

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

Building Science

Adventures In Building Science

www.buildingscience.com

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

Building Science Corporation Joseph Lstiburek 2

Buildings Must Be Designed To Dry

Building Science Corporation Joseph Lstiburek 3

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

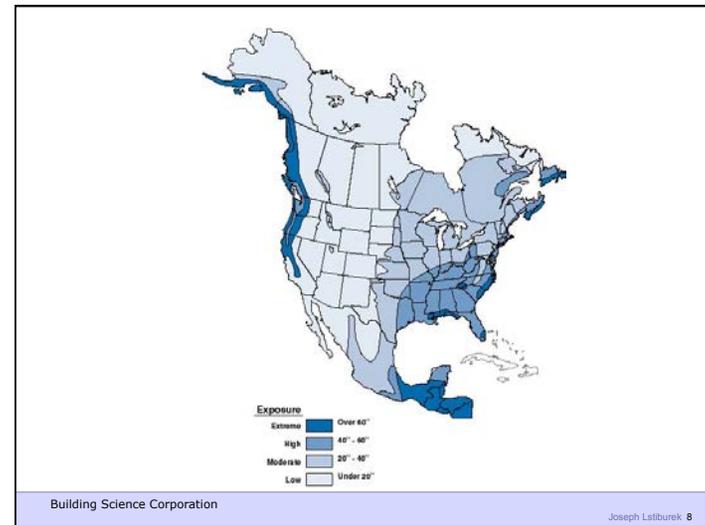
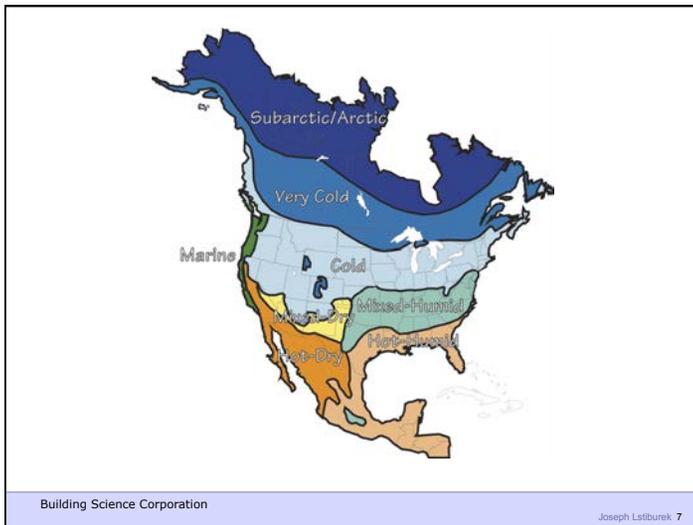
Building Science Corporation Joseph Lstiburek 4

