

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

Building Science

Adventures In Building Science

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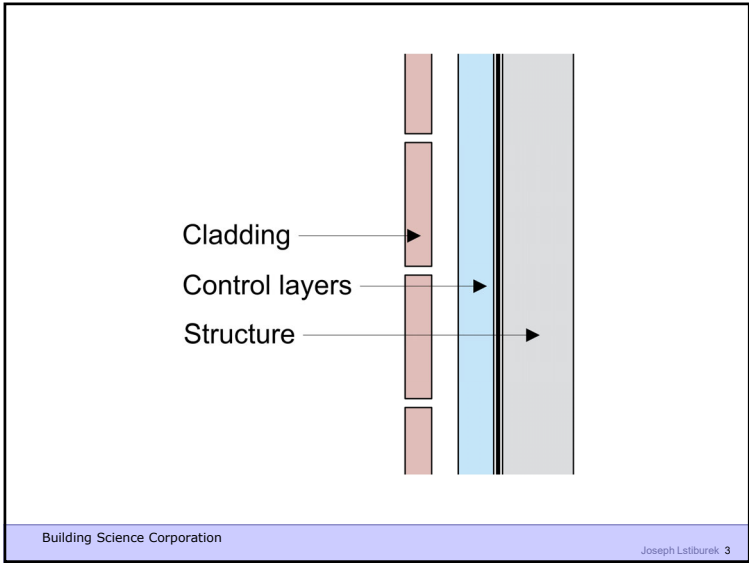
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Water Control Layer
Air Control Layer
Vapor Control Layer
Thermal Control Layer

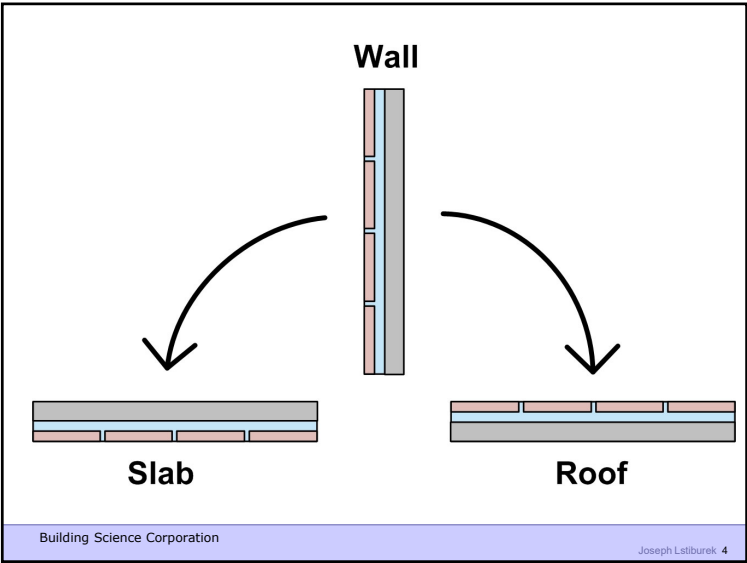
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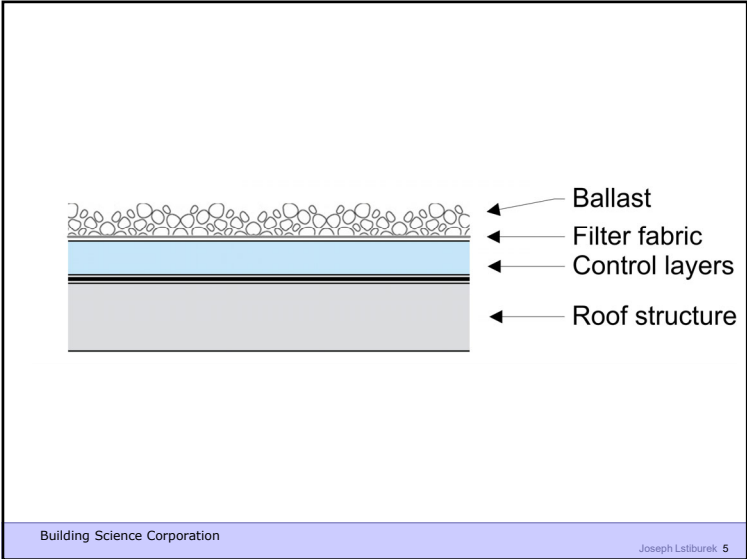
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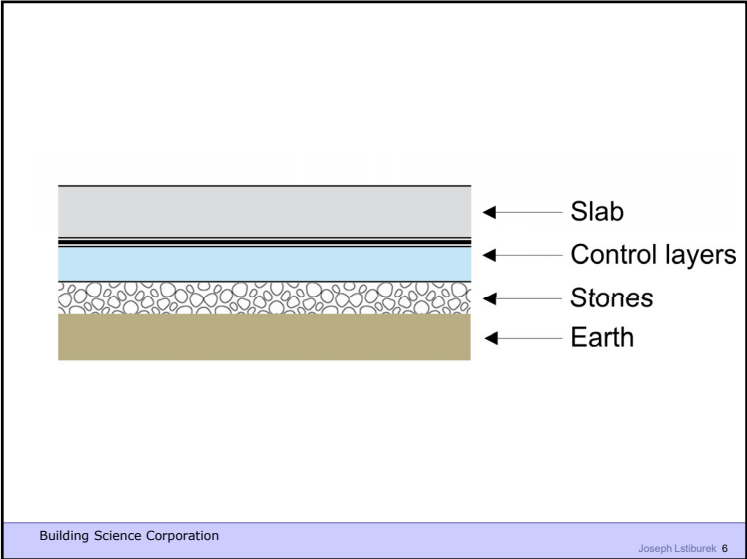
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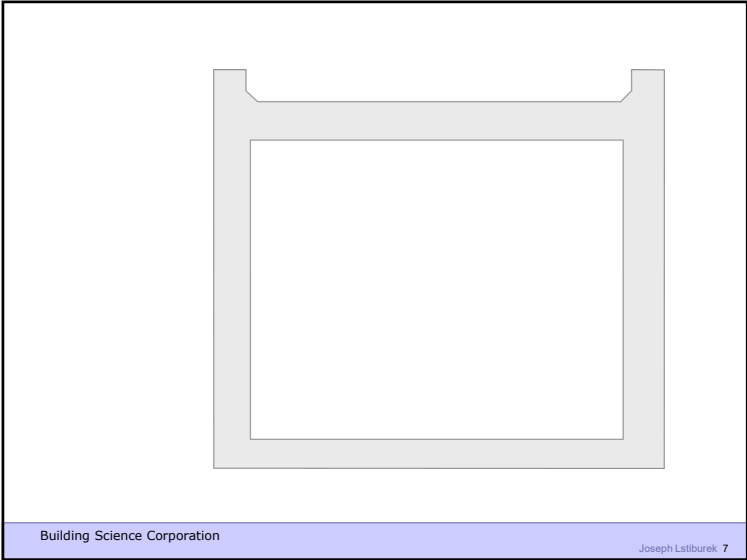
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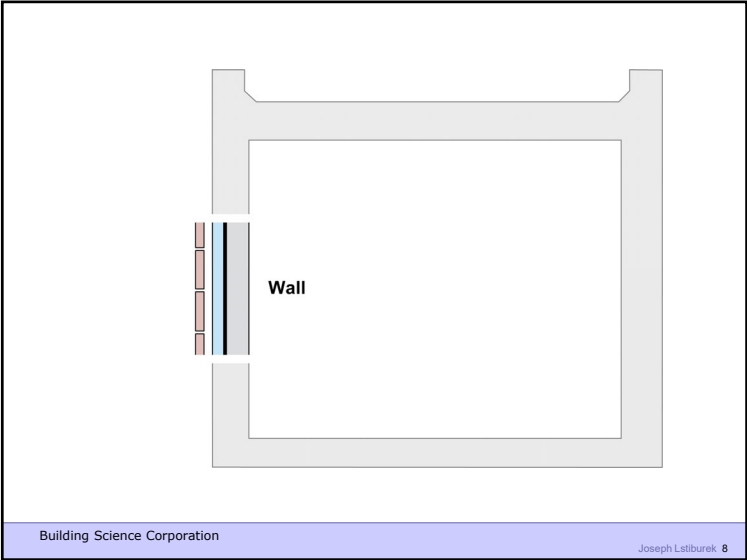
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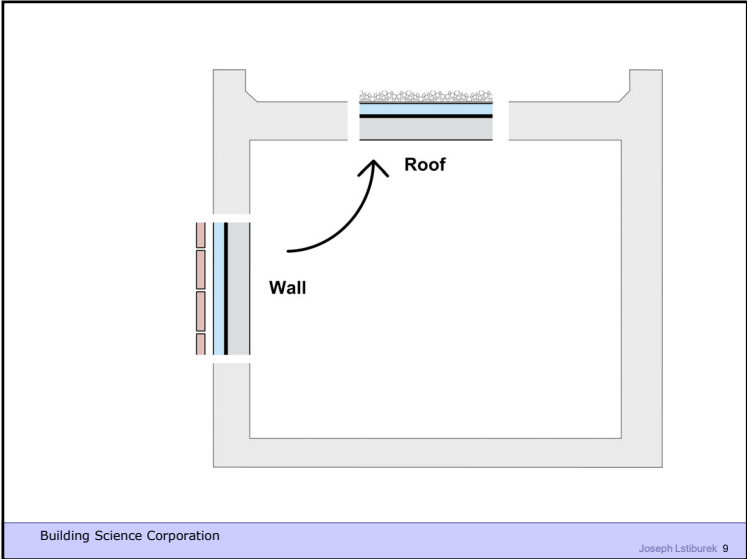
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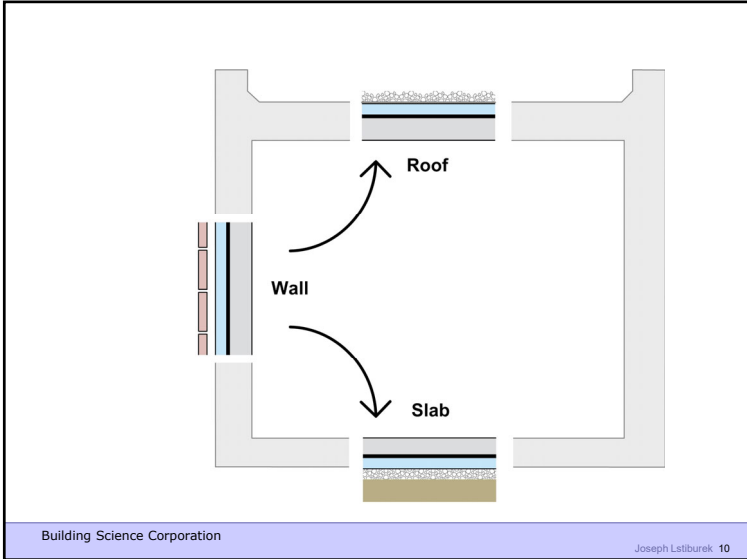
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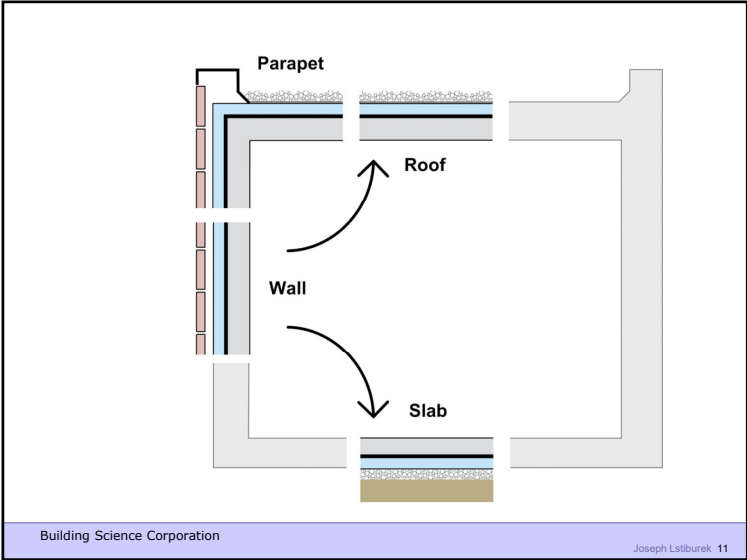
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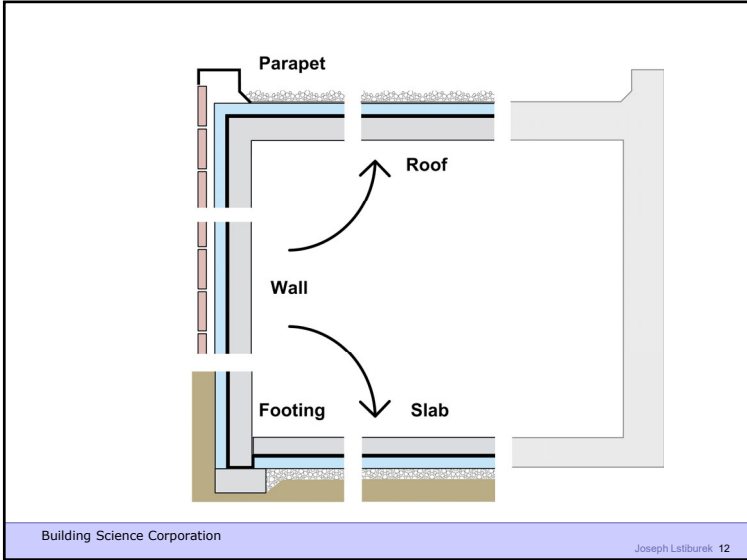
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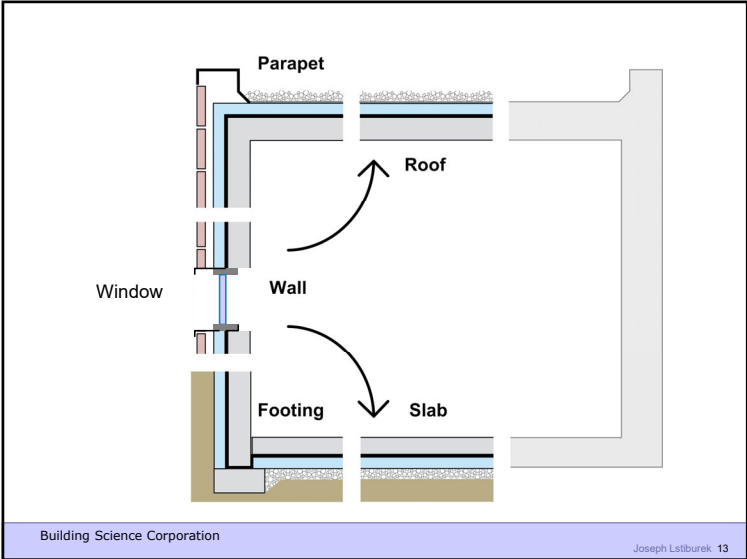
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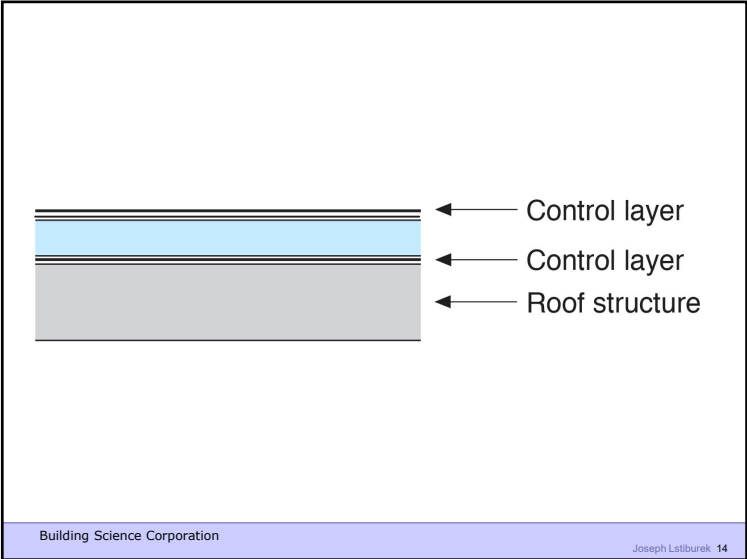
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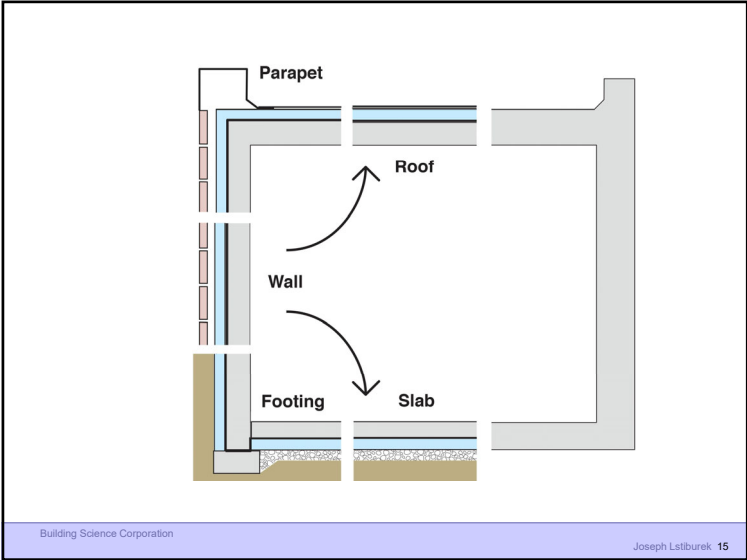
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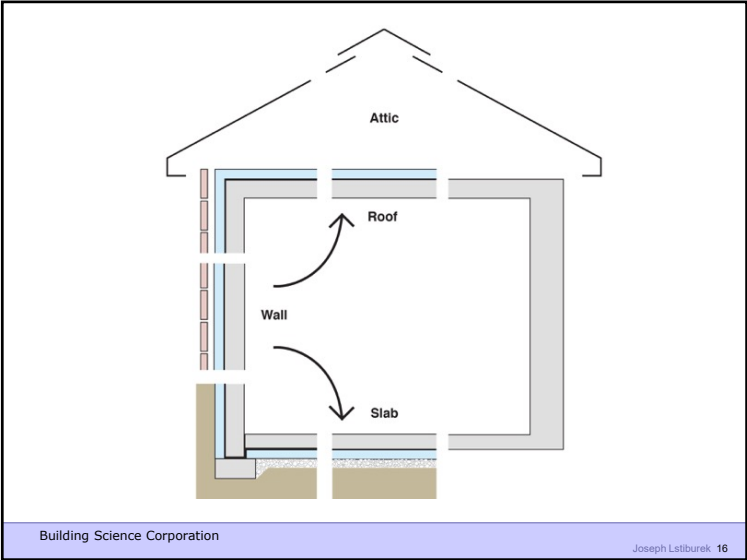
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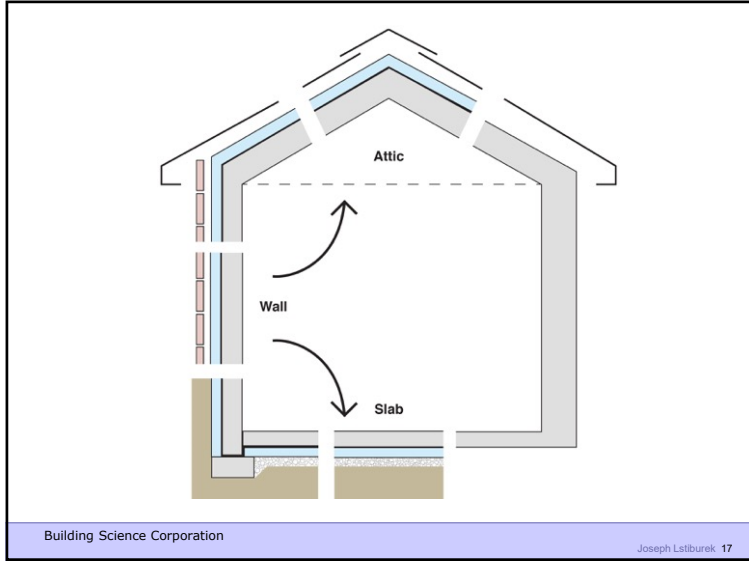
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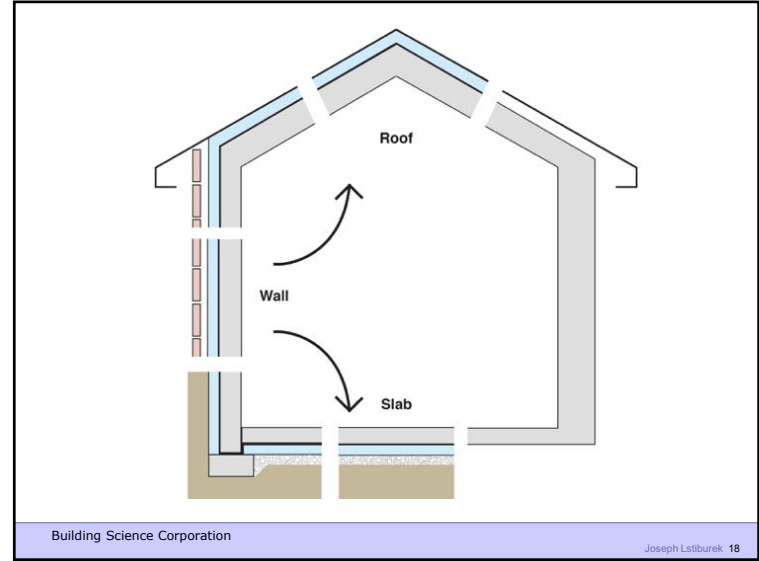
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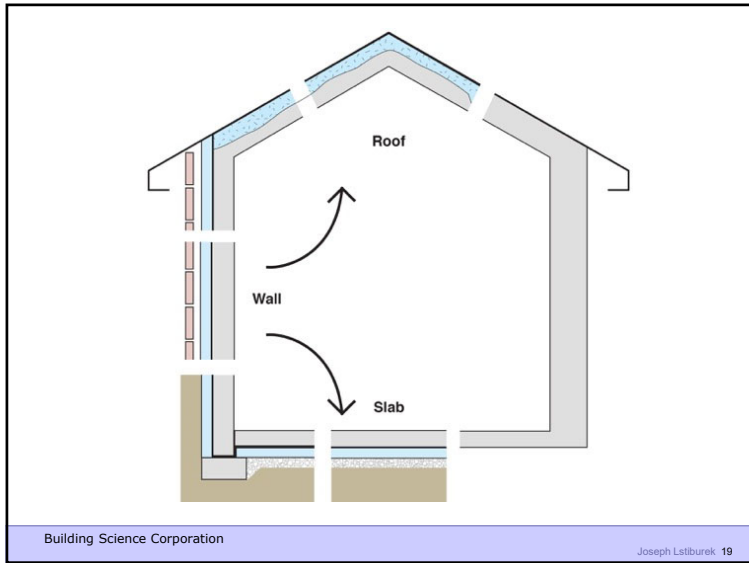
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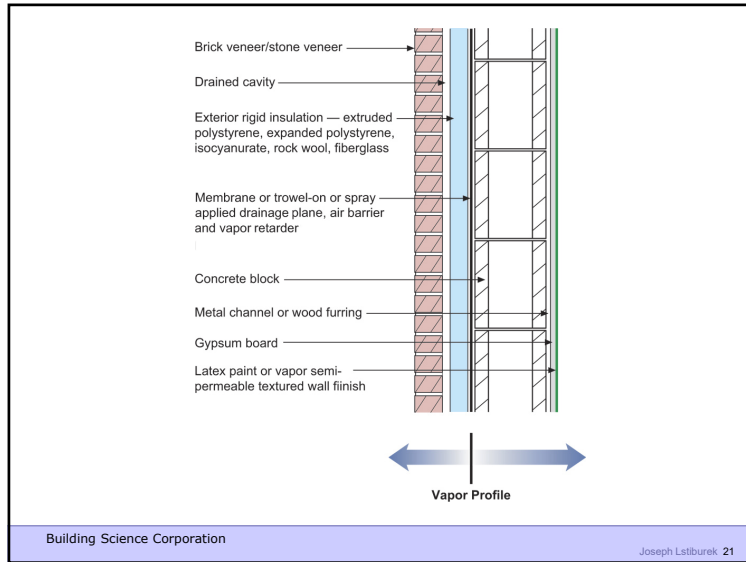


