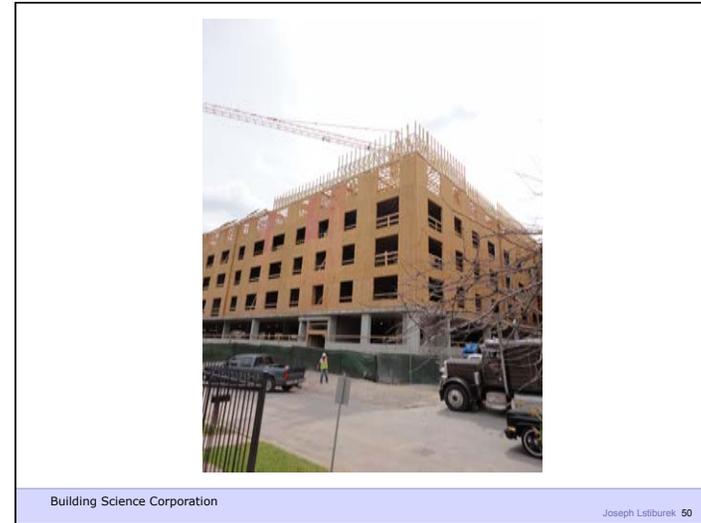




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Buildings Get Wet From The Outside
Buildings Get Wet From The Inside
Buildings Start Out Wet
Wet Happens

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Buildings Must Be Designed To Dry

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Buildings Can Dry To The Outside
Buildings Can Dry To The Inside
Buildings Can Dry To Both Sides