2nd Law of Thermodynamics

Building Science Corporation Joseph Lstiburek 5

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

Building Science Corporation Joseph Lstiburek 6



Don't Do Stupid Things

Building Science Corporation

Joseph Lstiburek 9



Building Science Corporation

Joseph Lstiburek 10



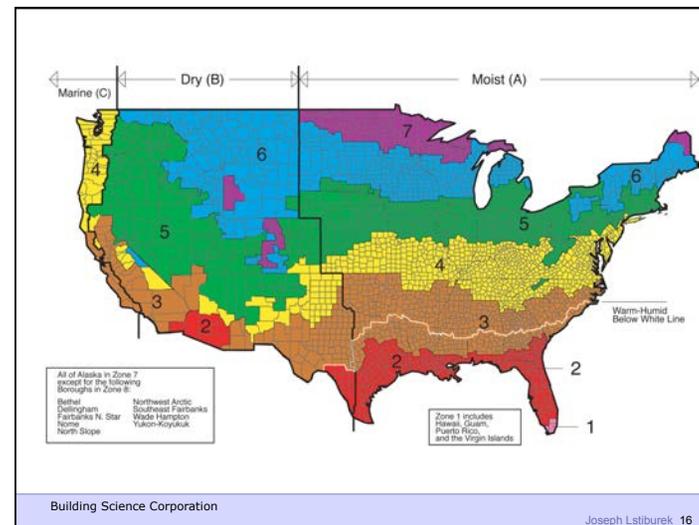
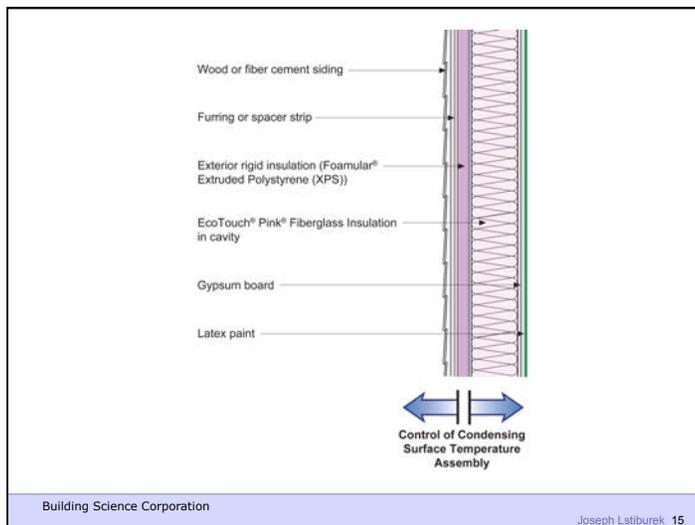
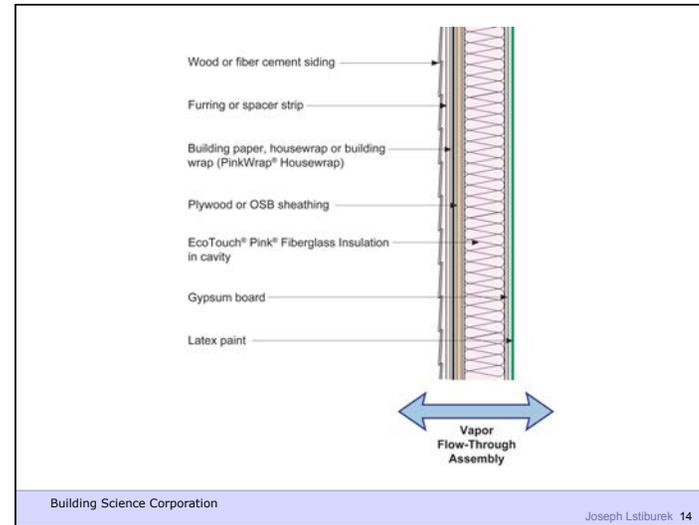
Building Science Corporation