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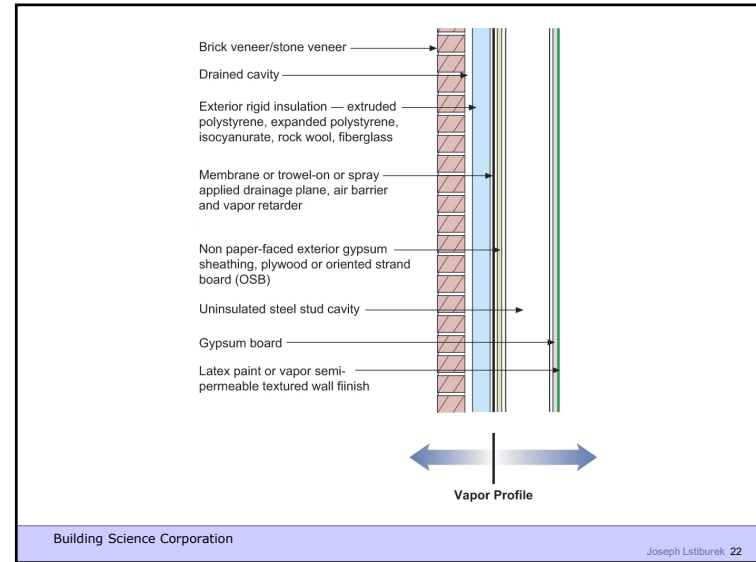
Configurations of the Perfect Wall

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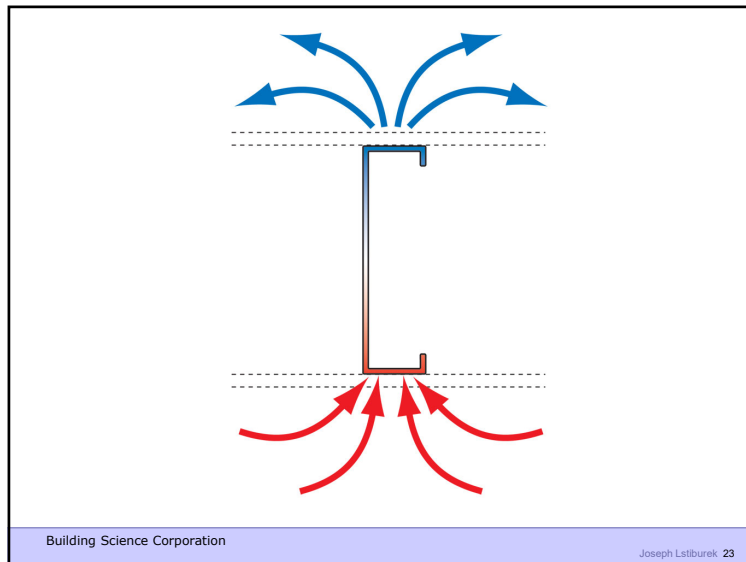
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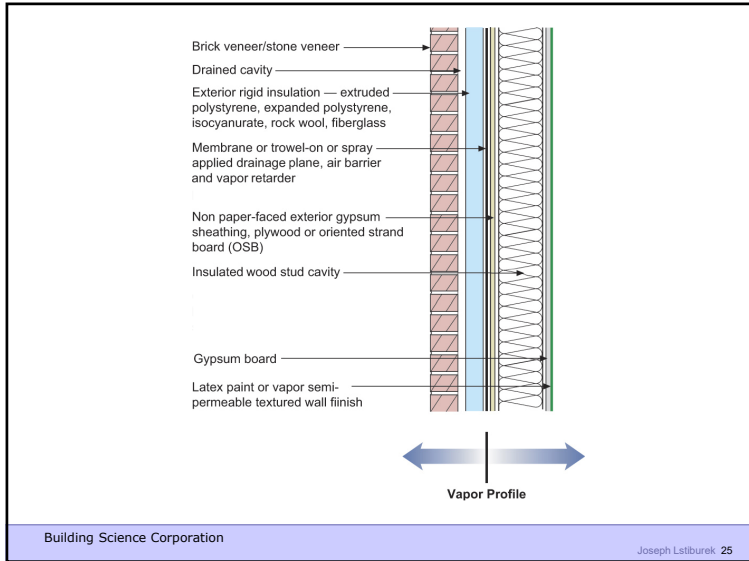
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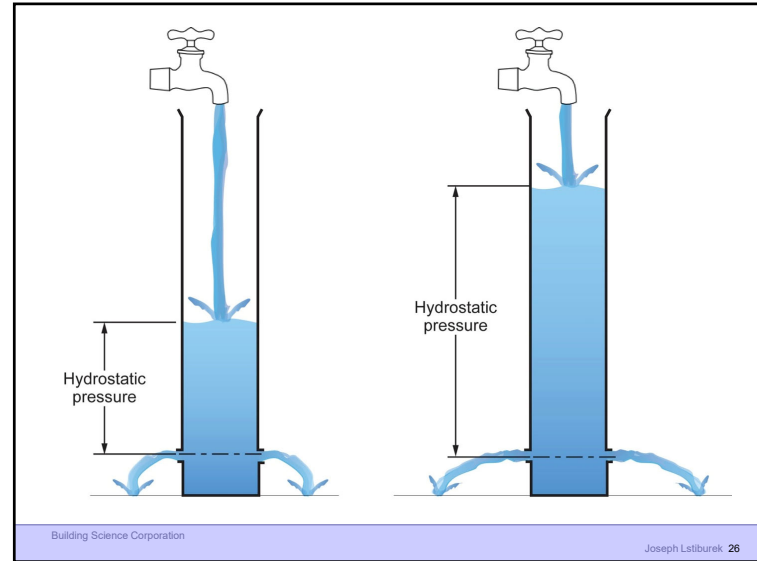
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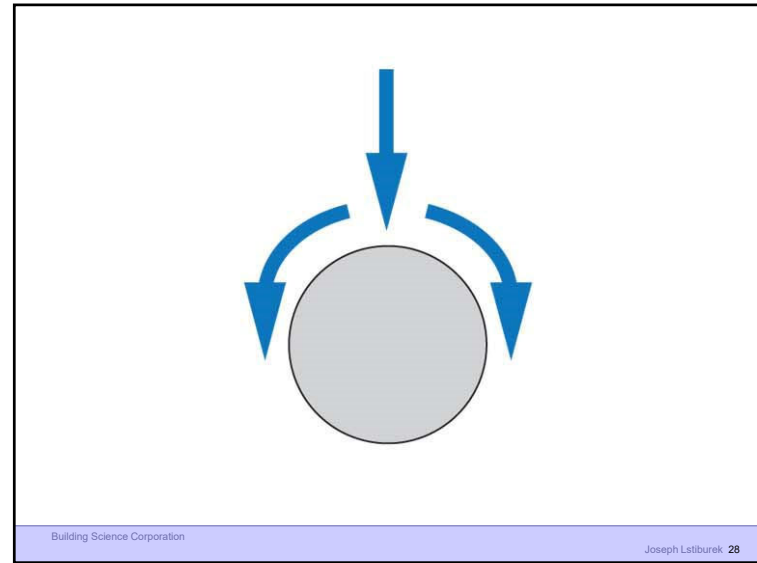
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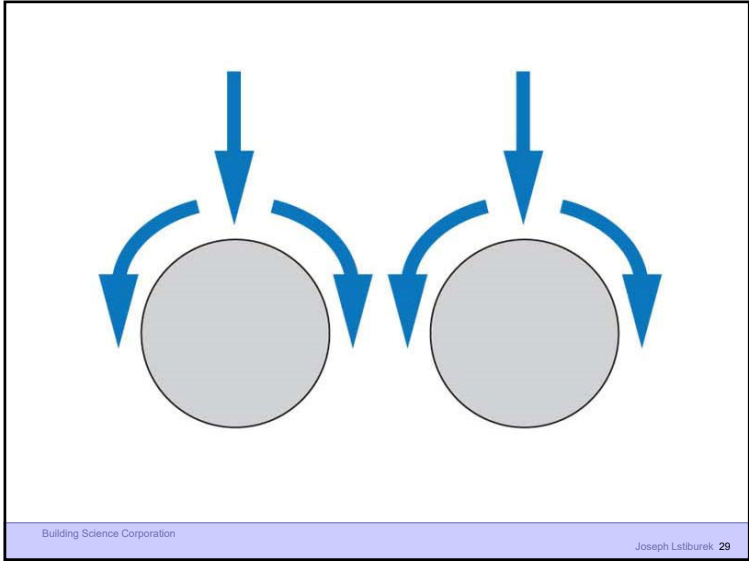
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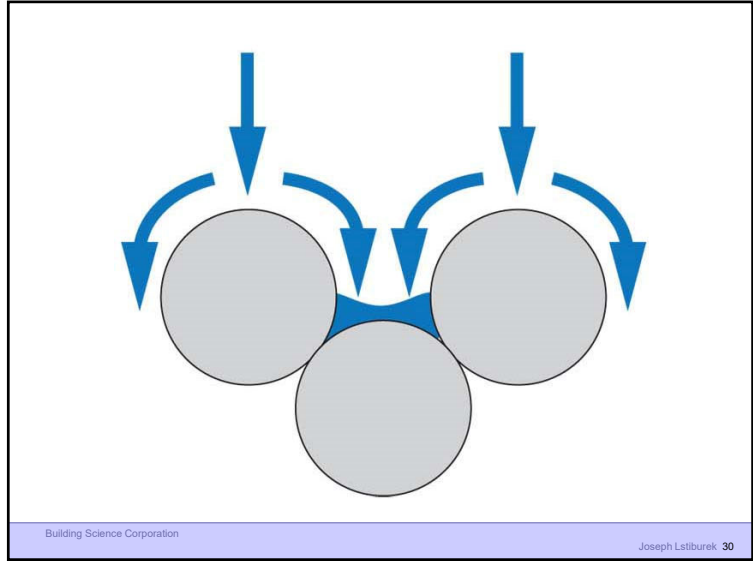
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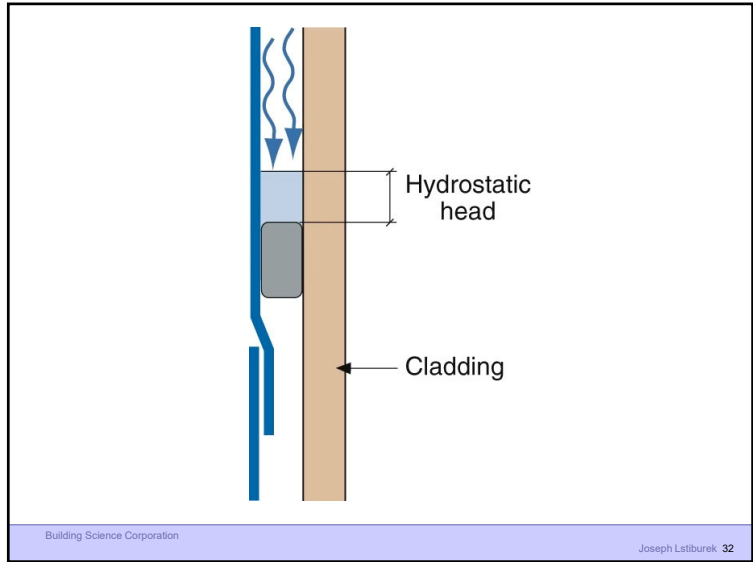
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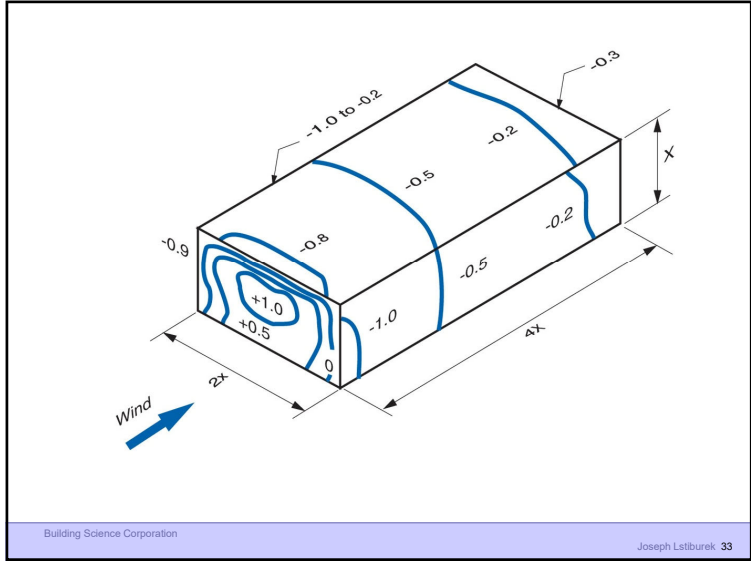
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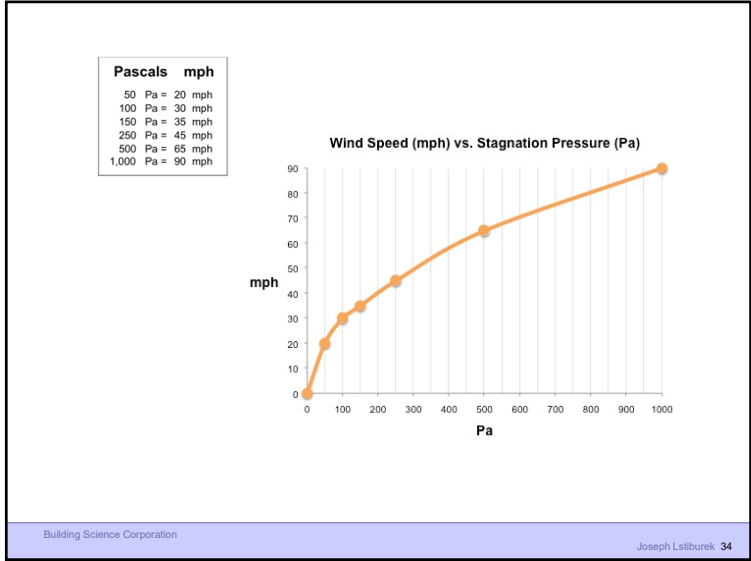
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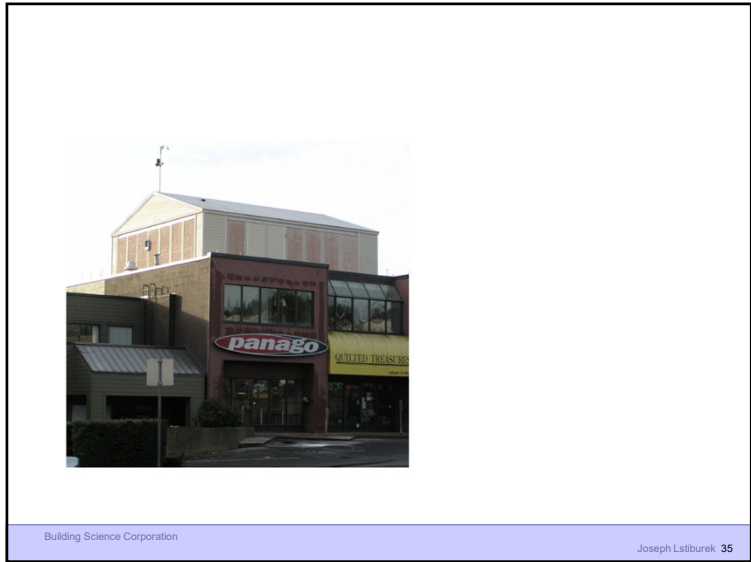
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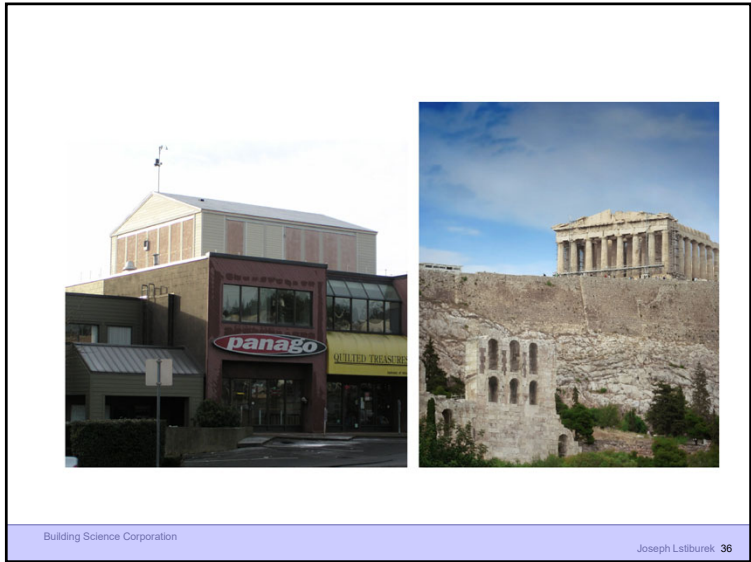
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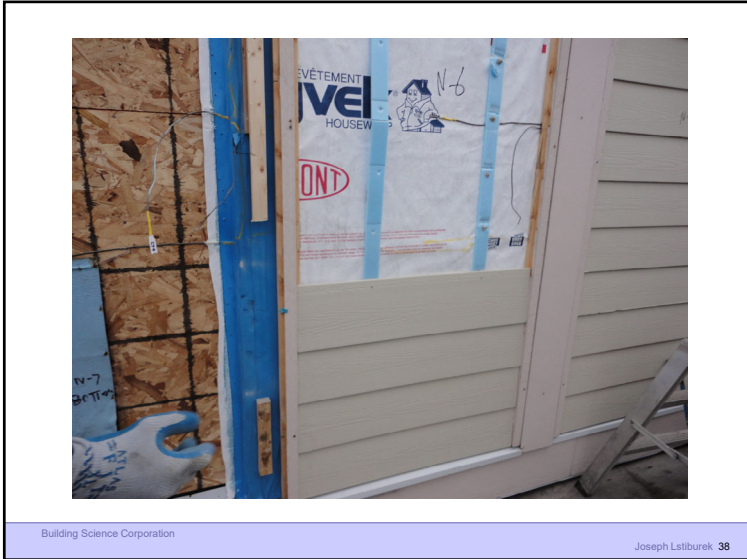
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Joseph Lstiburek – Rain Control 42

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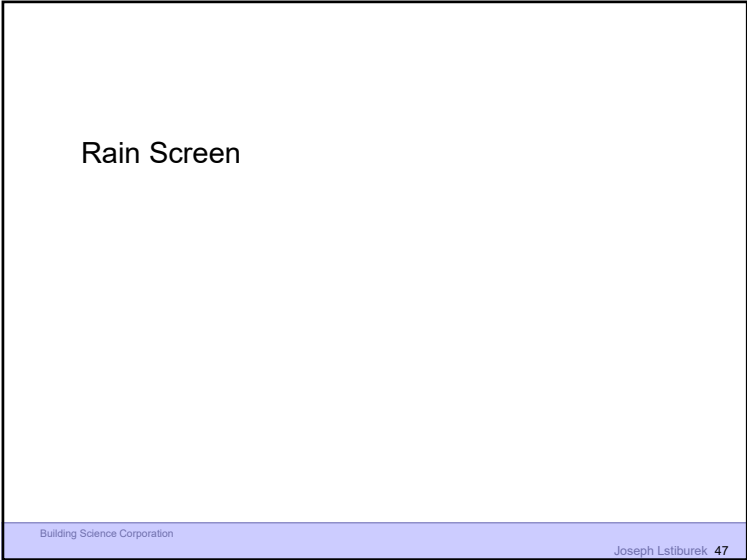
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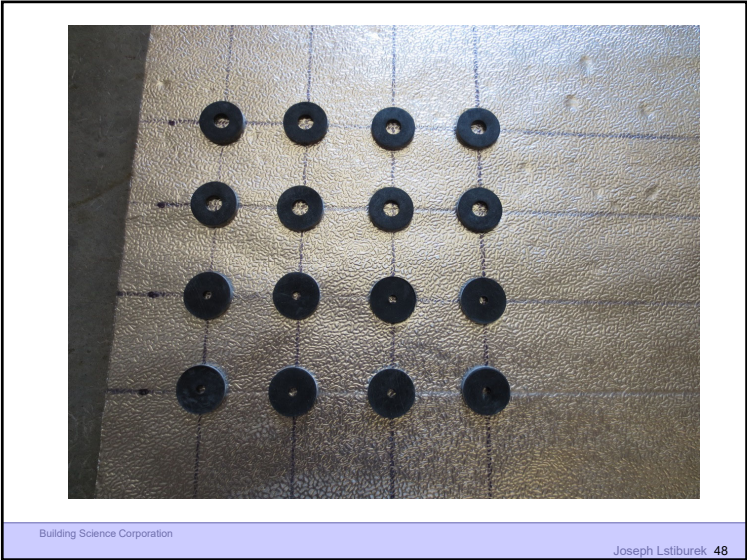
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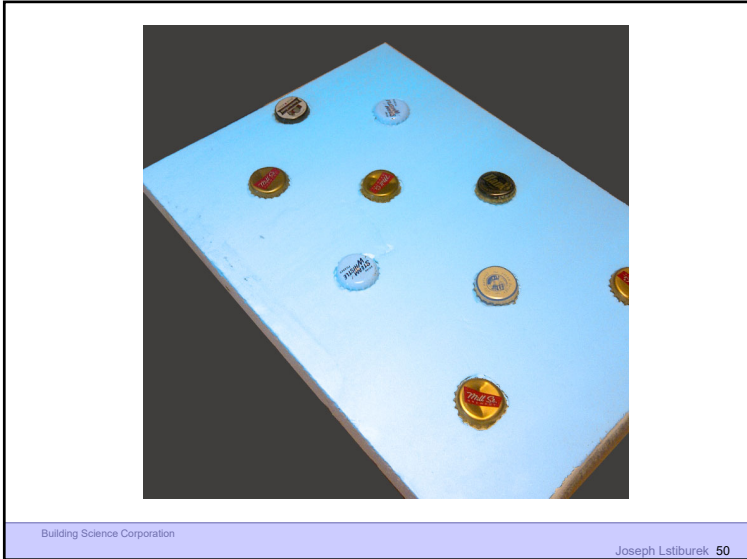


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Beer Screen?