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2nd Law of Thermodynamics

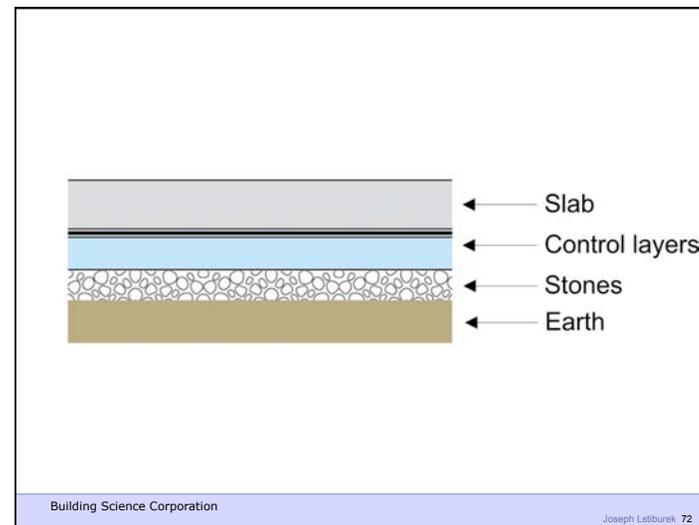
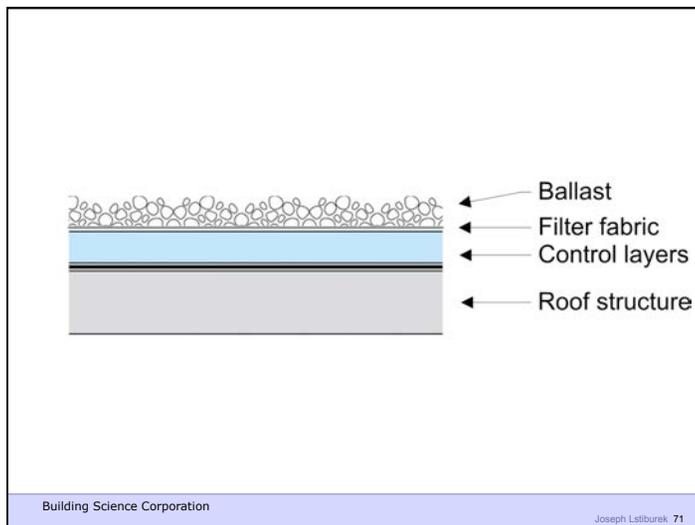
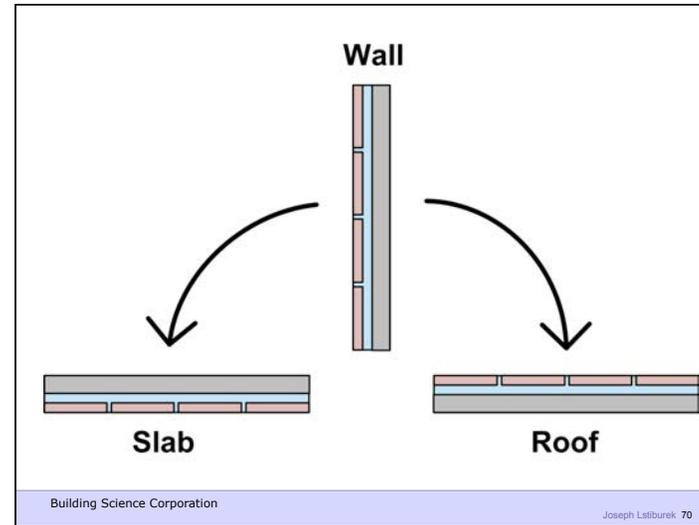
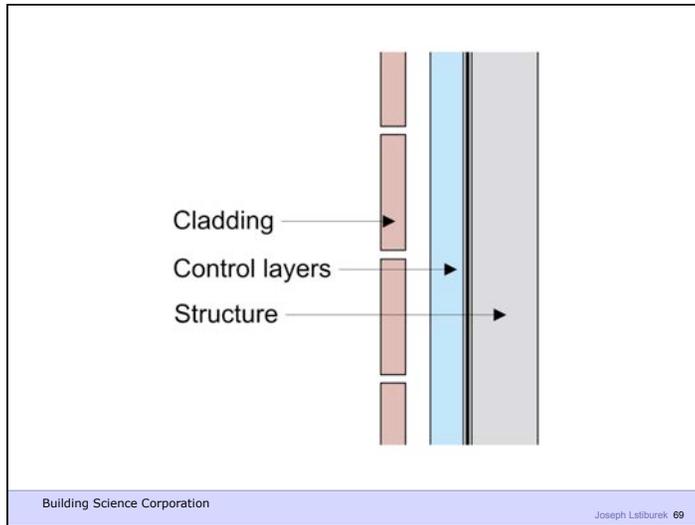
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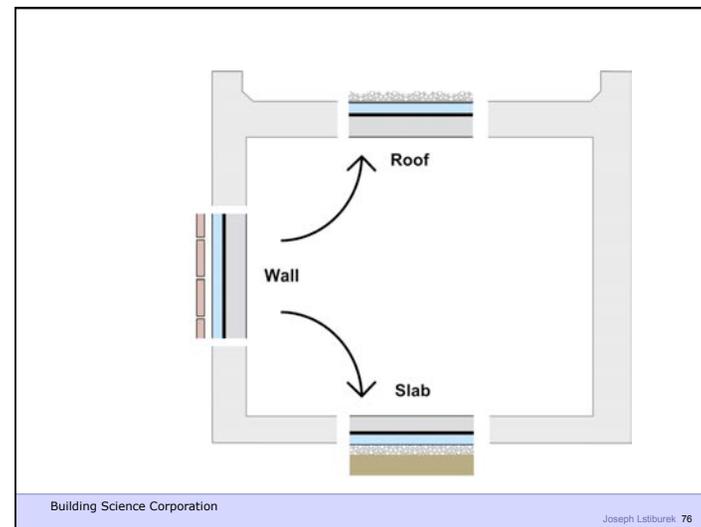