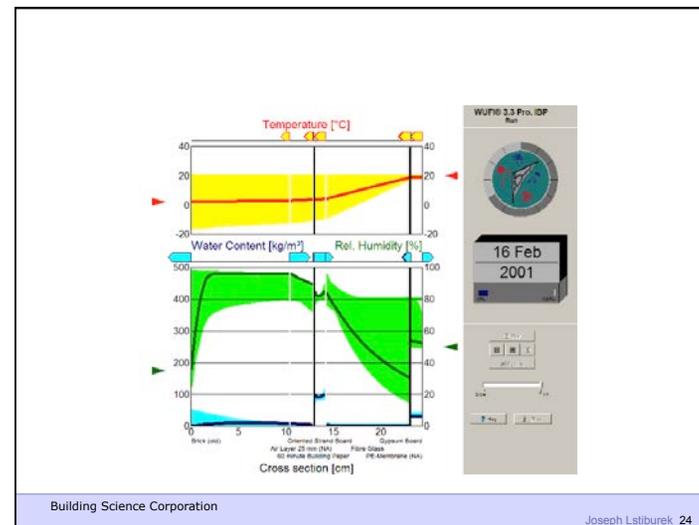
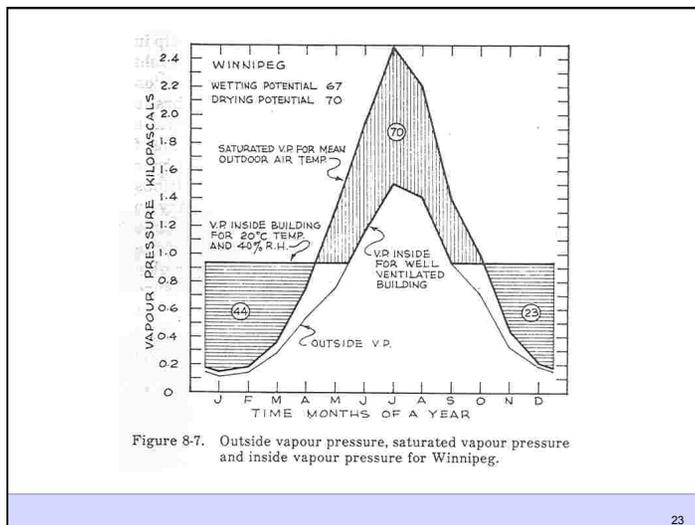
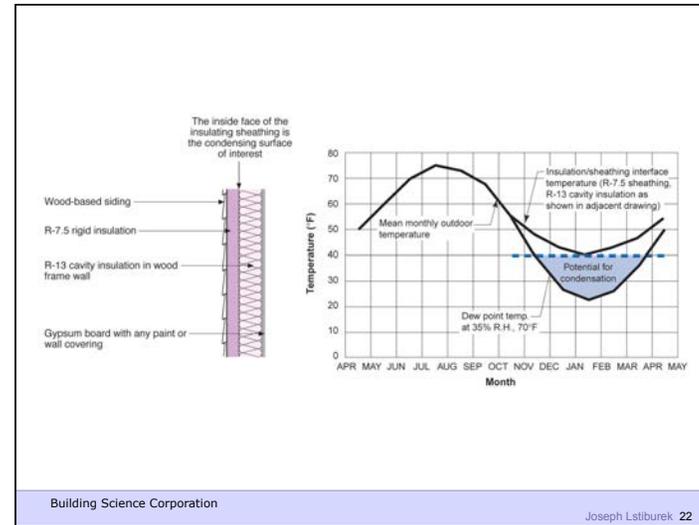
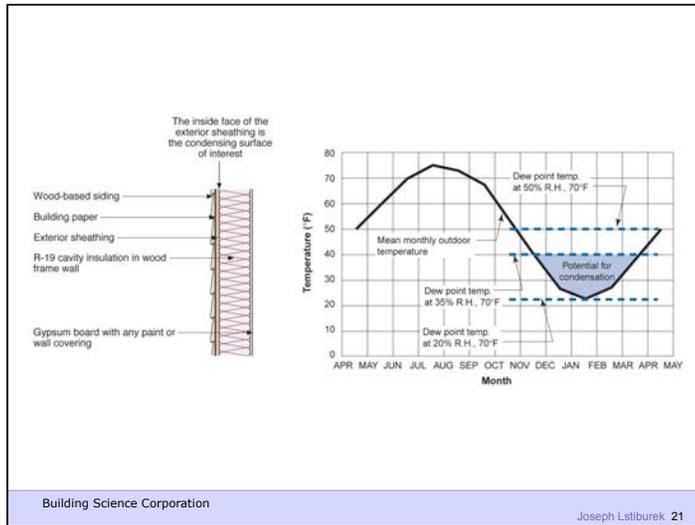
Joseph Lstiburek 11