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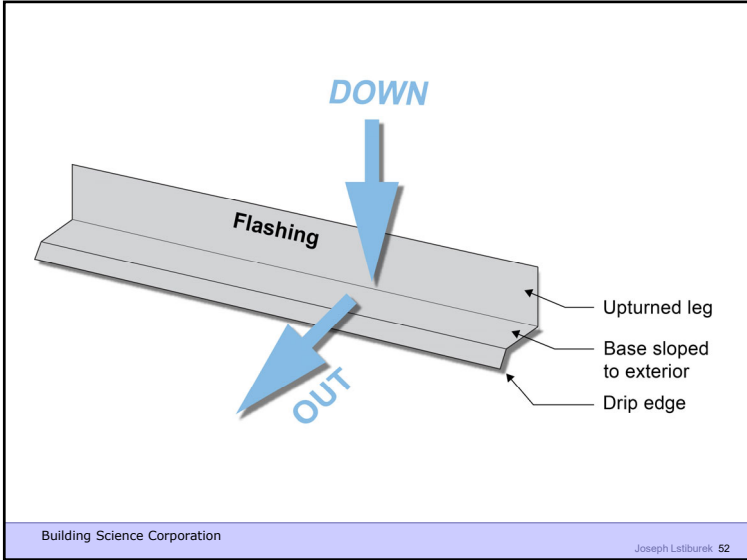


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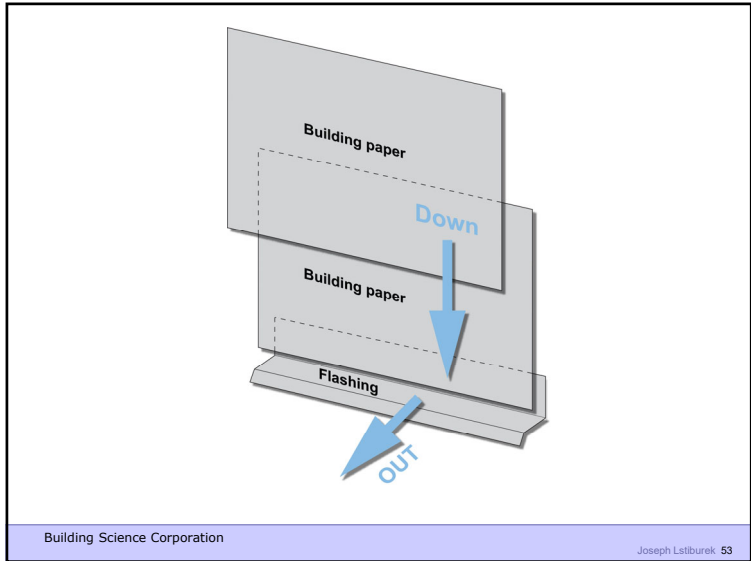
Drain the Rain on the Plane
If You Want to Save Cash...Flash

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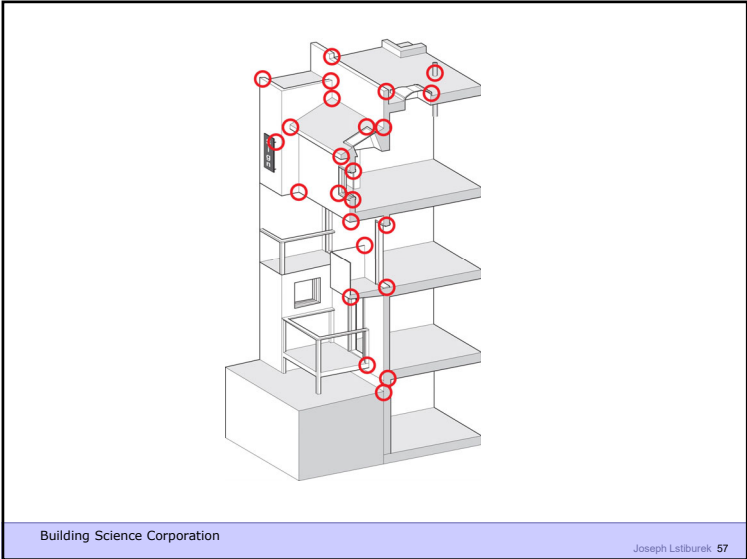
Commercial Enclosure: Simple Layers