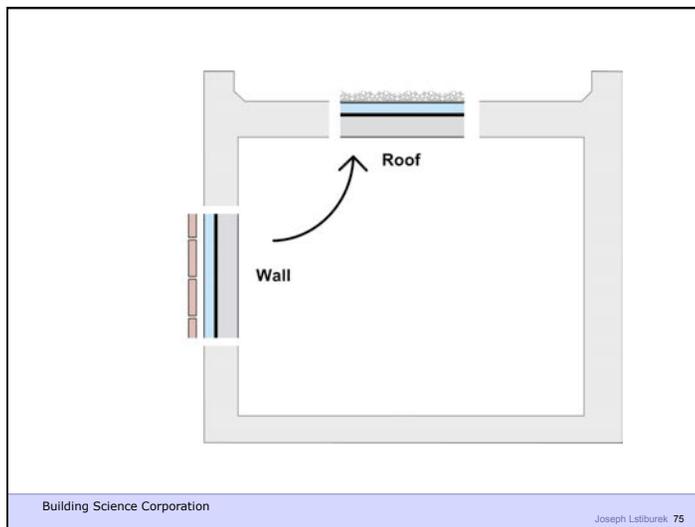
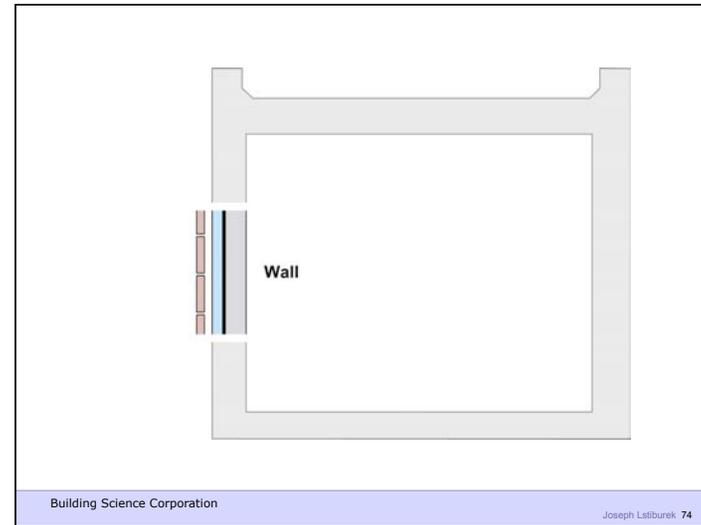
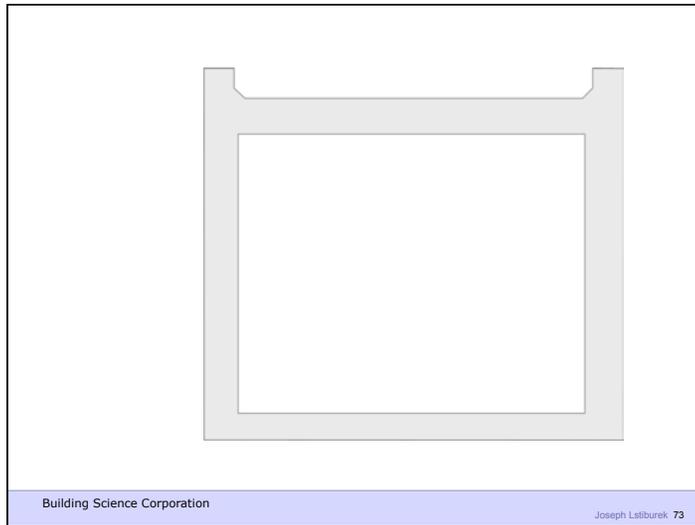
Heat flow is from warm to cold
Moisture flow is from more to less
Air flow is from a higher pressure to a lower pressure
Gravity acts down