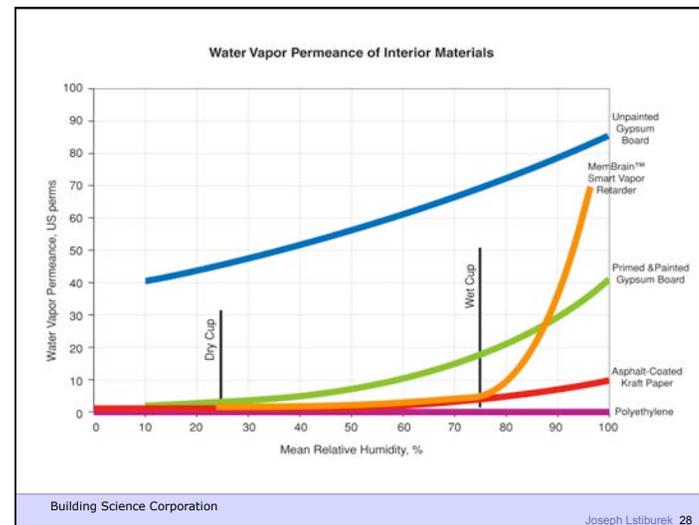
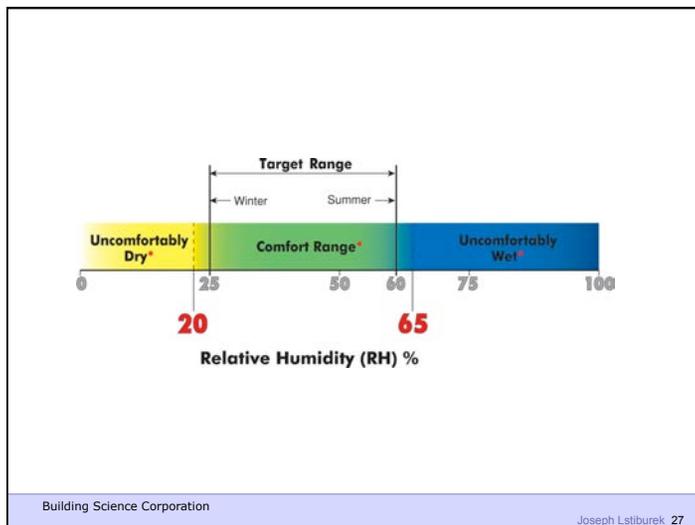
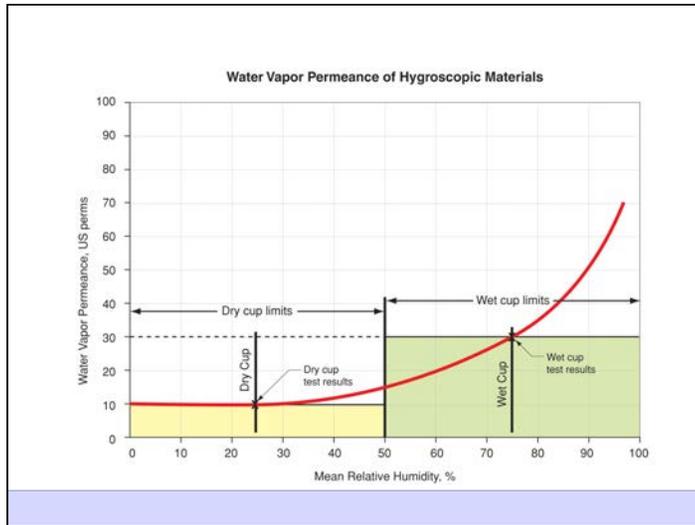