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

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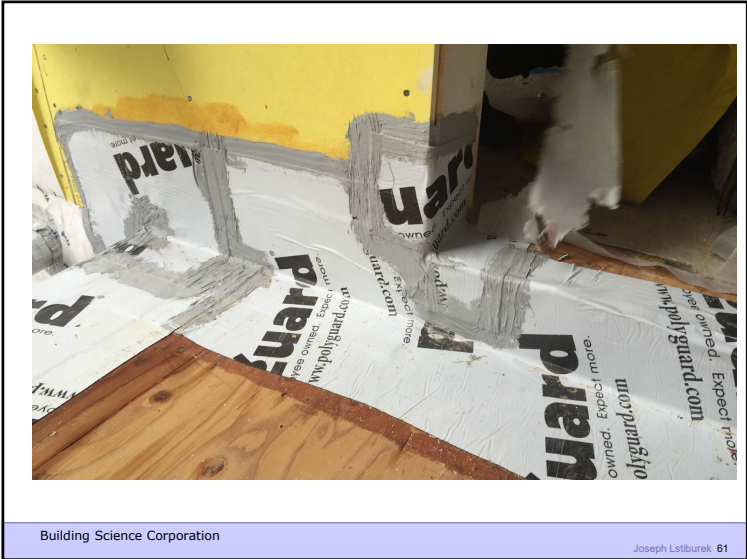
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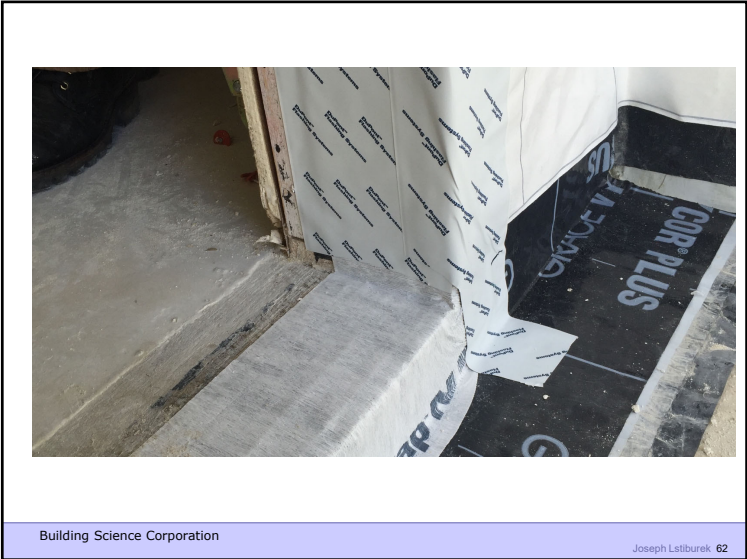
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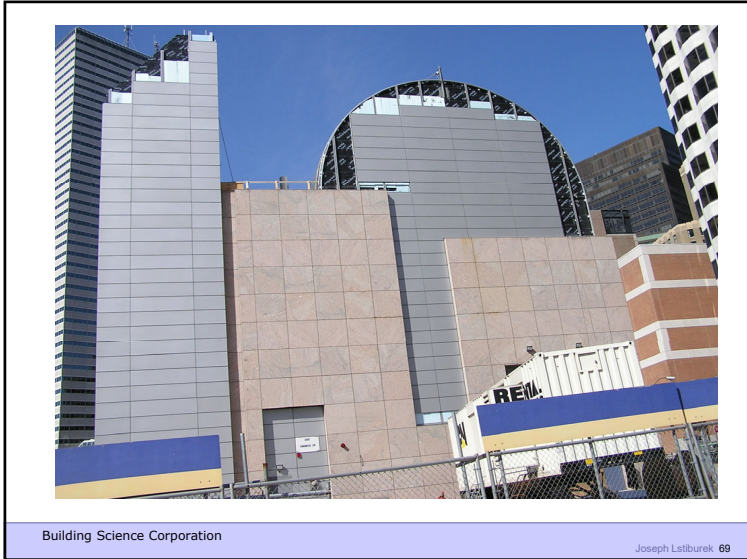
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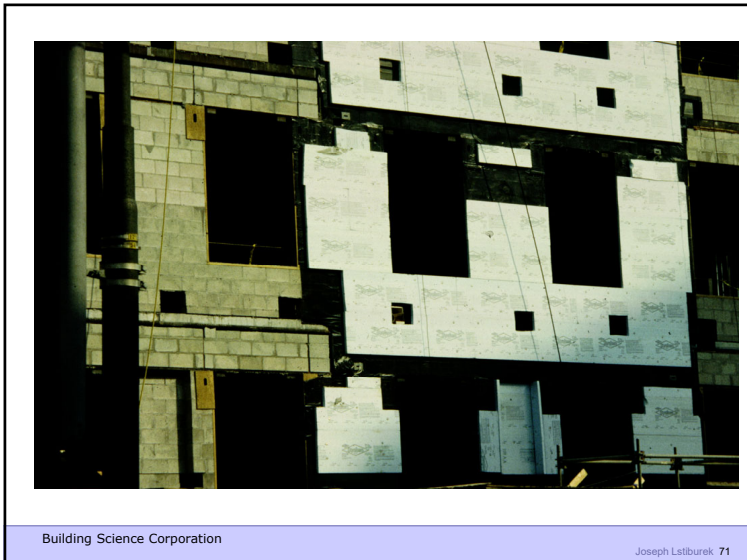
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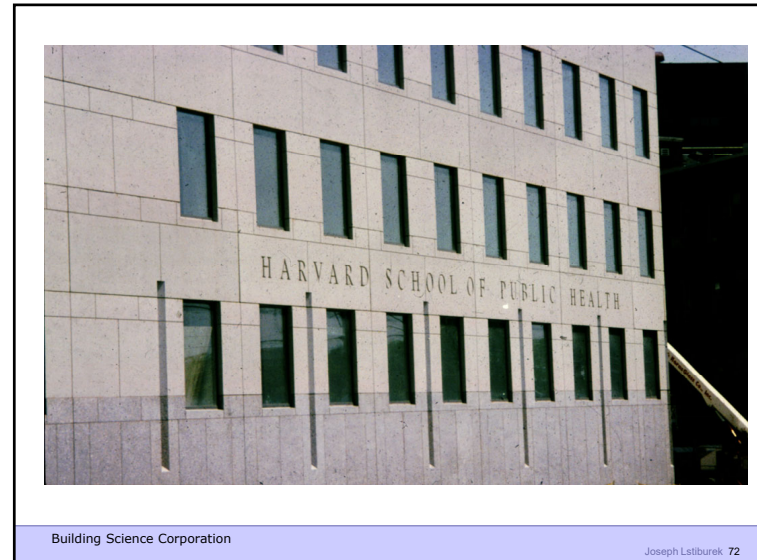
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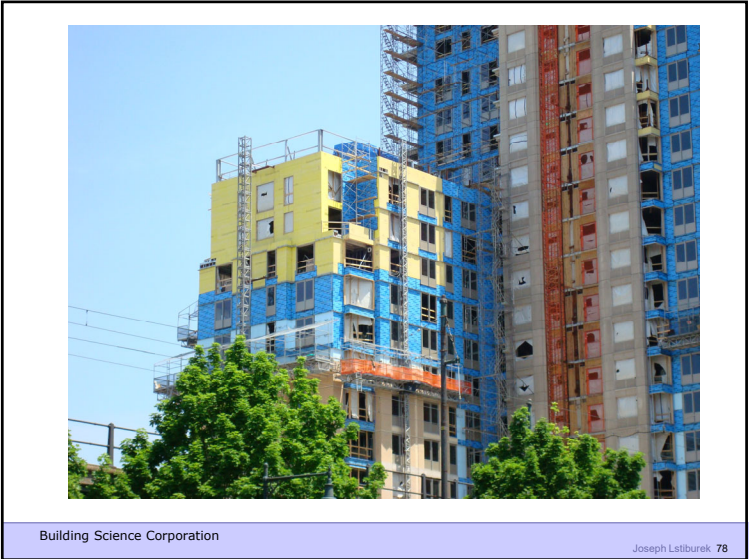
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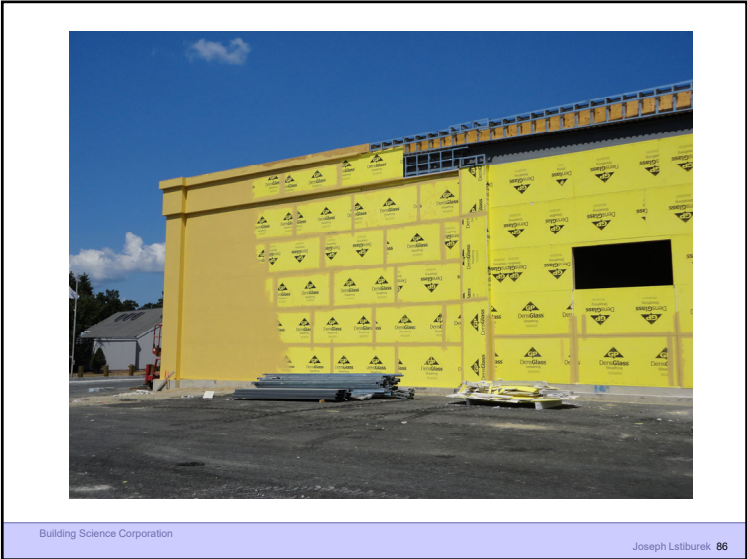
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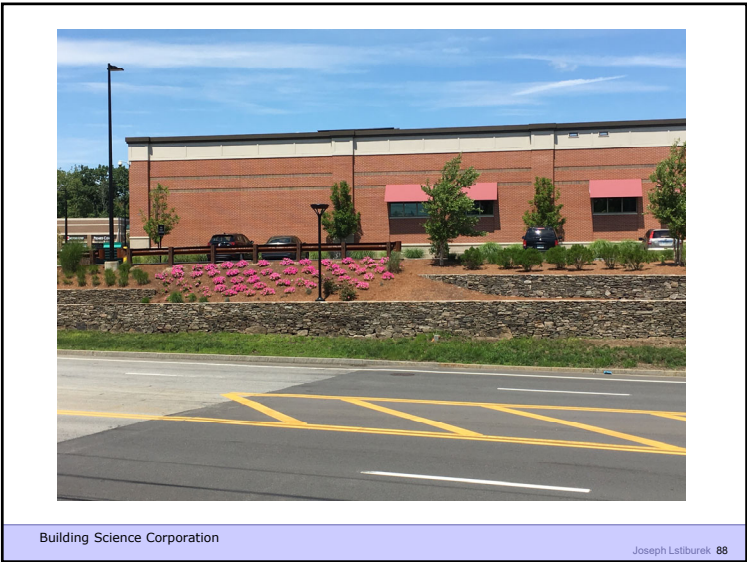
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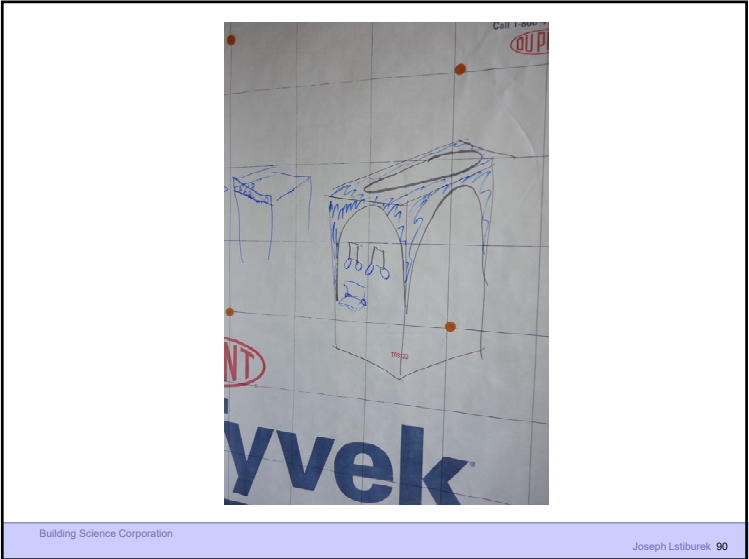
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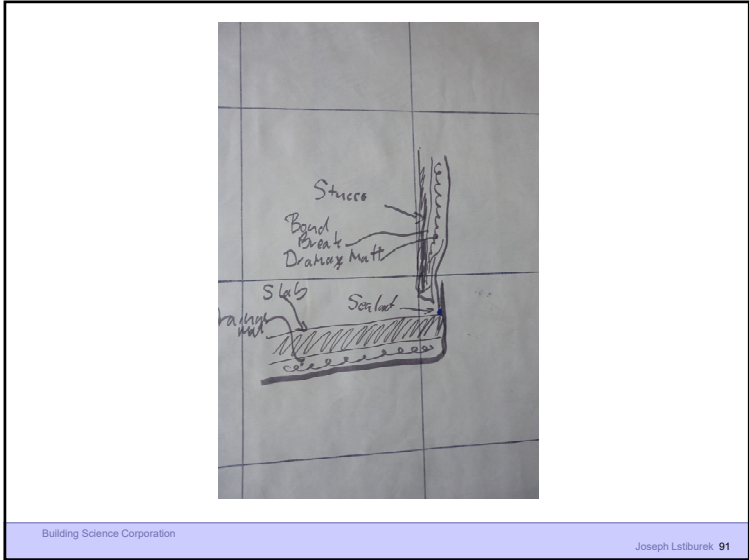
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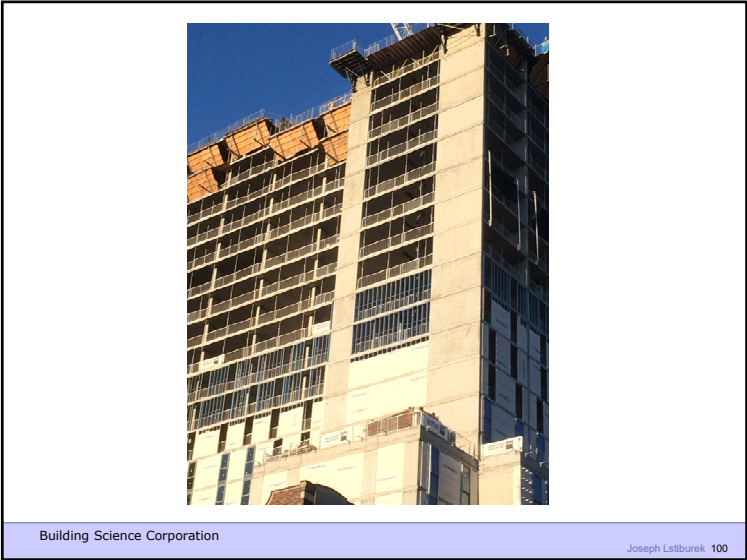
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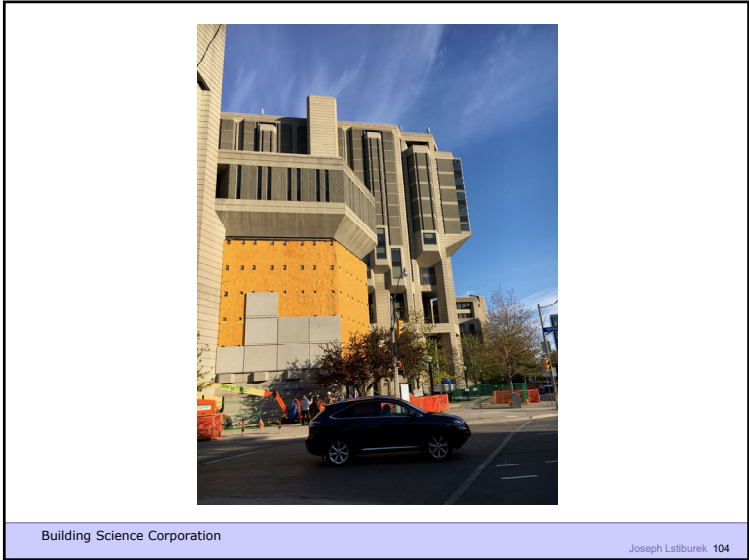
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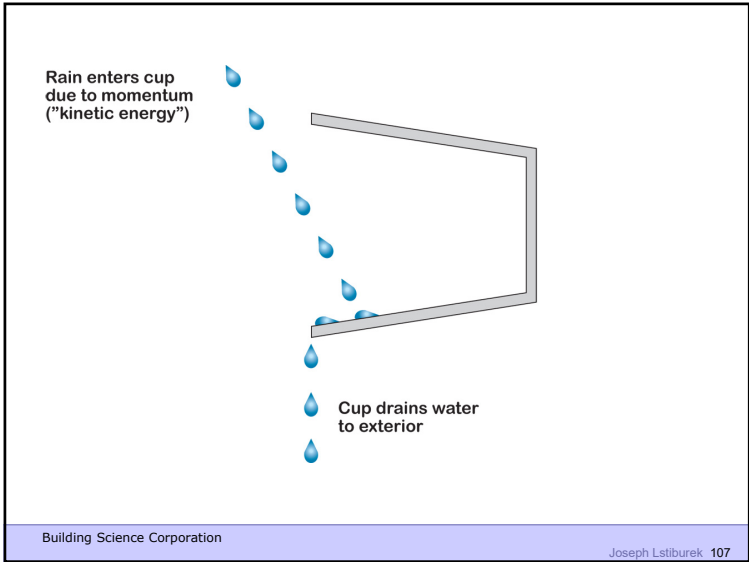
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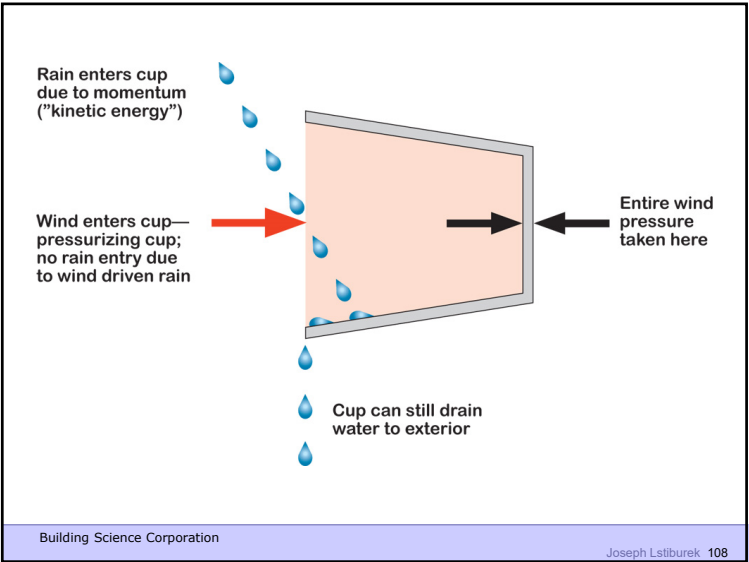
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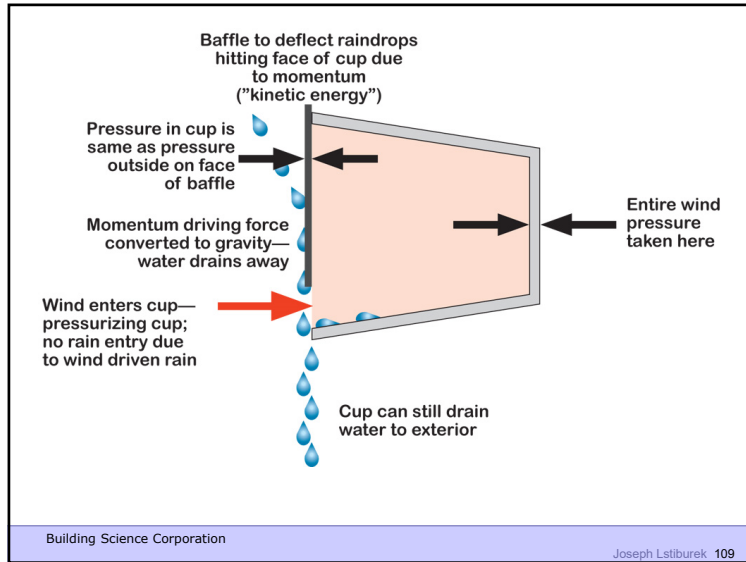
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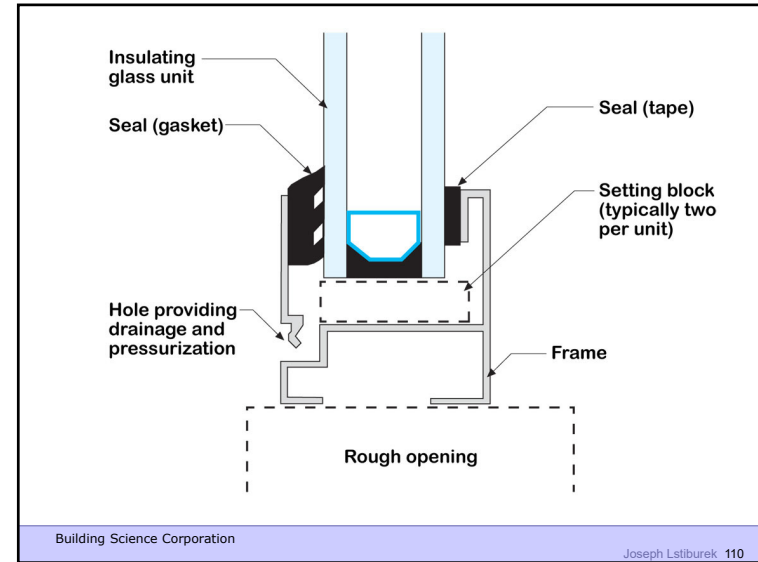
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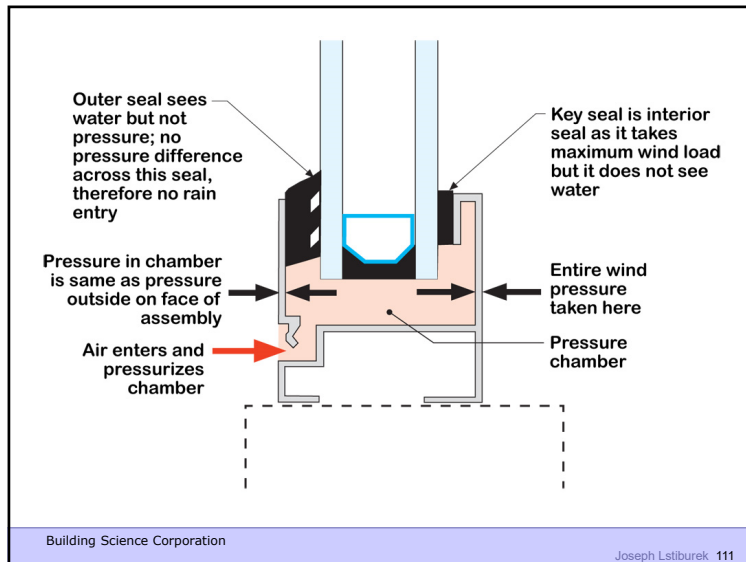
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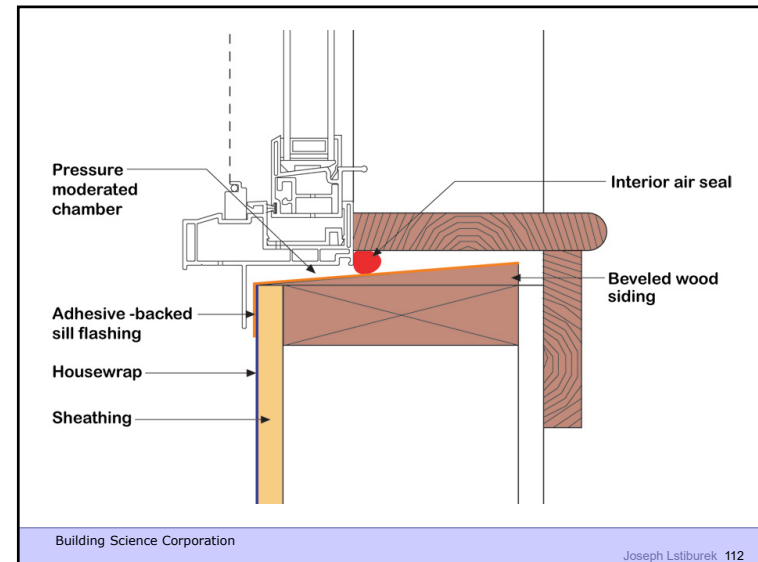
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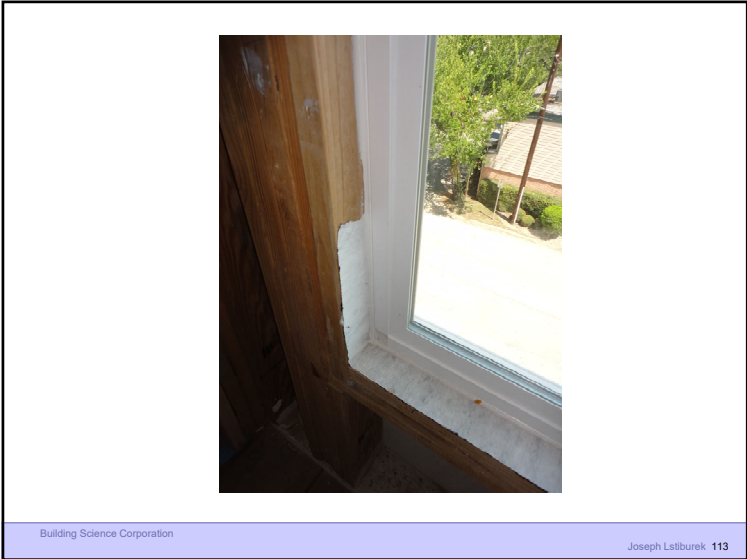
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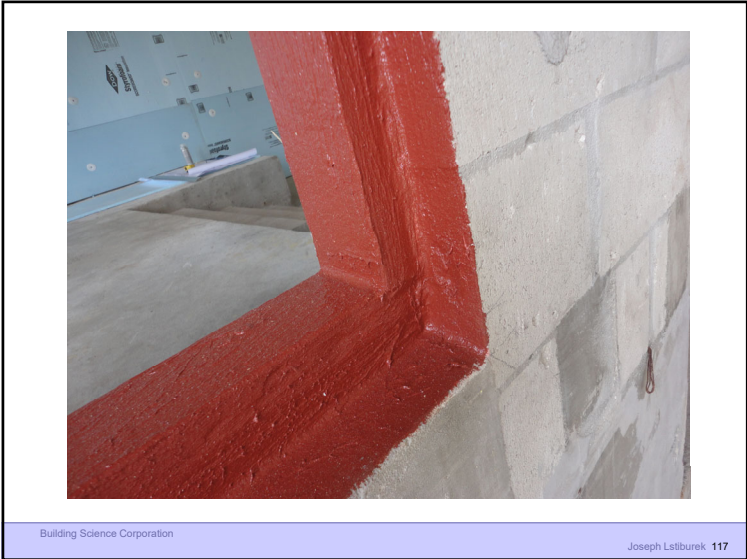
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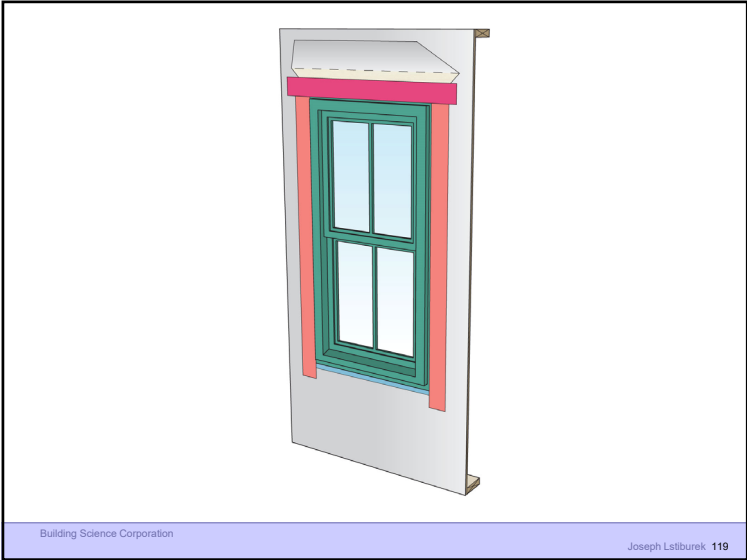
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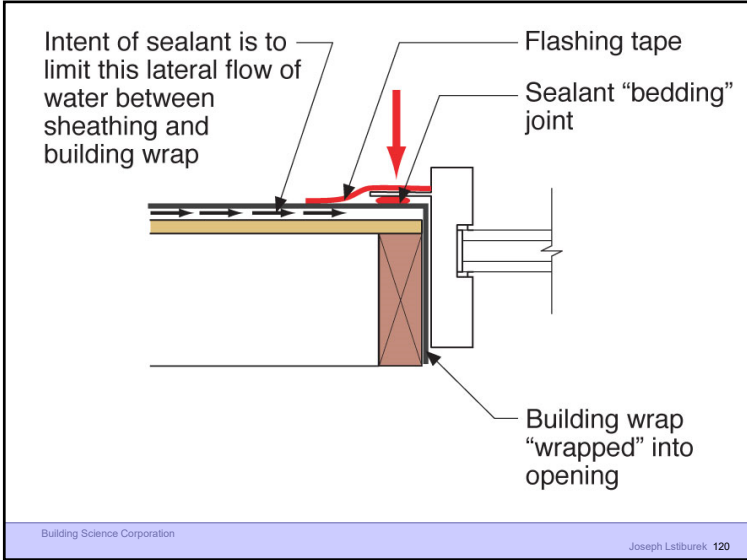
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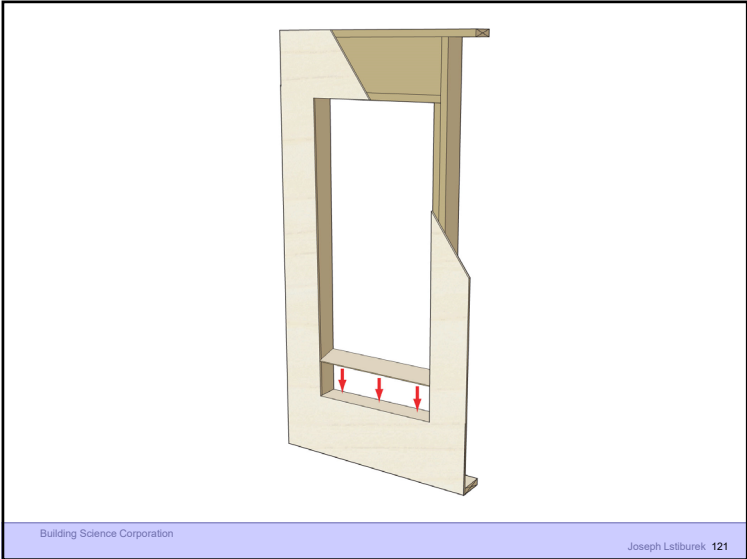
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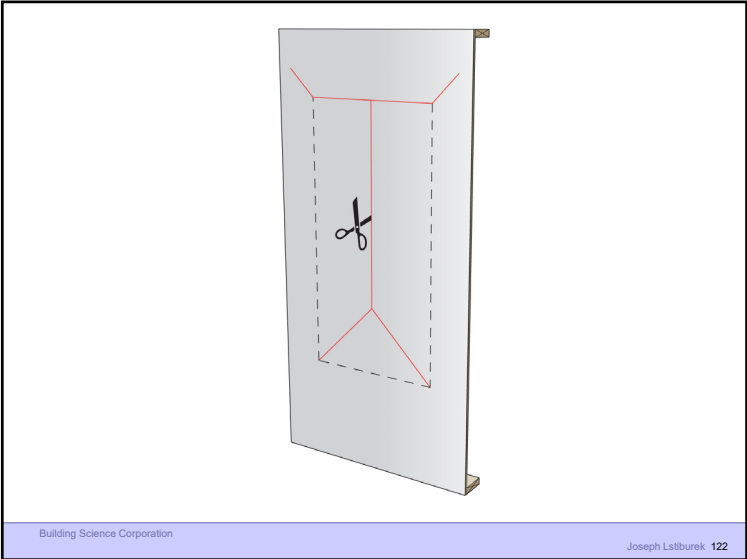