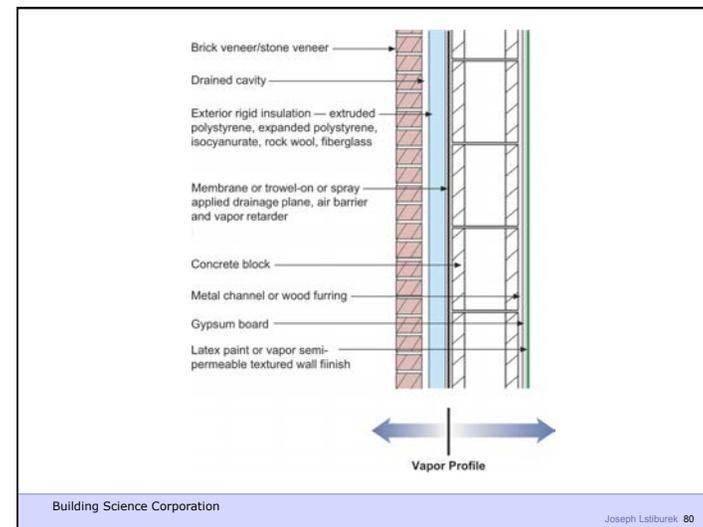
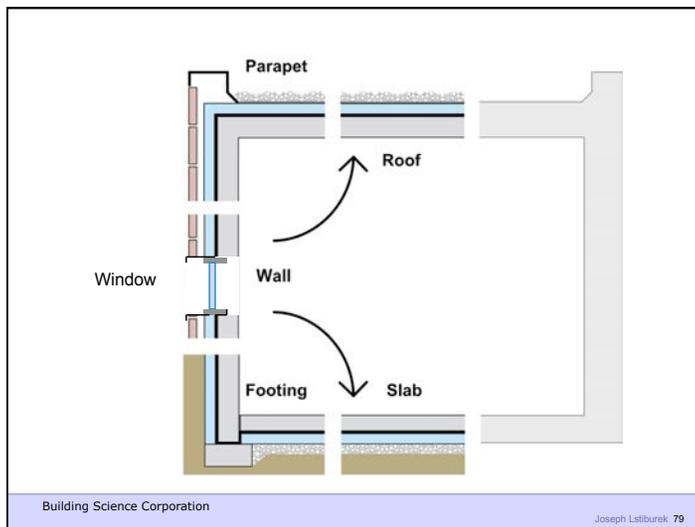
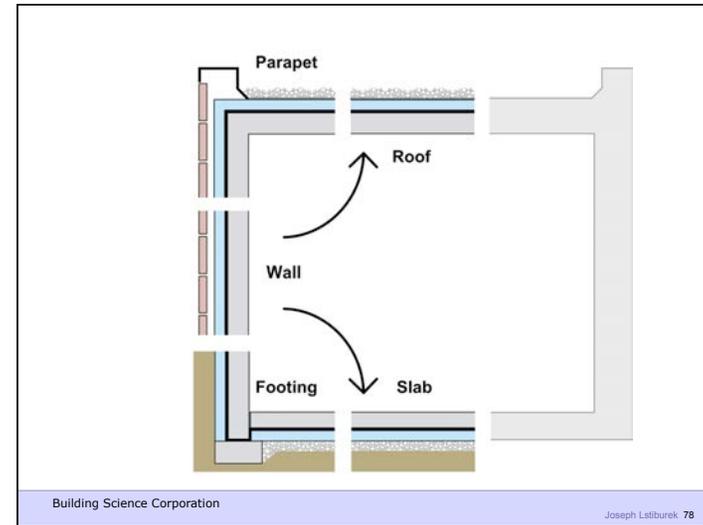
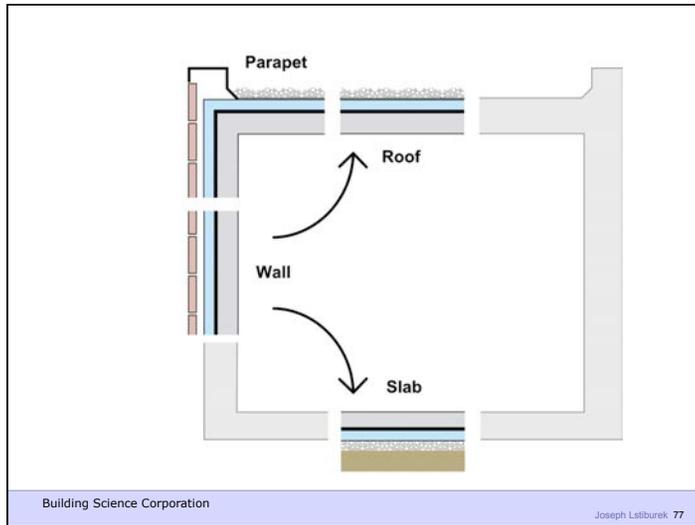
A Building is an Environmental Separator