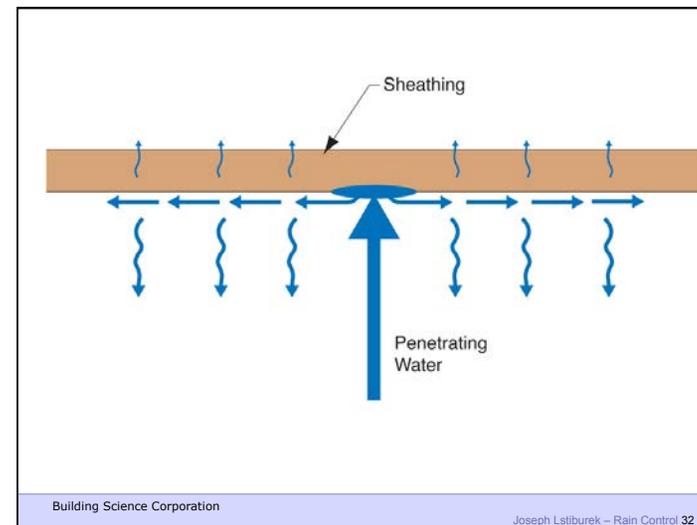
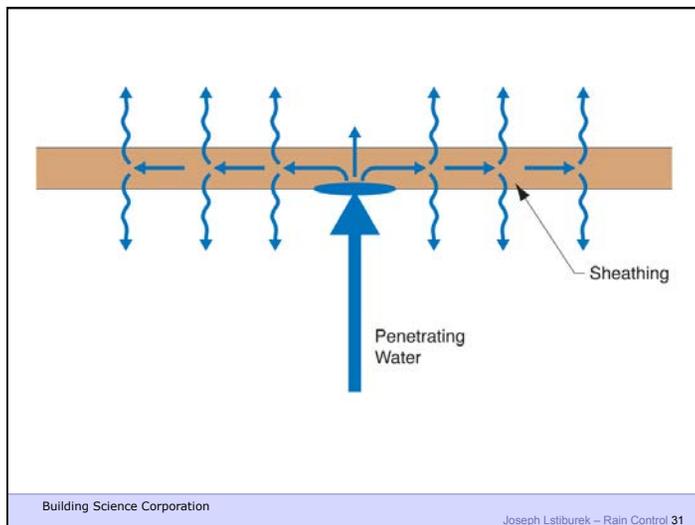
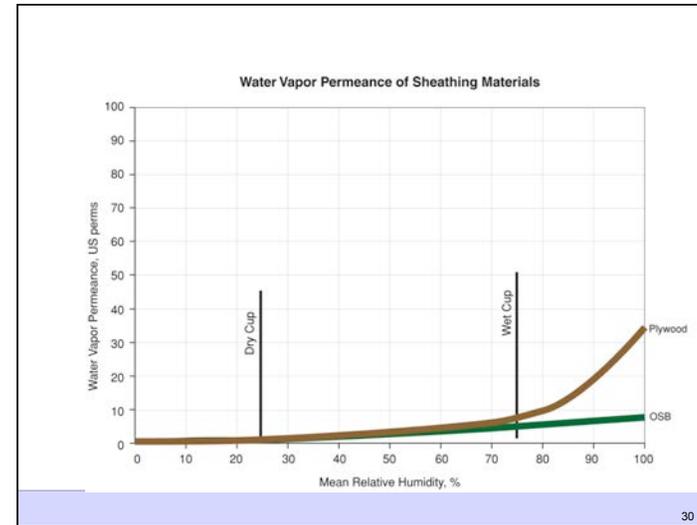
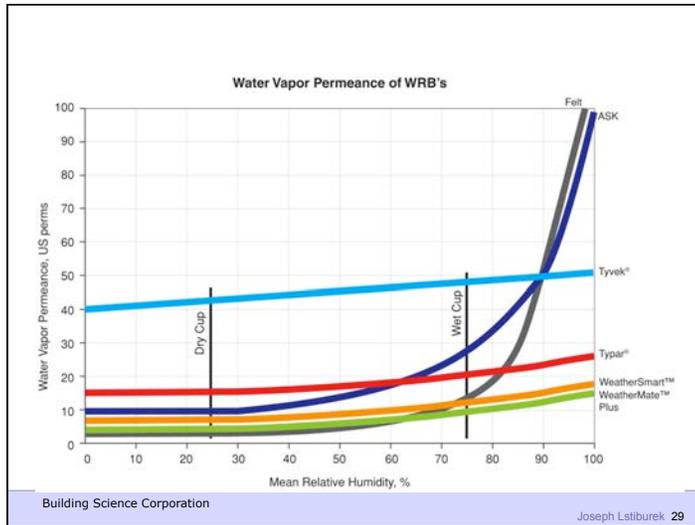
Building Science Corporation