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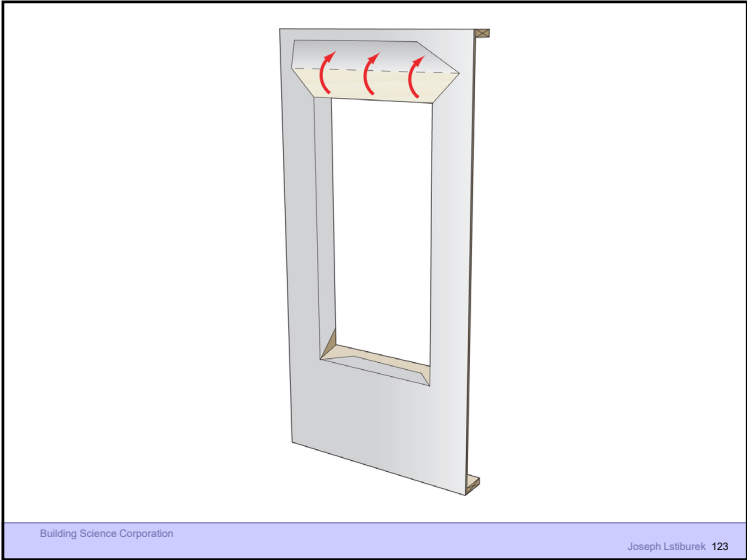
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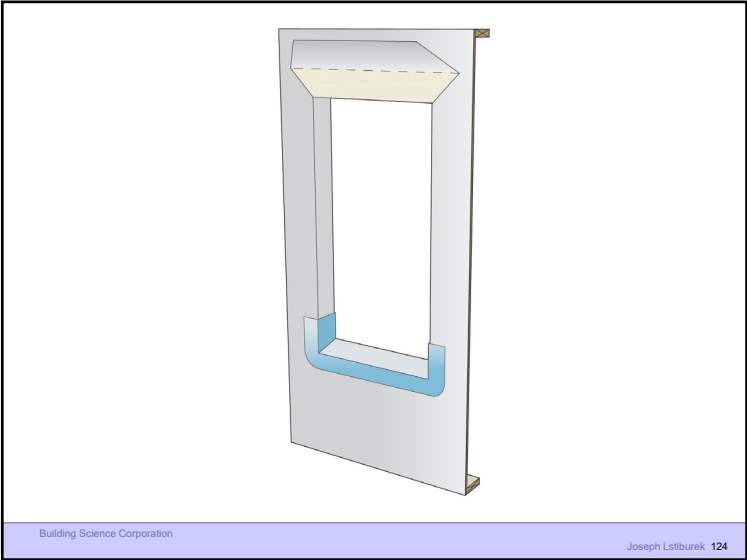
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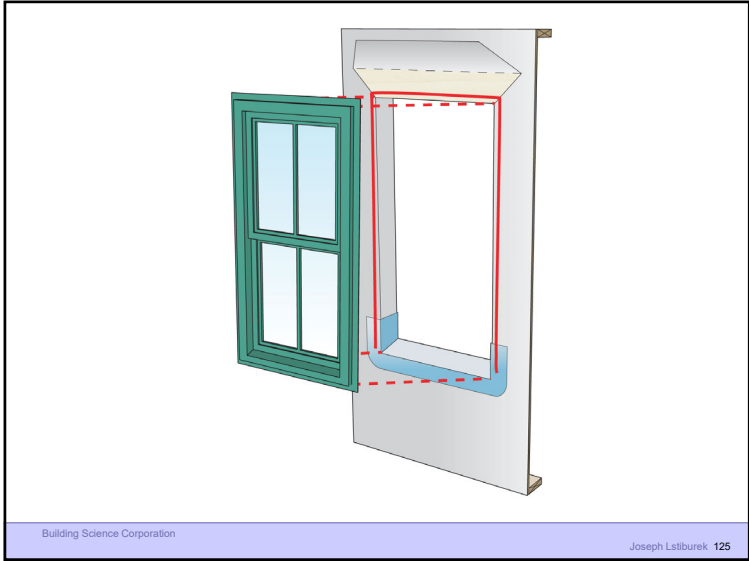
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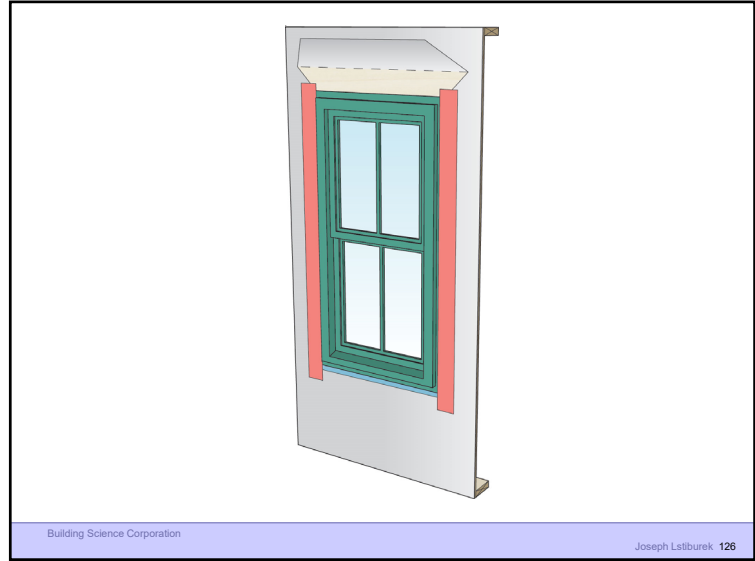
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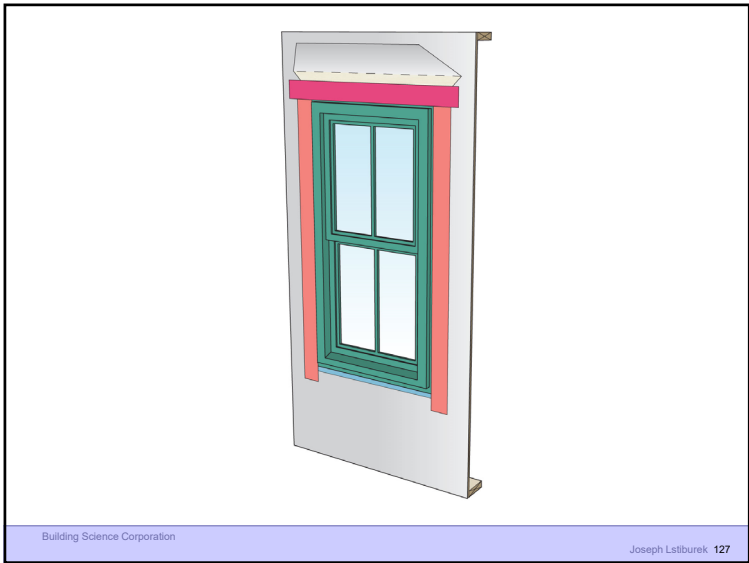
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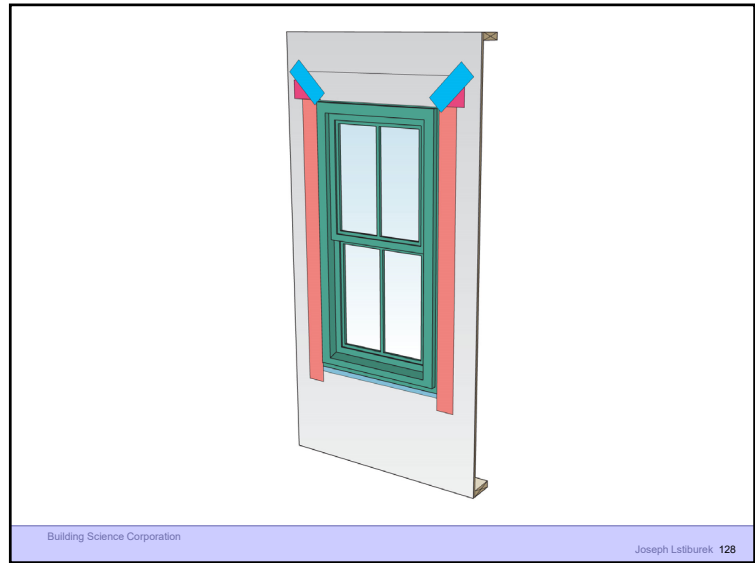
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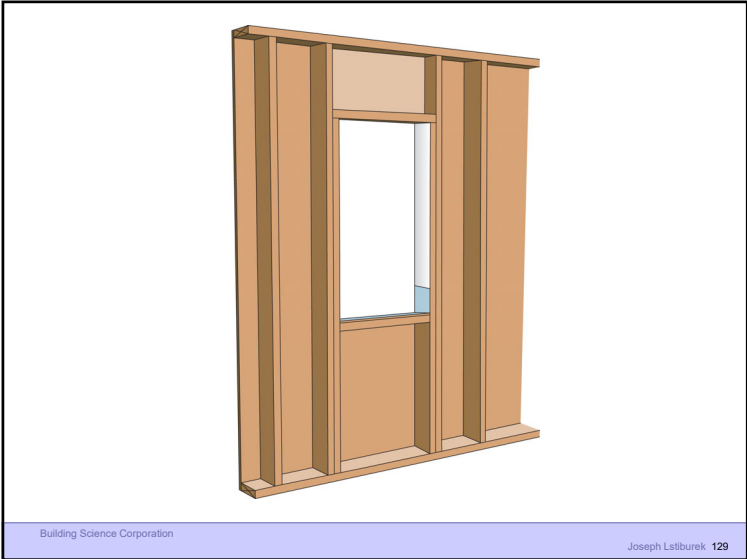
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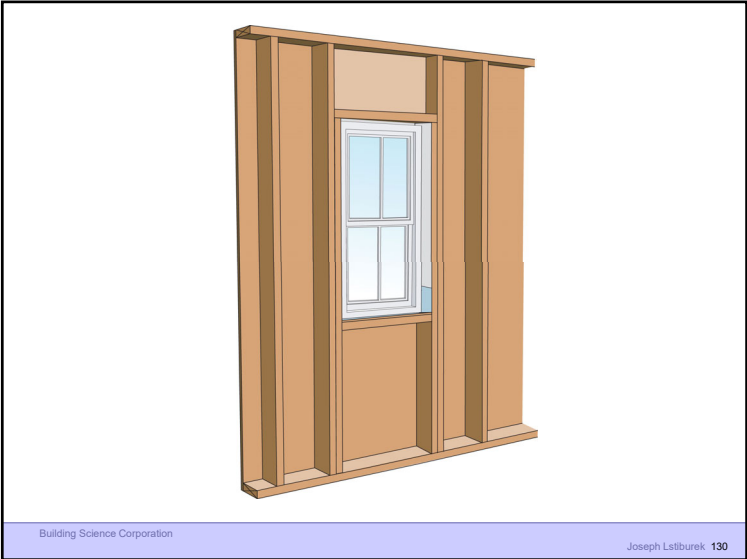
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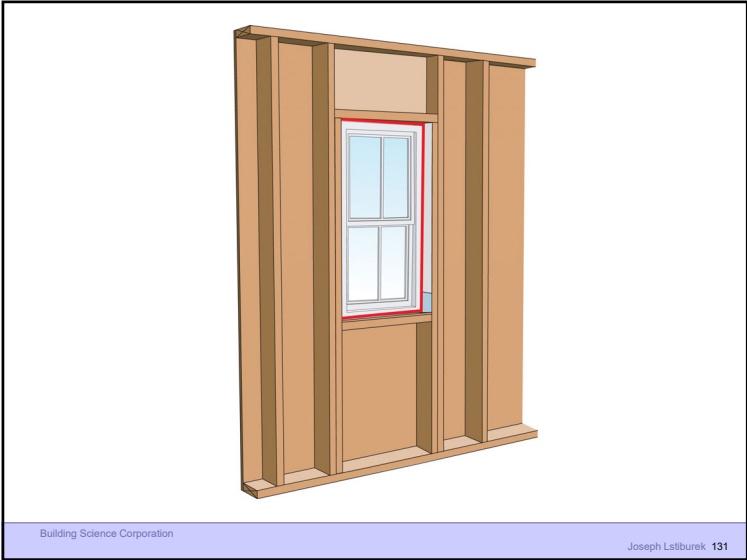
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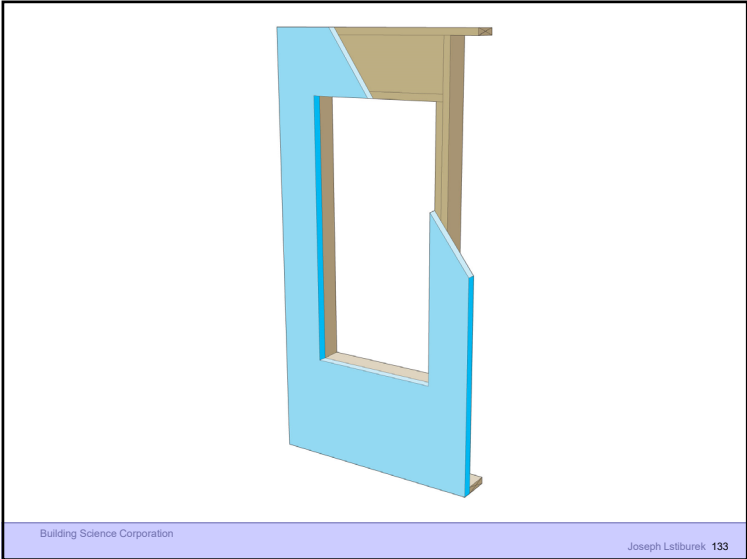
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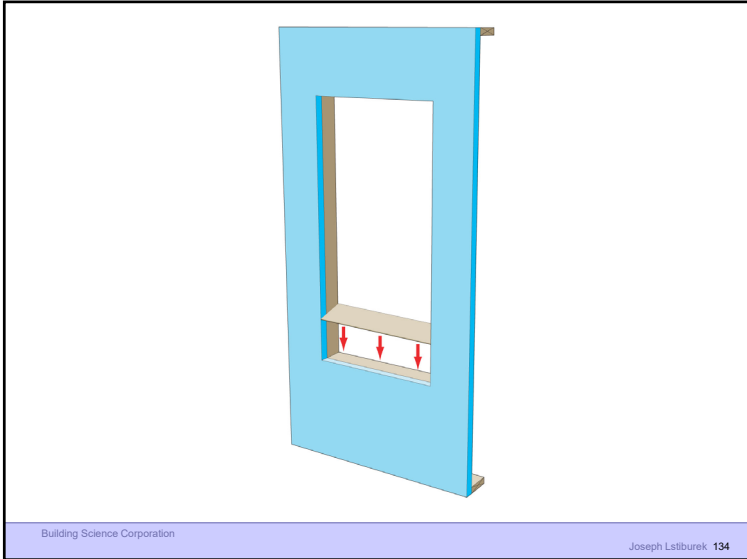
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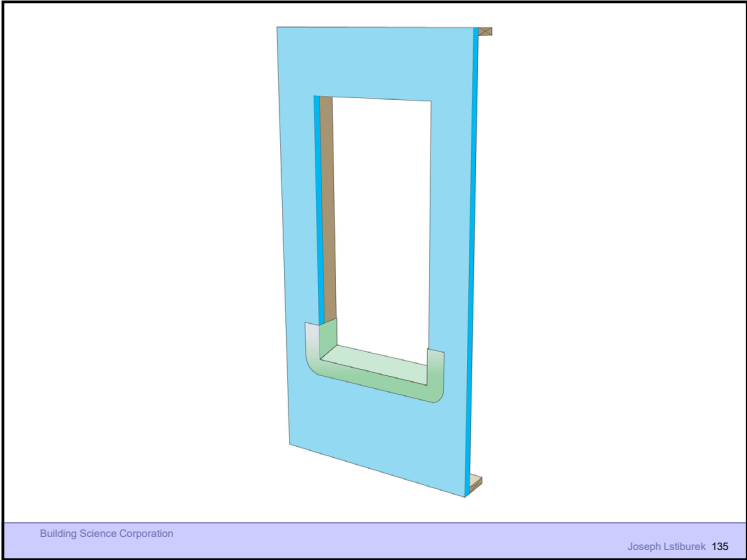
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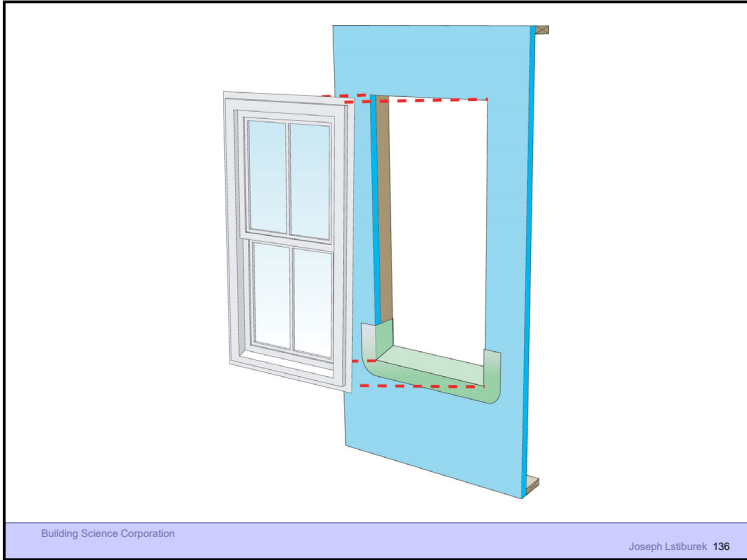
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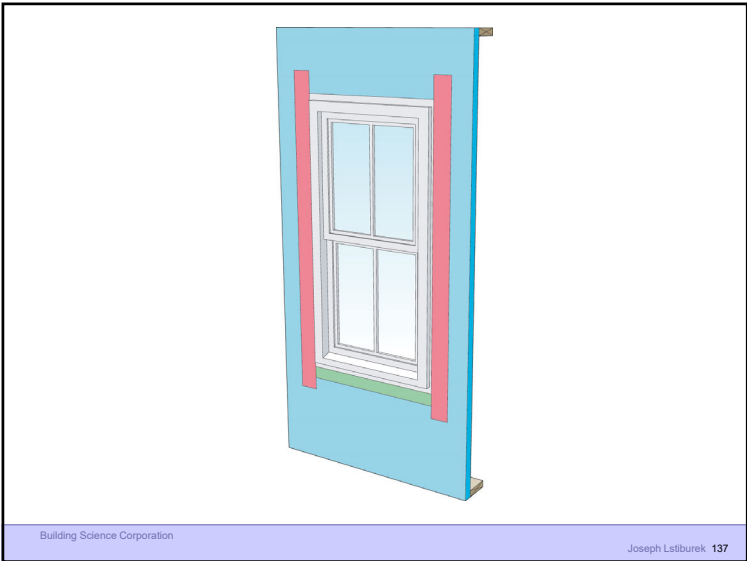
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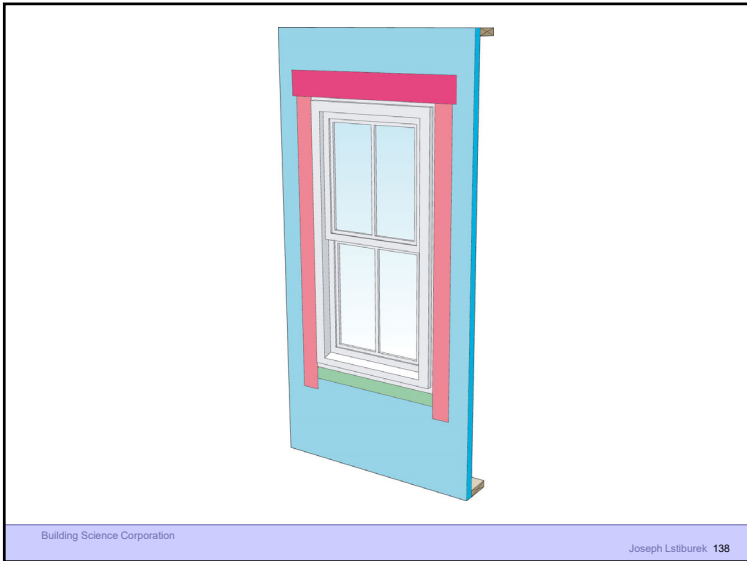
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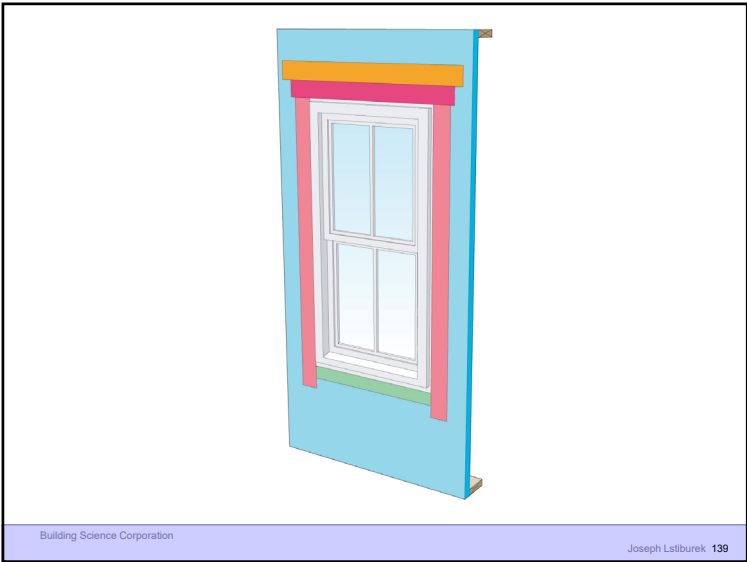
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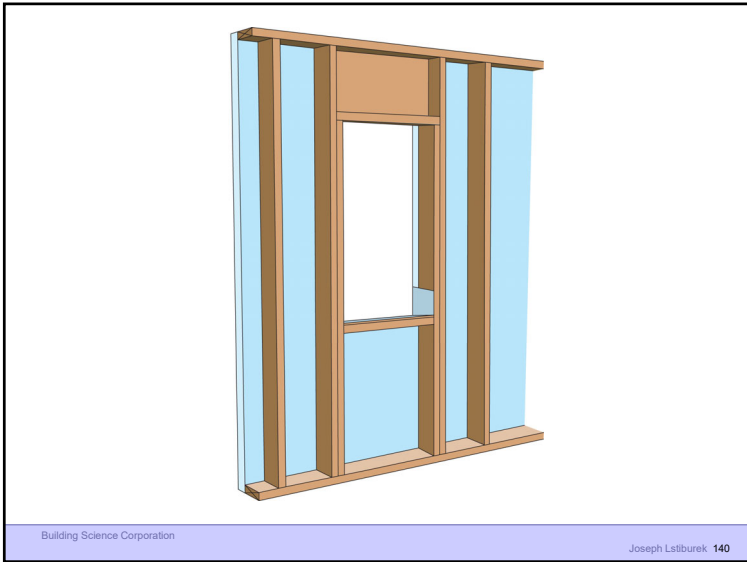
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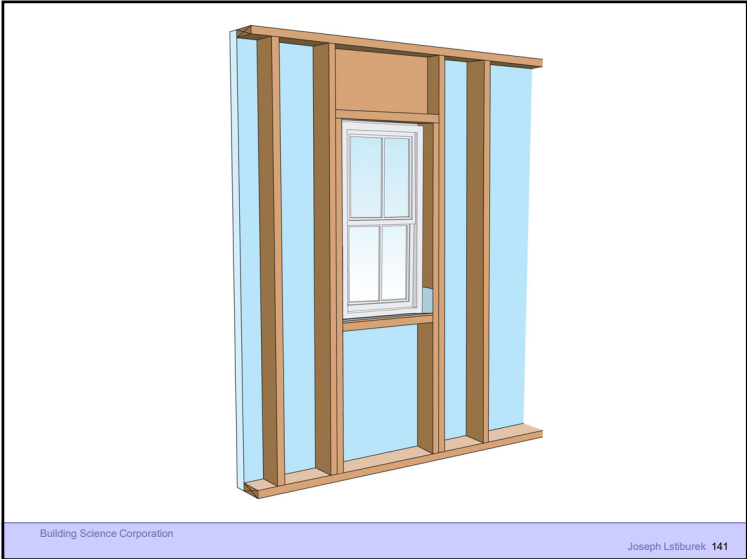
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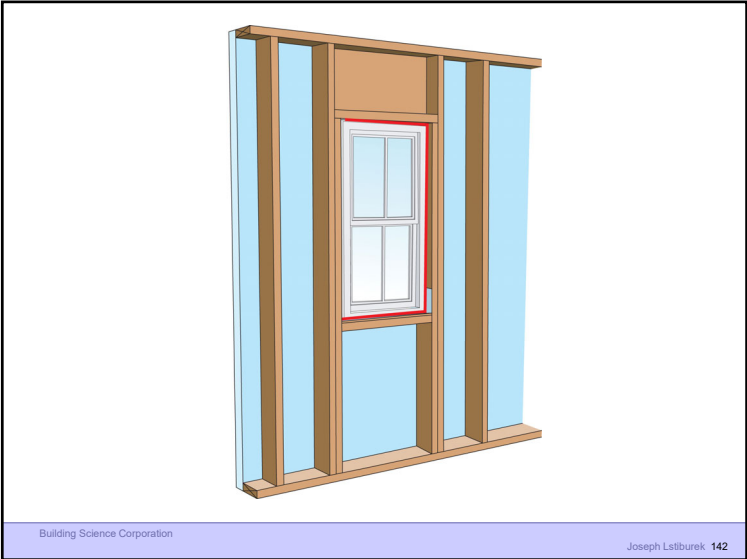
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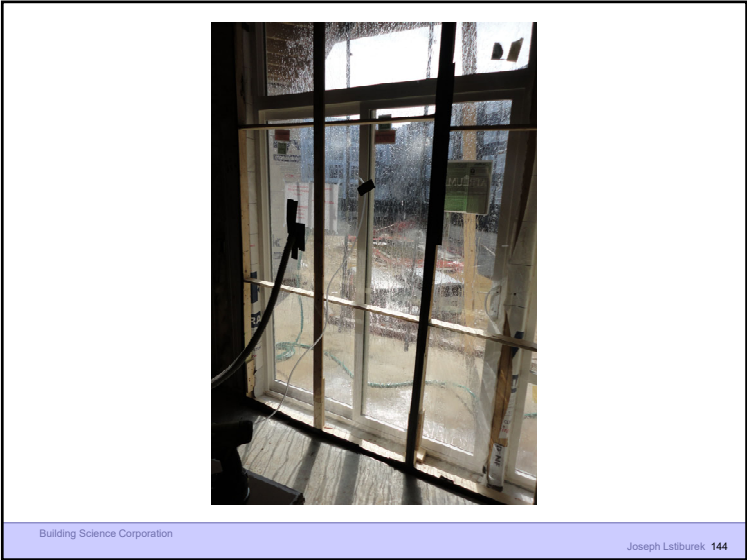
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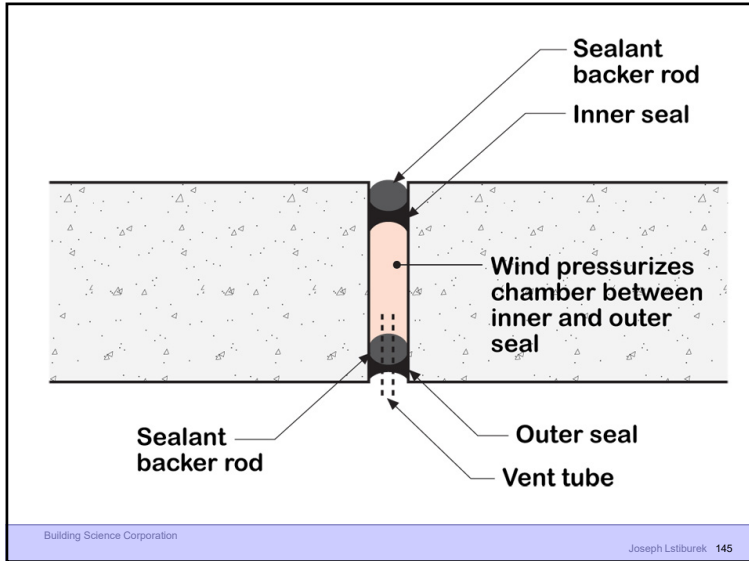
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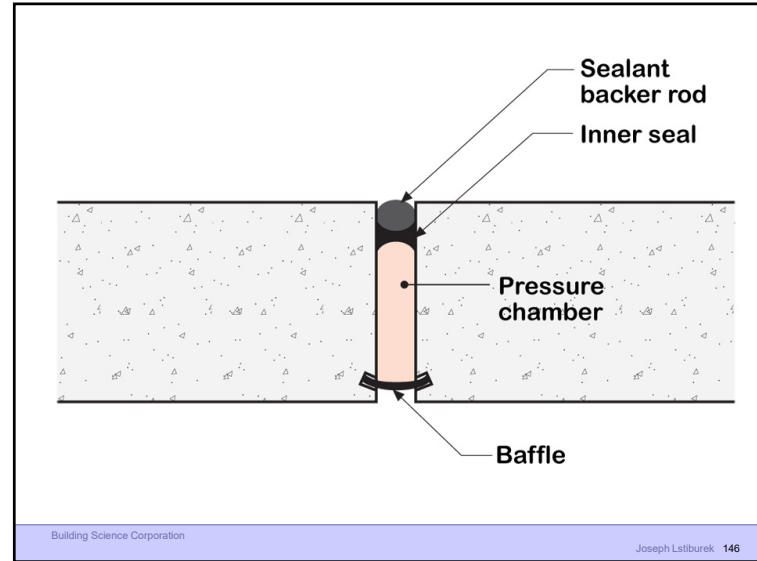
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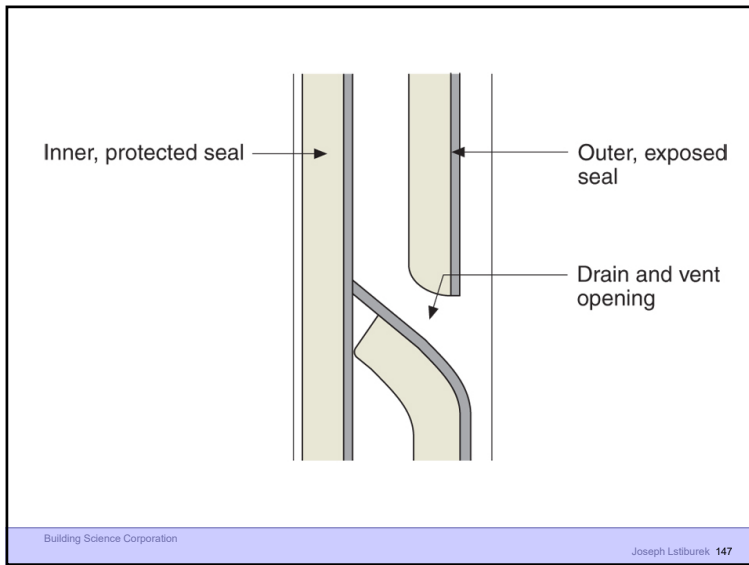
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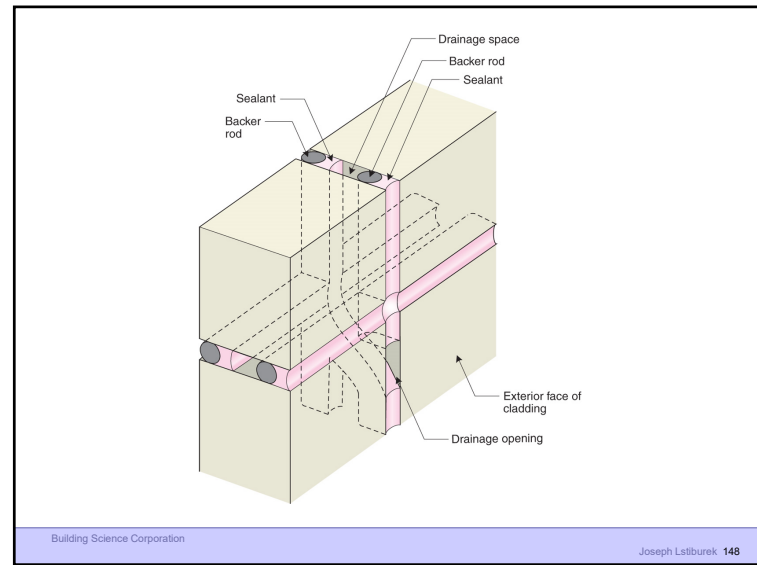
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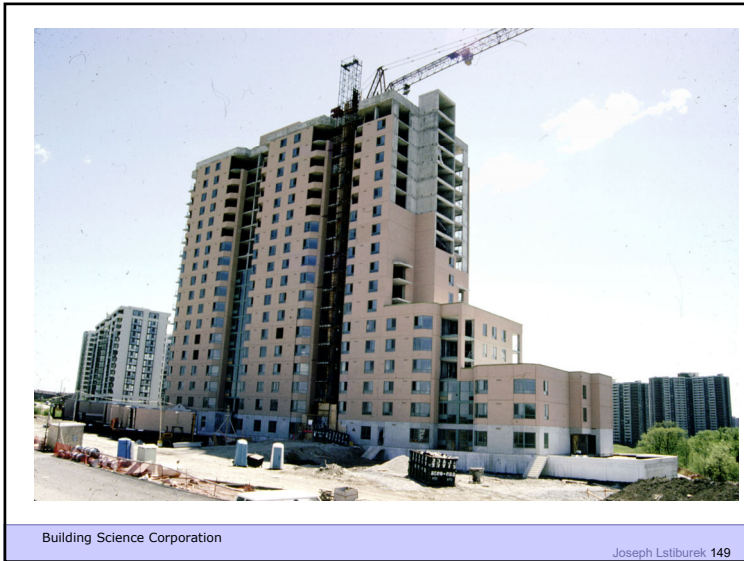
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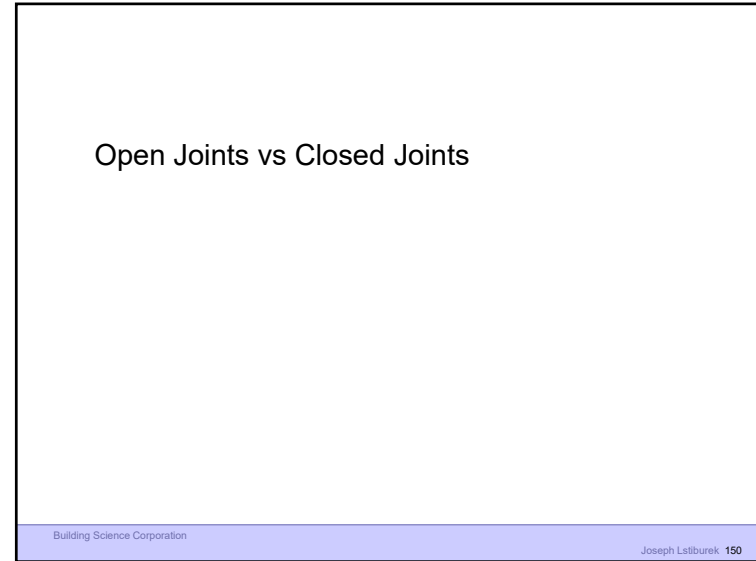
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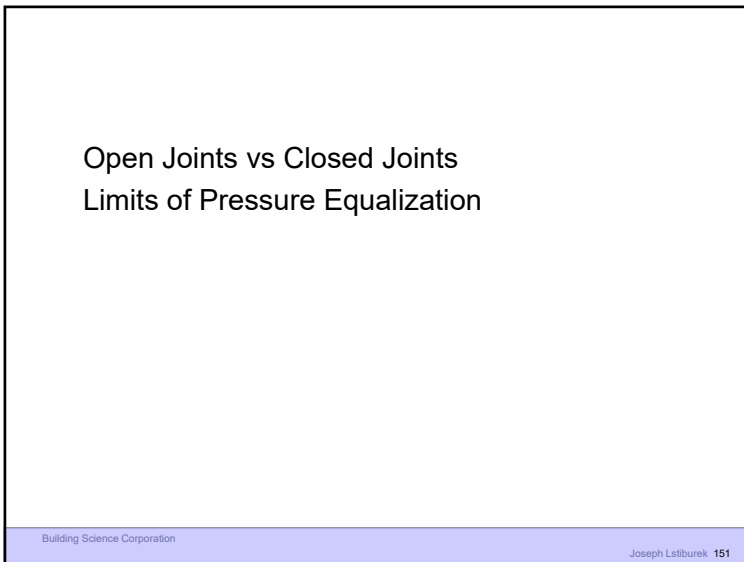
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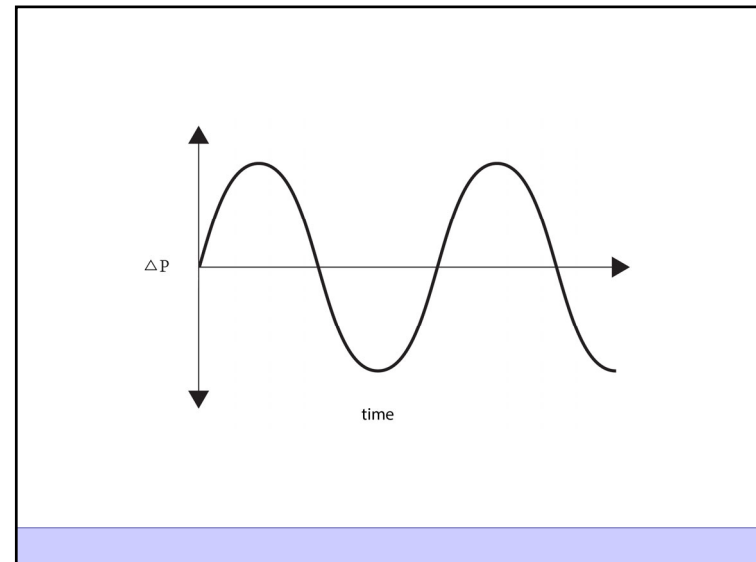
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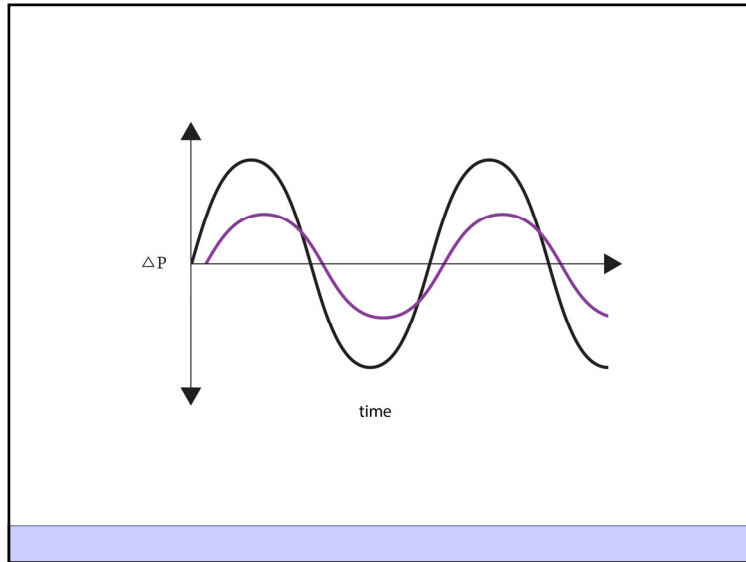
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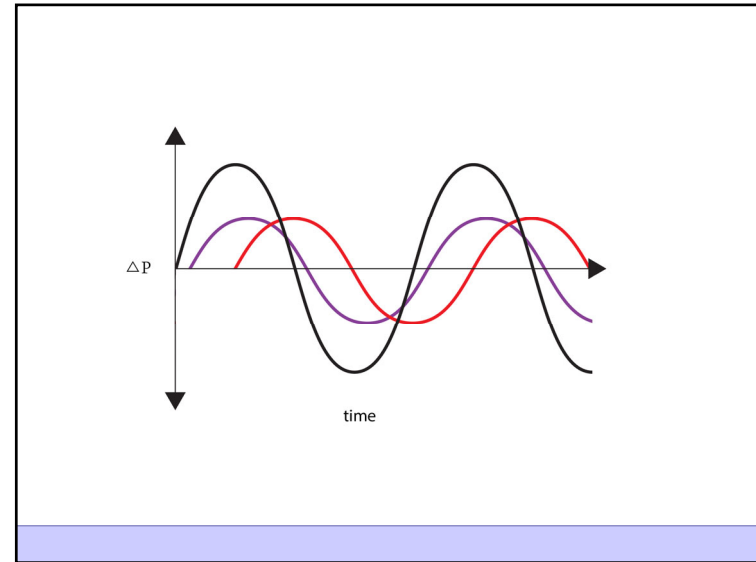
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Pressure Equalization Needs to be Perfect
 Pressure Equalization Reduces Drying
 Prevention of Wetting Is Not As Important As Drying
 Assume Things Get Wet...Design Them to Dry
 Ventilated Claddings Promote Drying