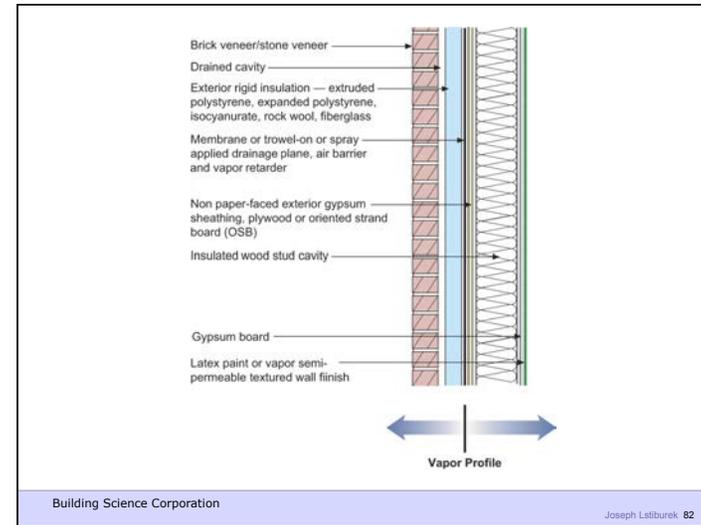
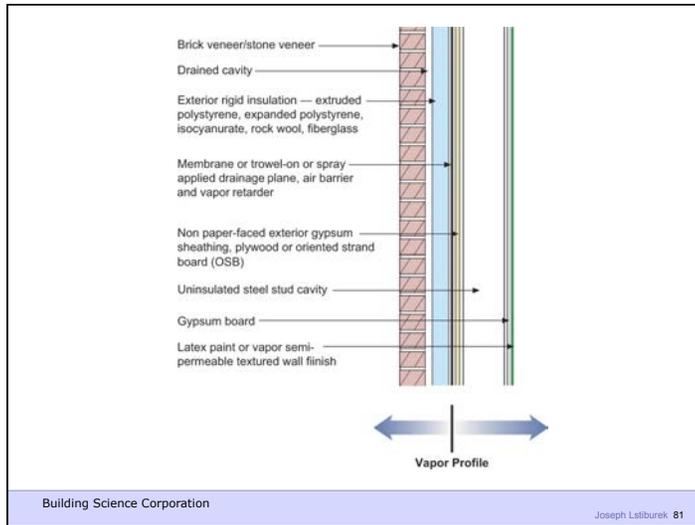
- Control heat flow
- Control airflow
- Control water vapor flow
- Control rain
- Control ground water
- Control light and solar radiation
- Control noise and vibrations
- Control contaminants, environmental hazards and odors
- Control insects, rodents and vermin
- Control fire
- Provide strength and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

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









Commercial Enclosure: Simple Layers

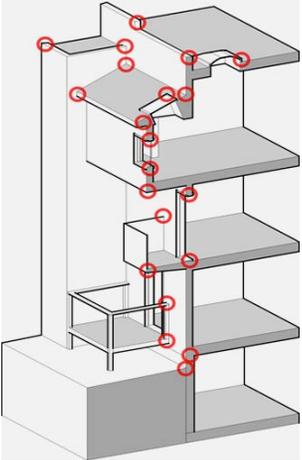


- Structure
- Rain/Air/Vapor
- Insulation
- Finish

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Enclosure Design: Details

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



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