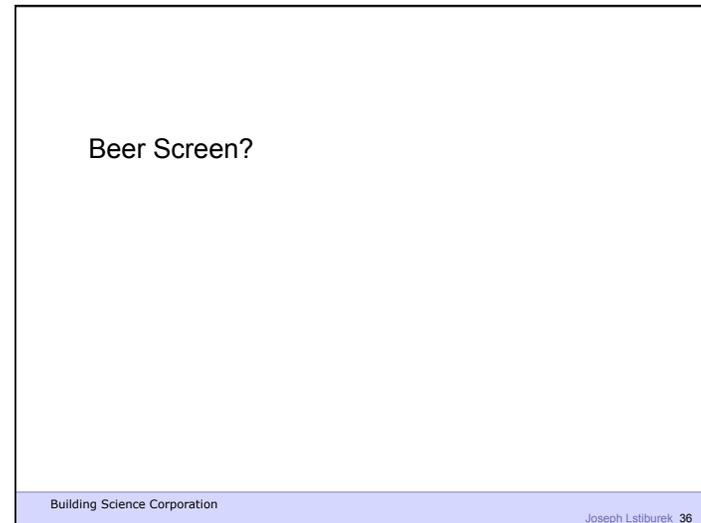
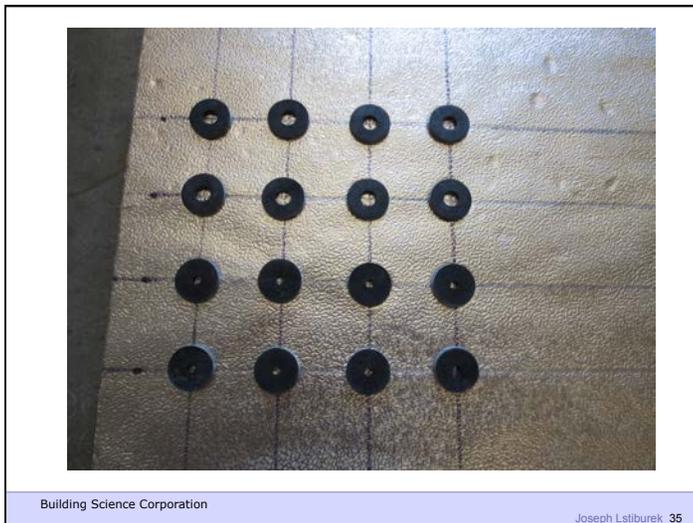
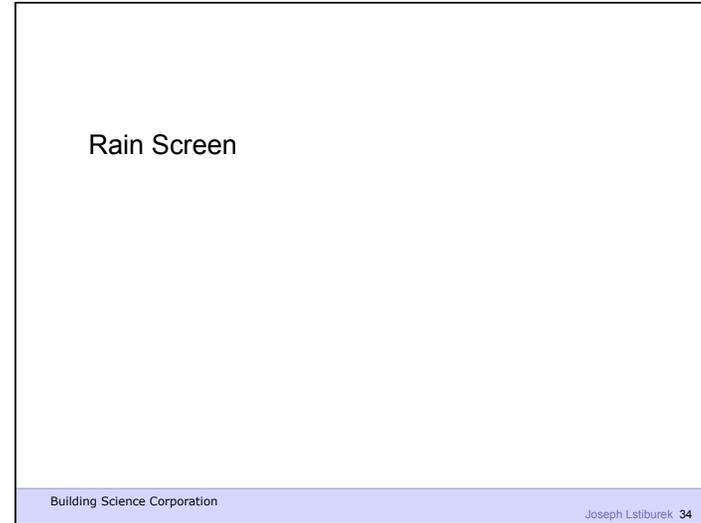
Joseph Lstiburek 12