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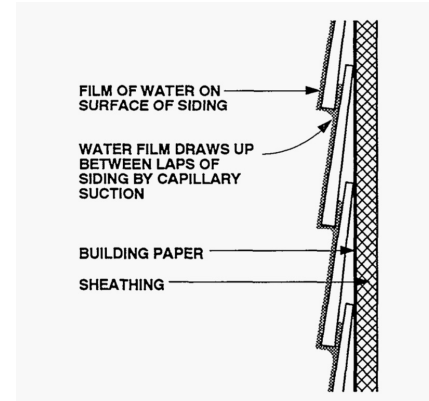
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Capillarity

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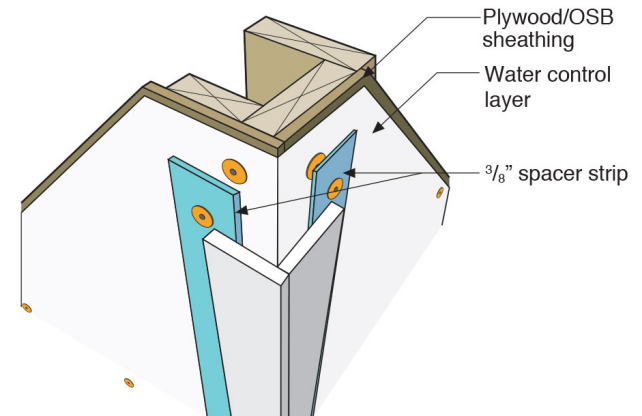
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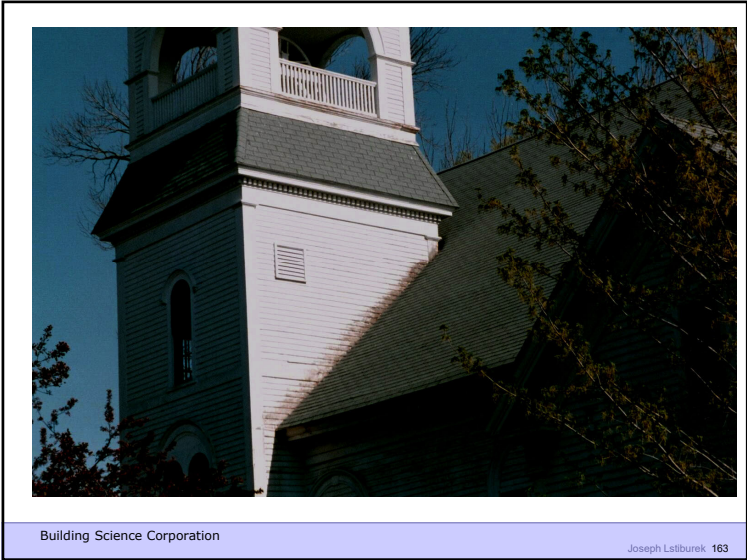
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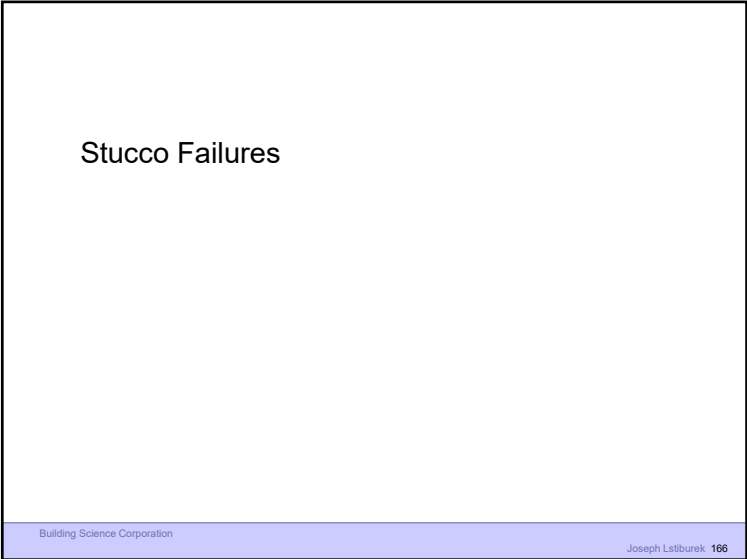
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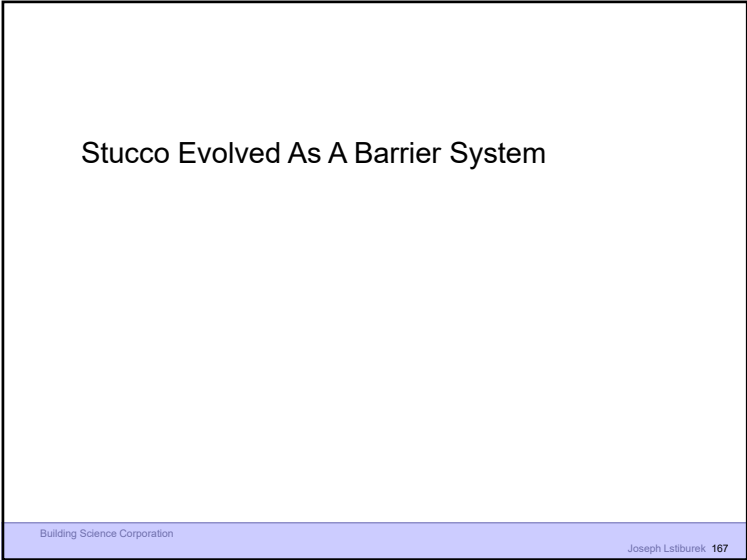


Stucco Failures

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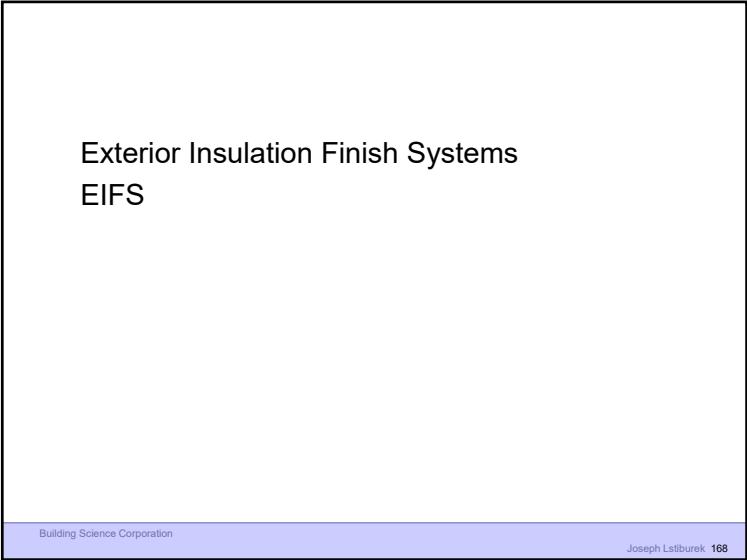


Stucco Evolved As A Barrier System

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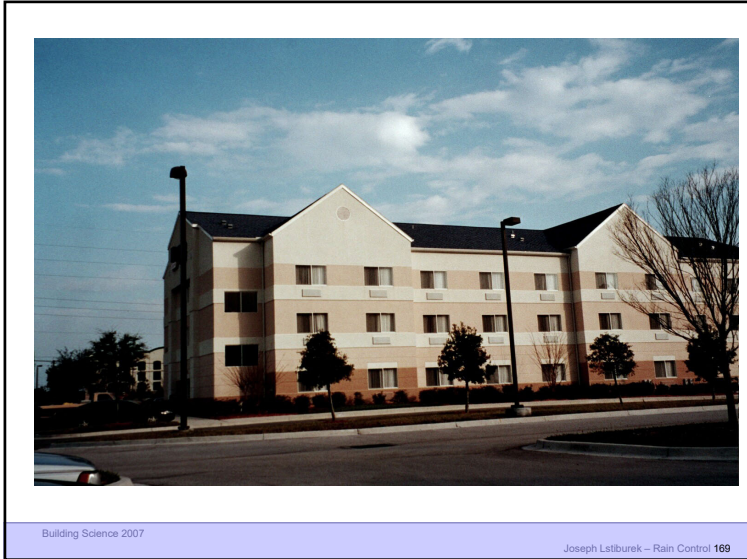


Exterior Insulation Finish Systems EIFS

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Exterior Insulation Finish Systems
EIFS
Barrier System
Face-Sealed Not Water Managed

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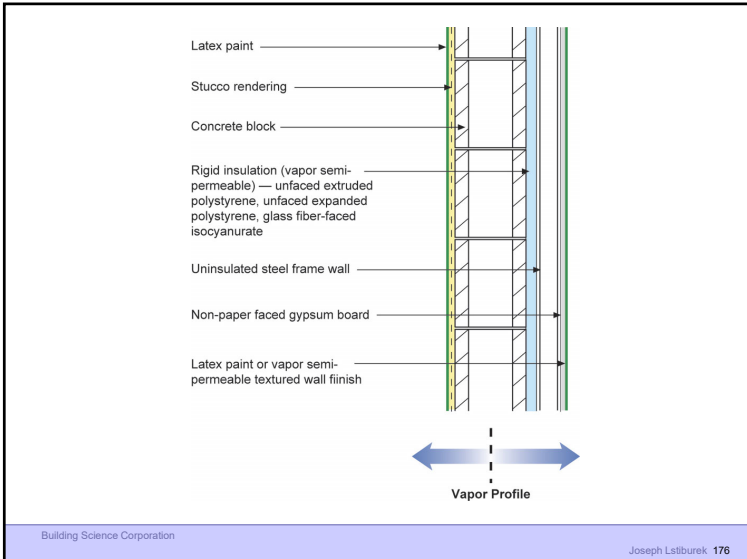
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Can Barrier or Face Seal Work?

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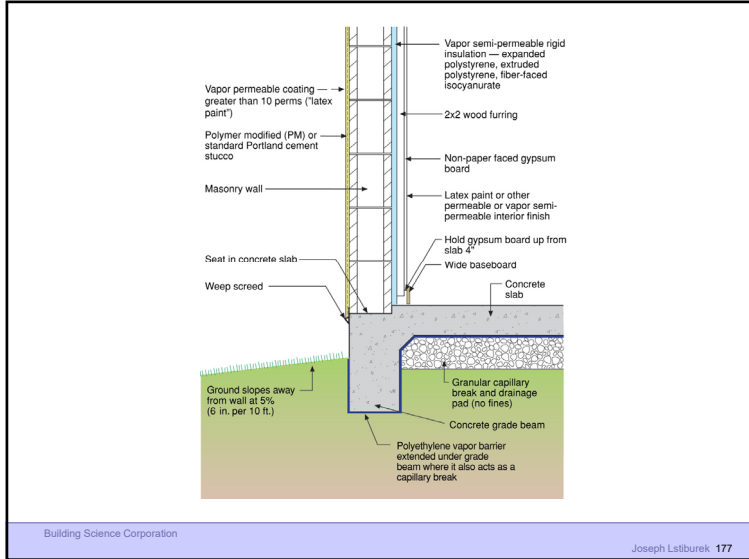
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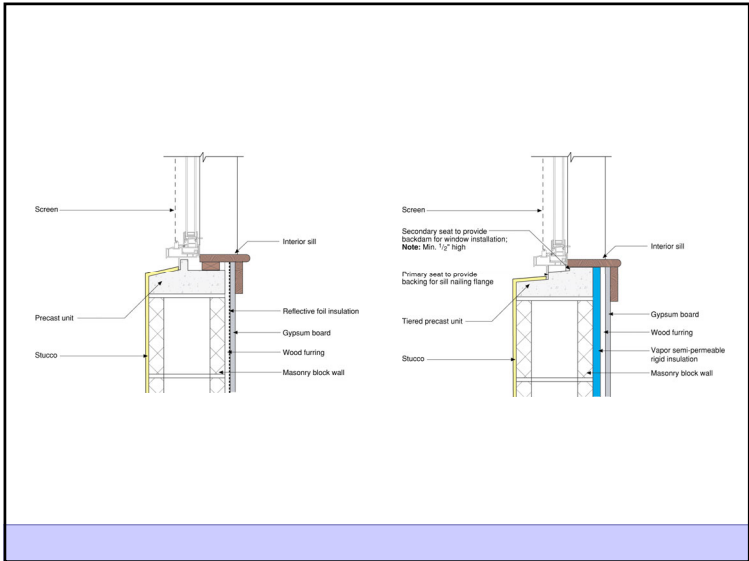
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Reminder...
Don't Do Stupid Things

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What Is Going On With Stucco?

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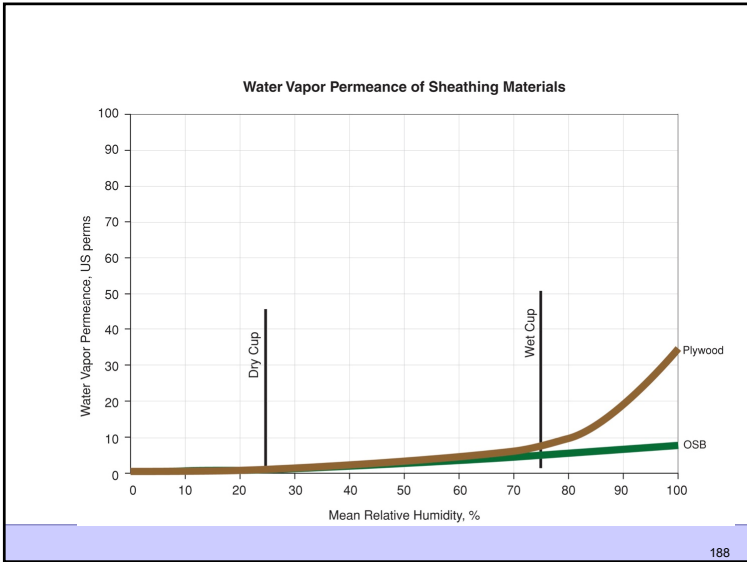
Materials Inward Drive Energy

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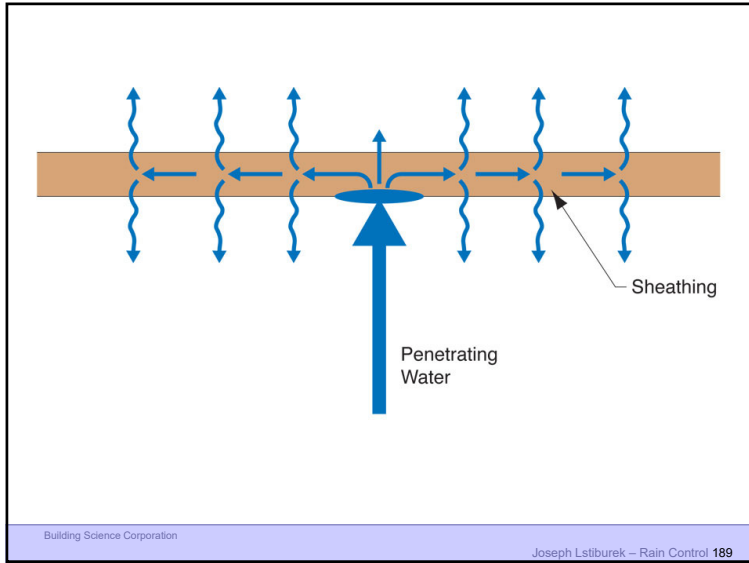
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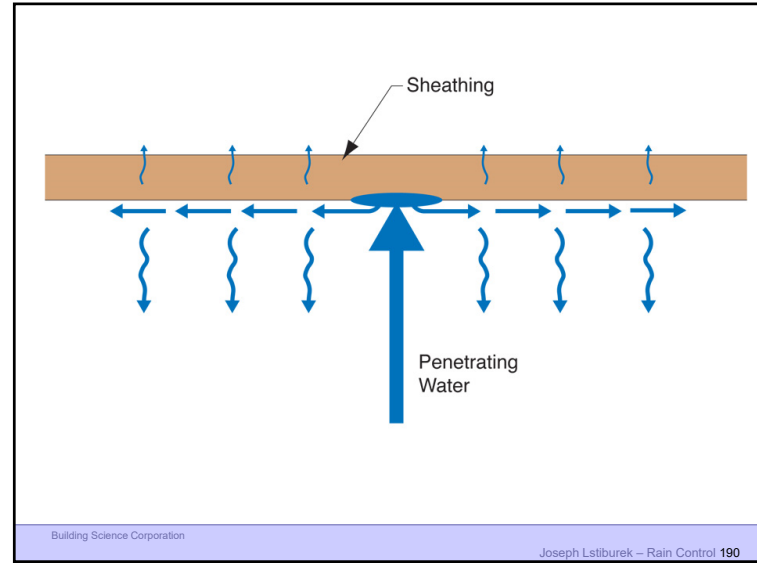
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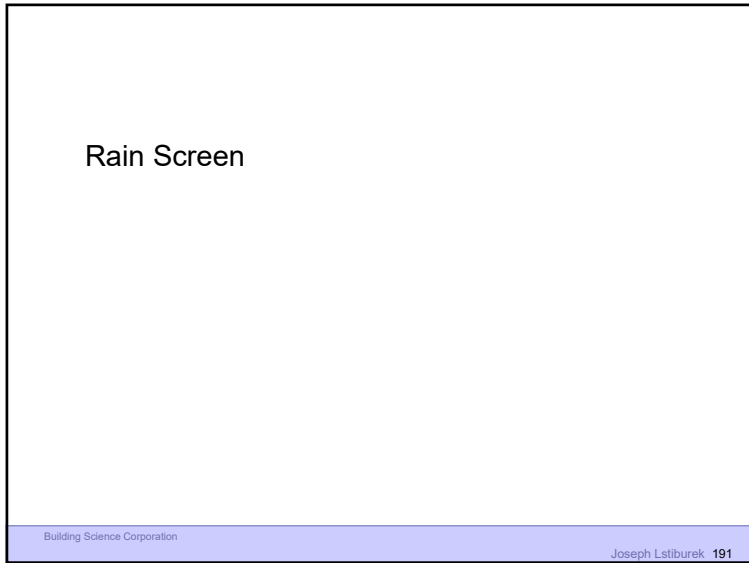
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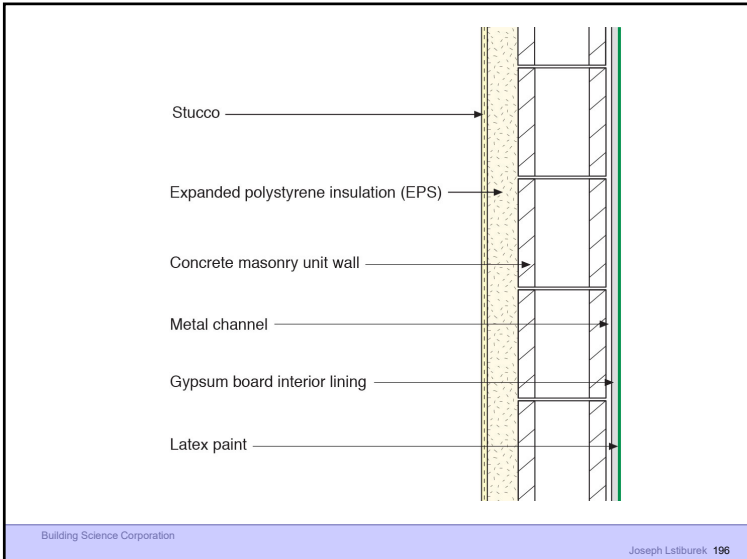
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EIFS No Longer Has Issues

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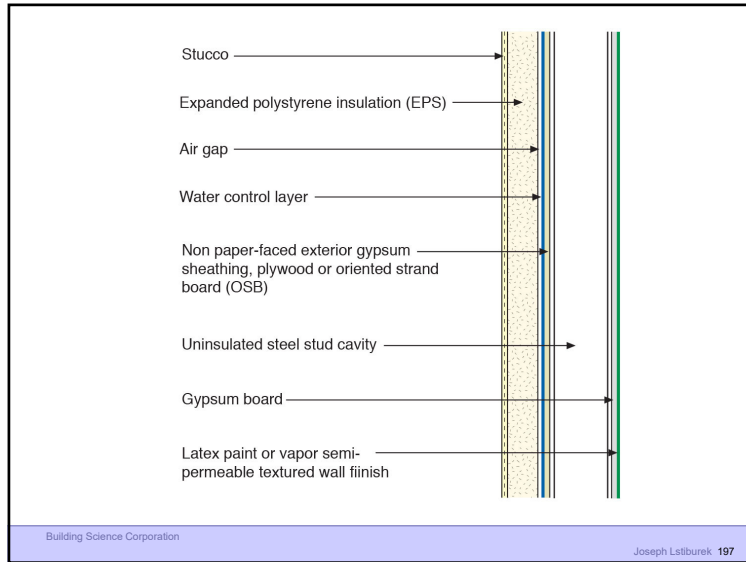
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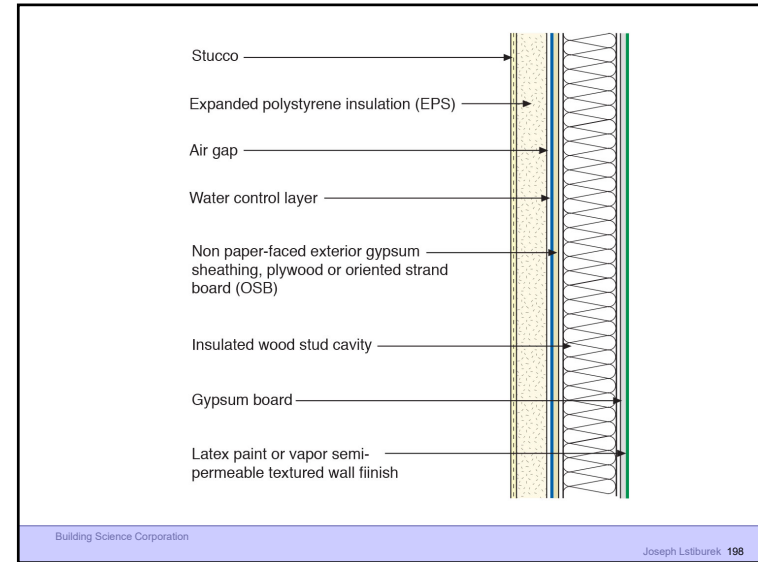
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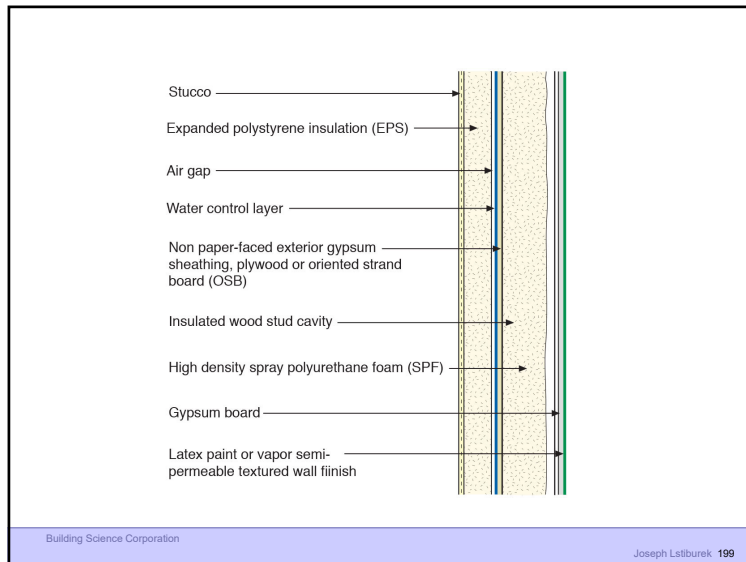
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Back To Stucco....

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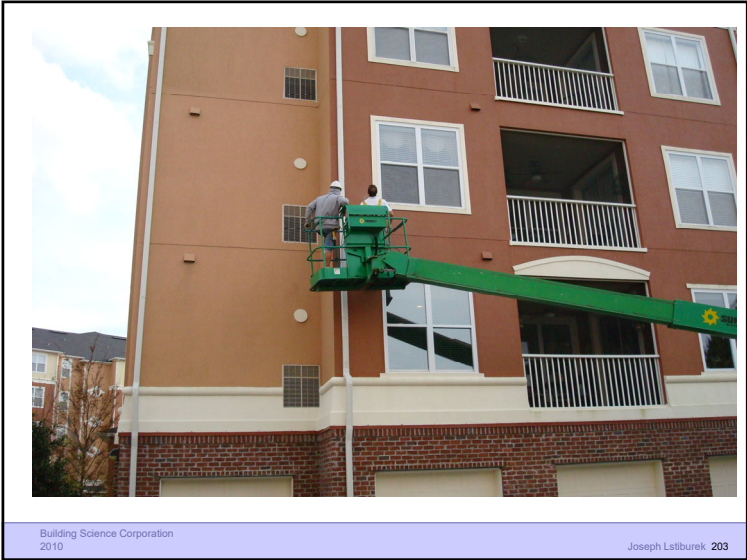
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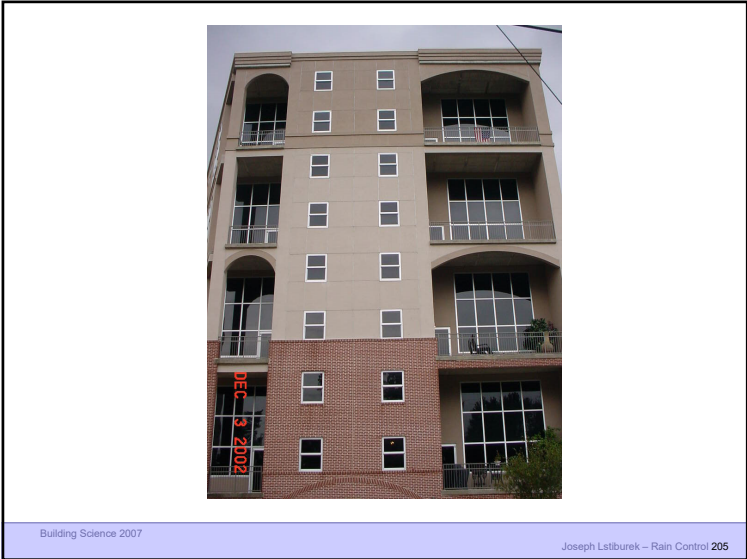
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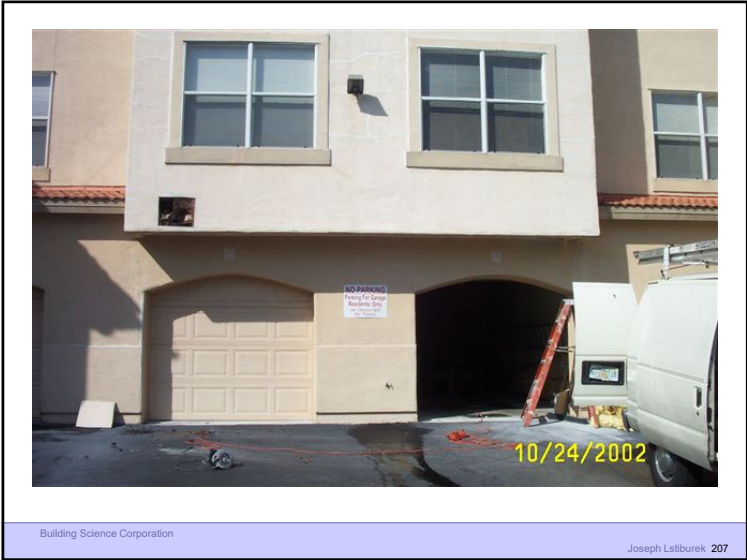
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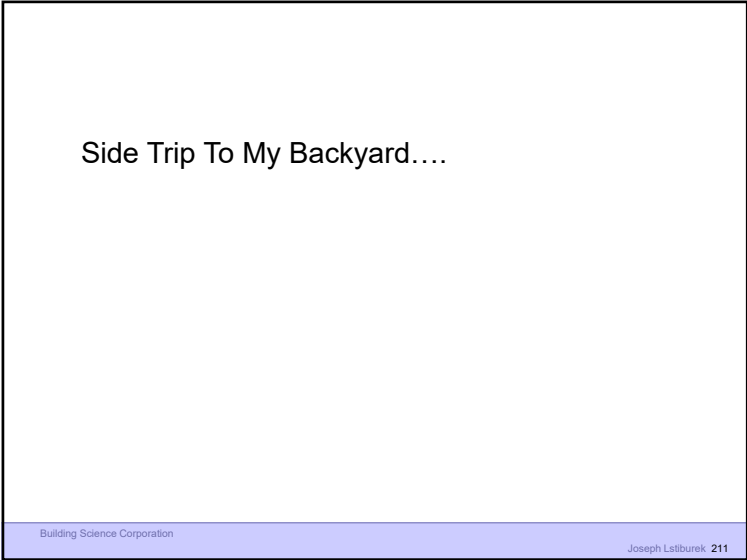
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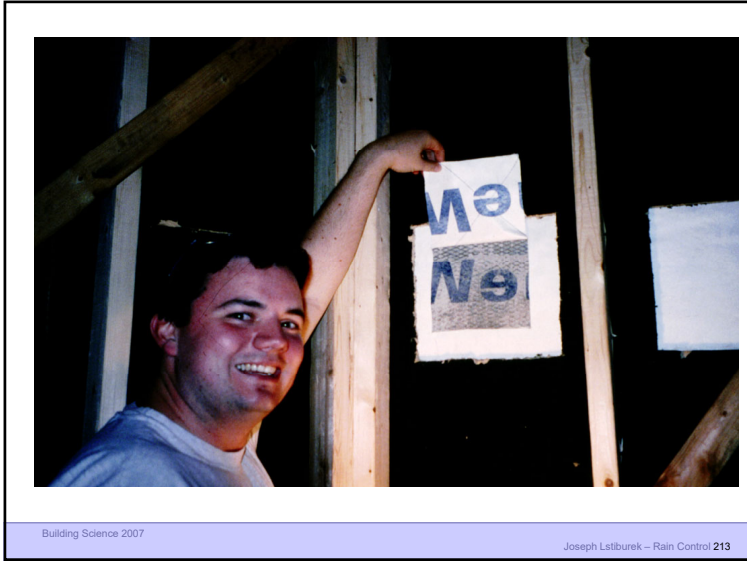
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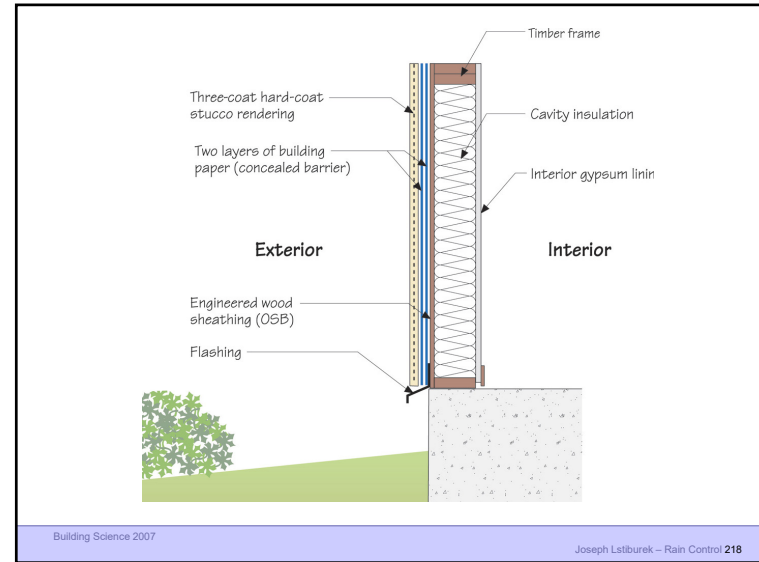
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“Lumpy Stucco”....
Should Have Been The Big Warning....