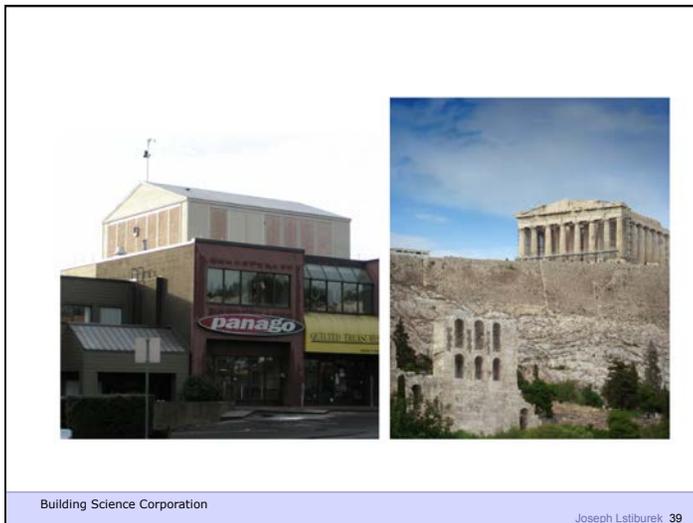
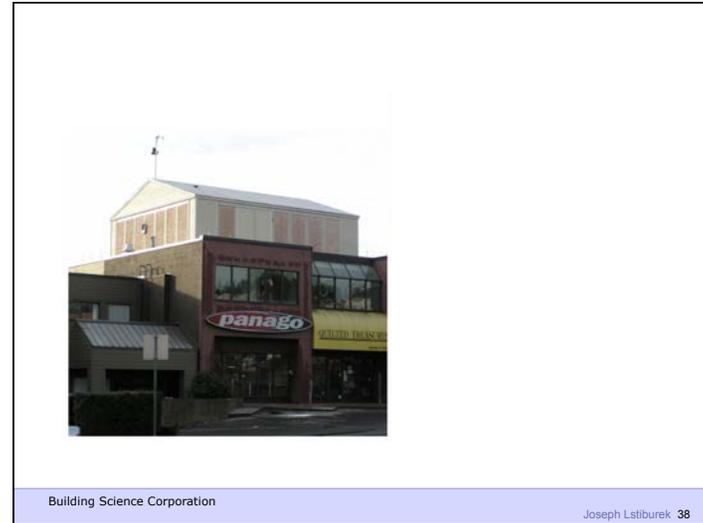
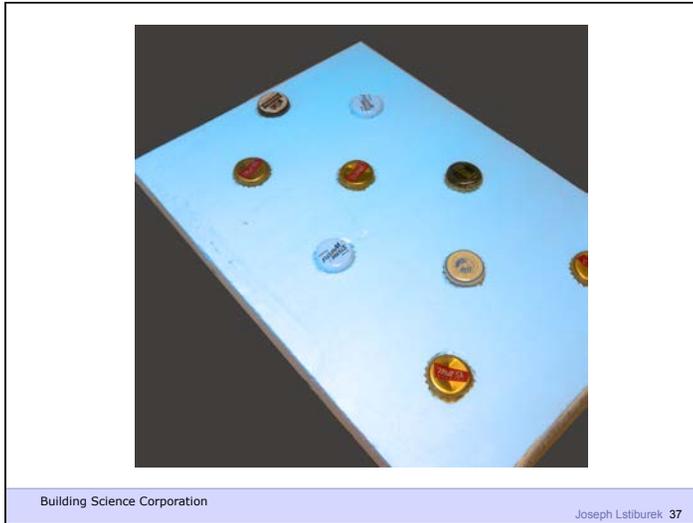