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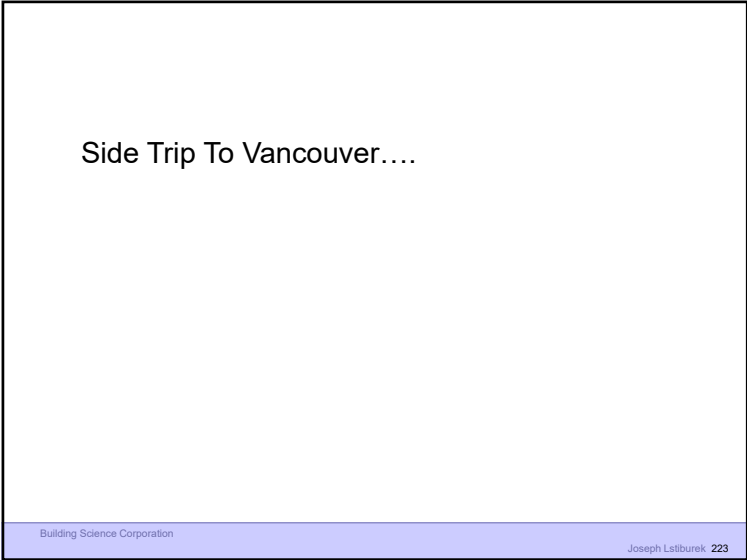
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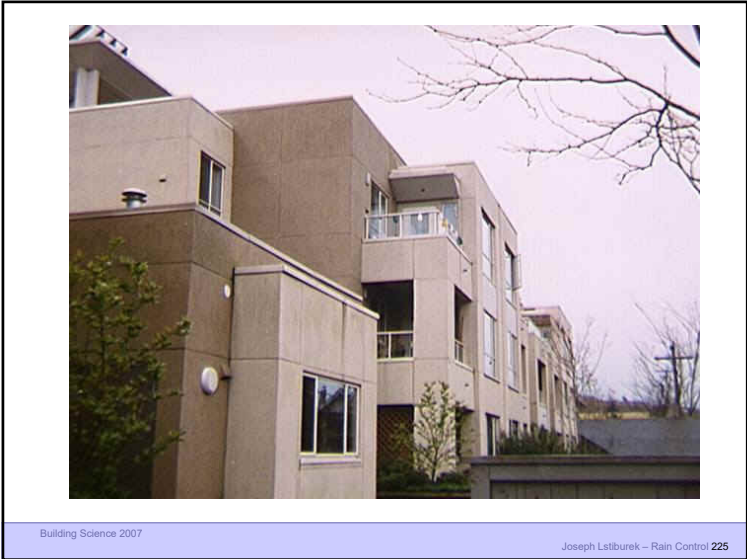
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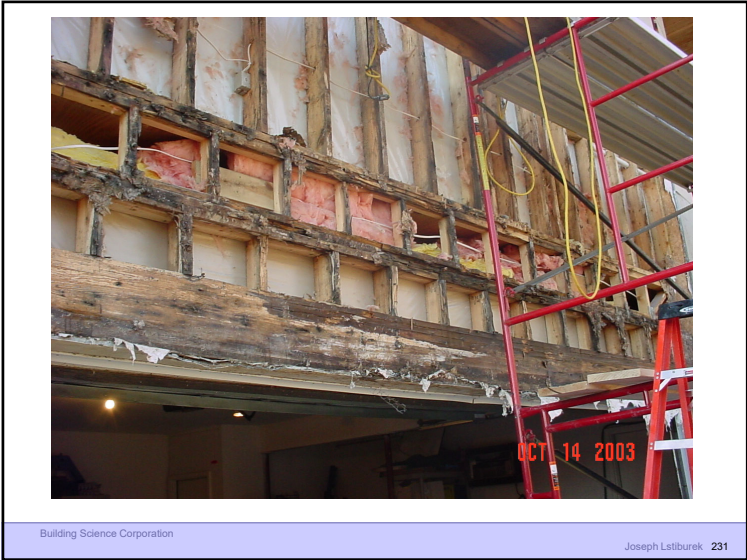
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Back To America....Pennsylvania....
And Then Pretty Much Anywhere It Rains...

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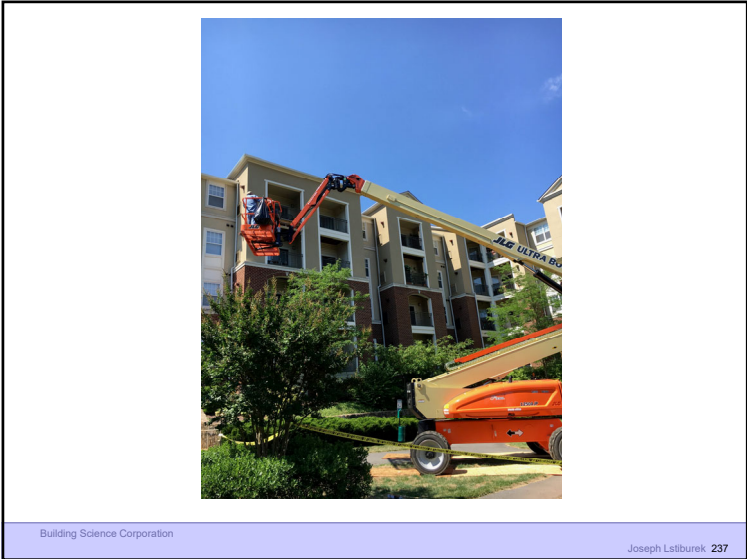
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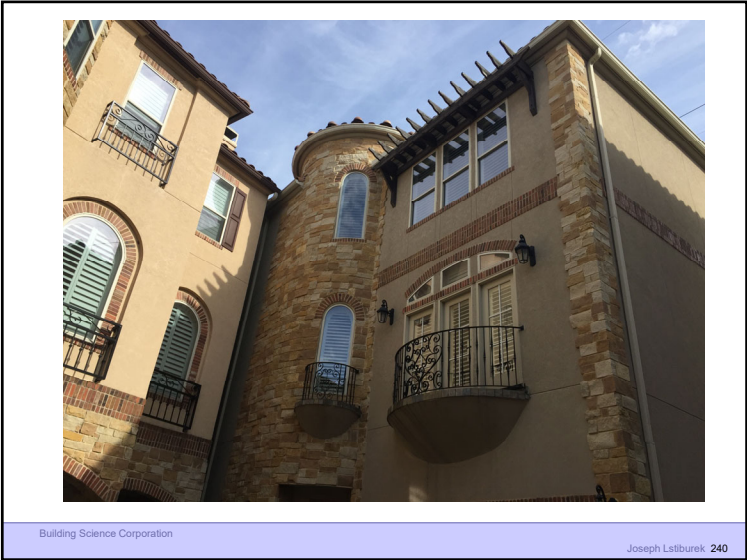
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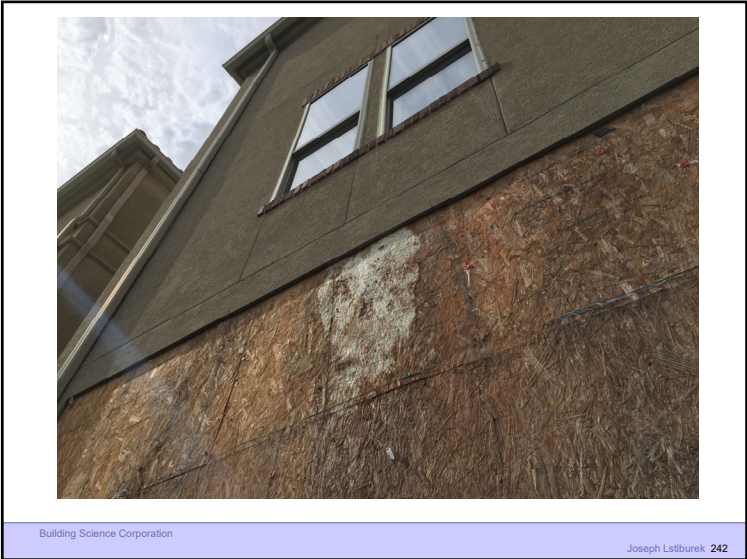
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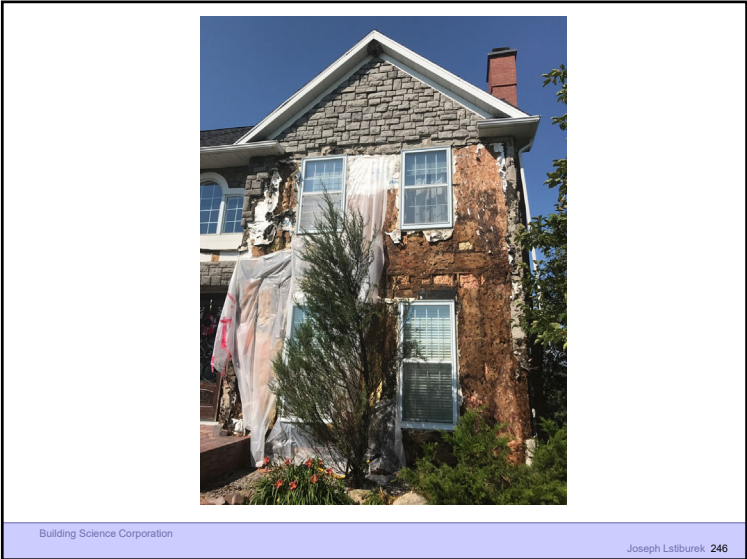
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Back To Lumpy Stucco....

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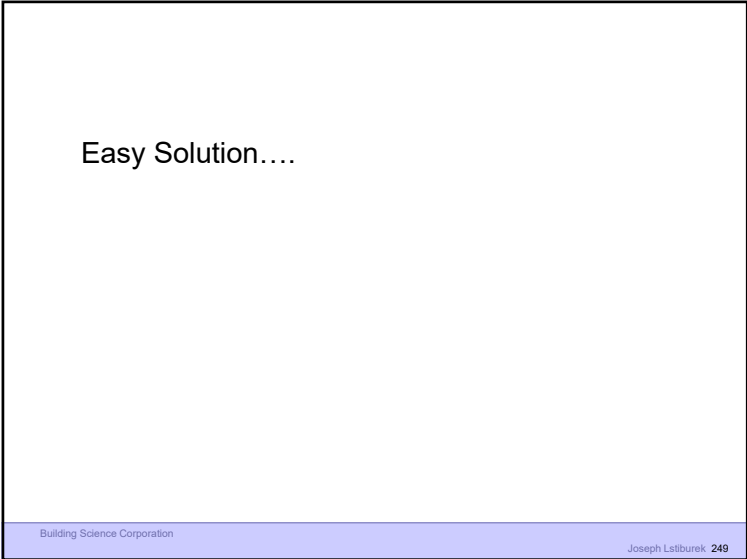
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Recommendations....

- Provide a 3/8 inch air space behind all stucco in regions where it rains more than 20 inches per year
- Provide a 3/8 inch air space behind all stucco over three stories
- Don't install interior vapor barriers
- Air space can be reduced to 1/16 inch where inward vapor drive is limited

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Recommendations....

- Barrier works in Florida over block
- Barrier does not work in Florida over OSB
- Don't install interior vapor barriers in Florida
- Don't drain a drained system into a barrier system

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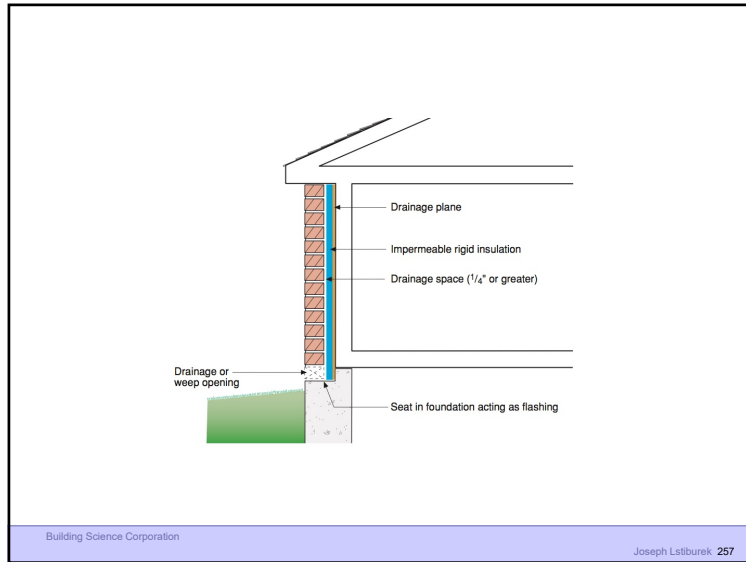
| | | |
|--|--|--|
| <p>Exterior Conditions Temperature: 80°F Relative humidity: 75% Vapor pressure: 2.49 kPa</p> | <p>Conditions within Cavity: Temperature: 100°F Relative humidity: 100% Vapor pressure: 6.45 kPa</p> | <p>Interior Conditions Temperature: 75°F Relative humidity: 60% Vapor pressure: 1.82 kPa</p> |
|--|--|--|

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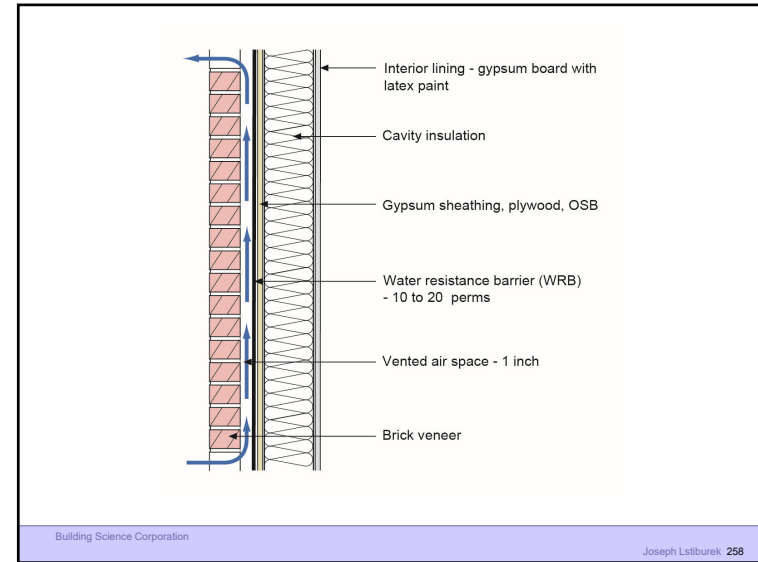
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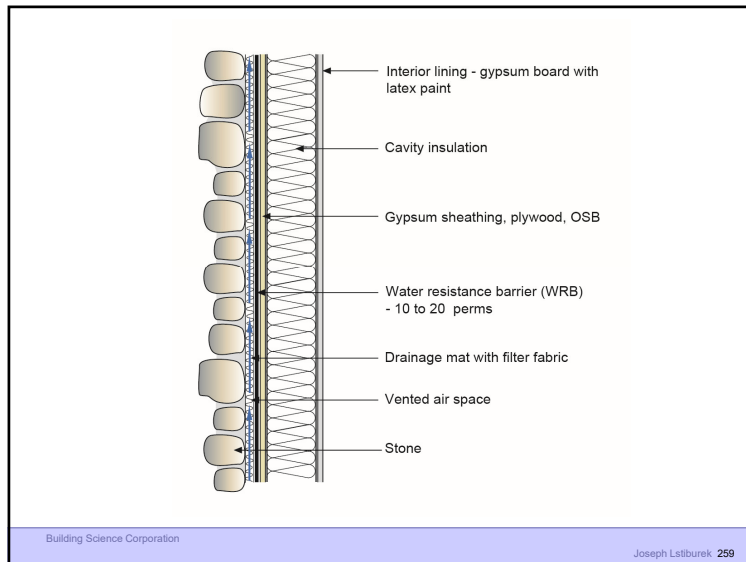
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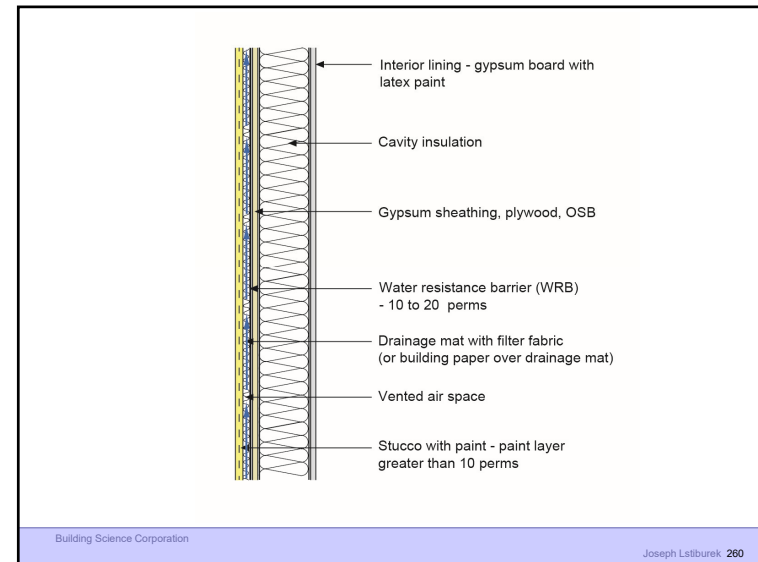
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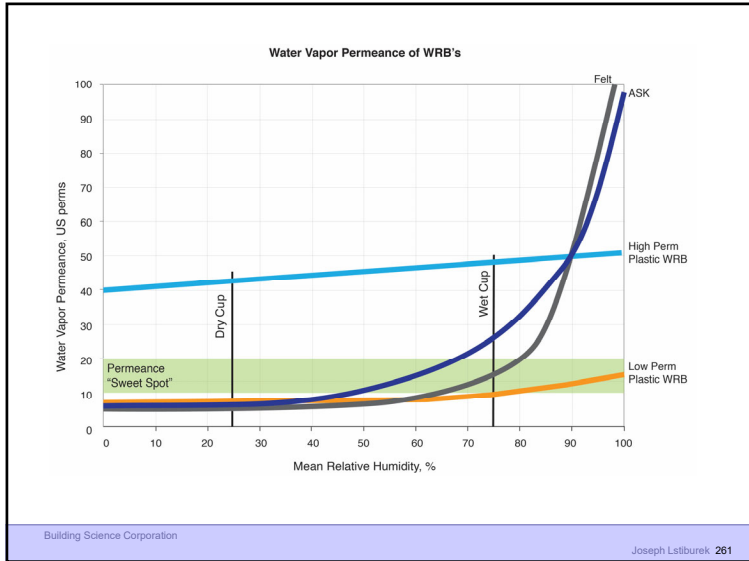
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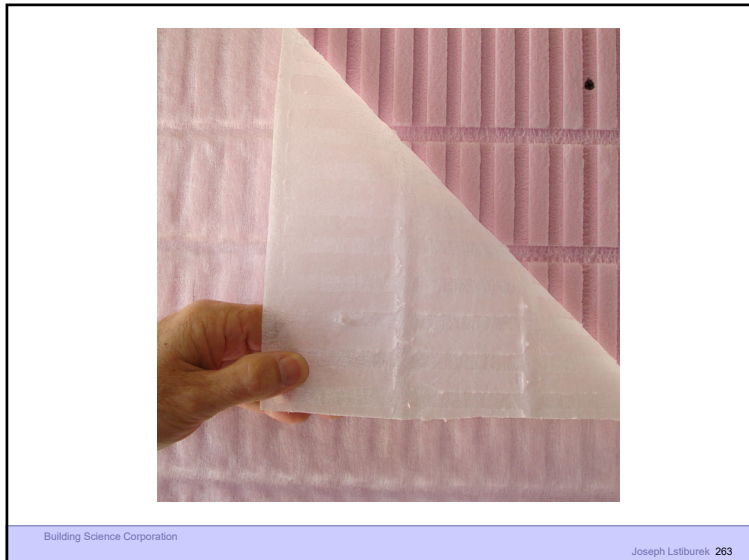
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