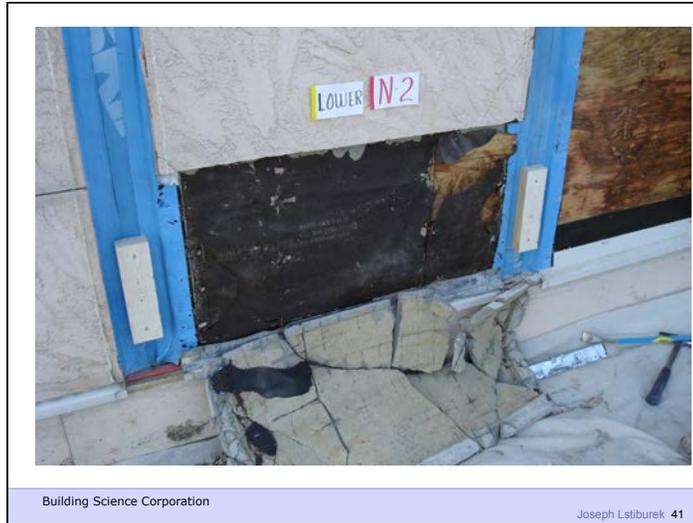










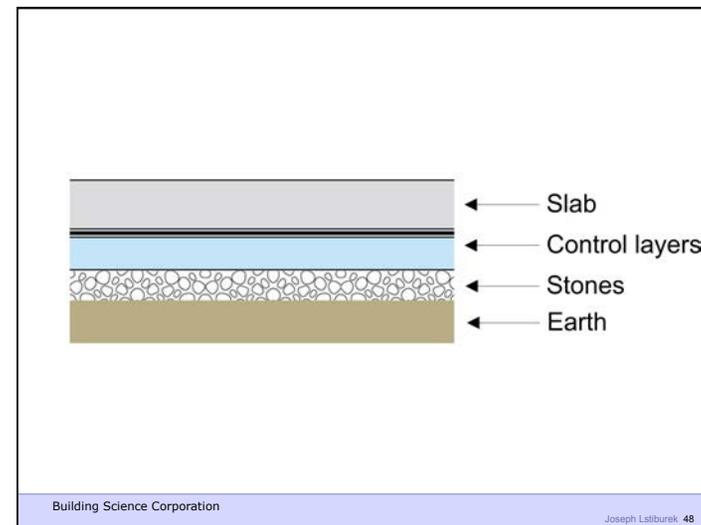
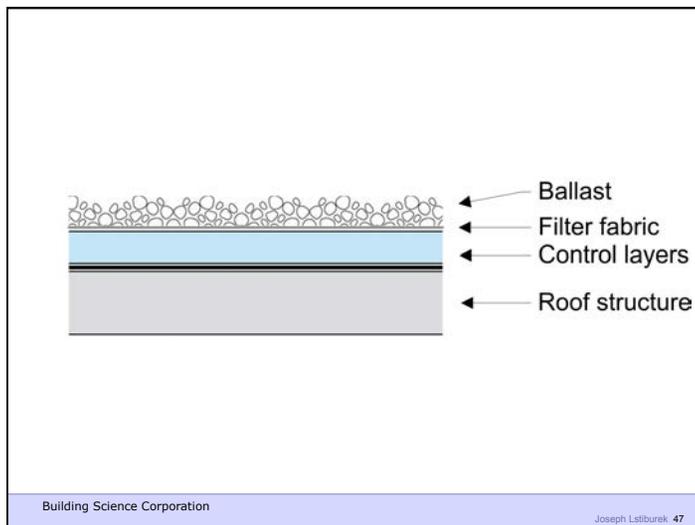
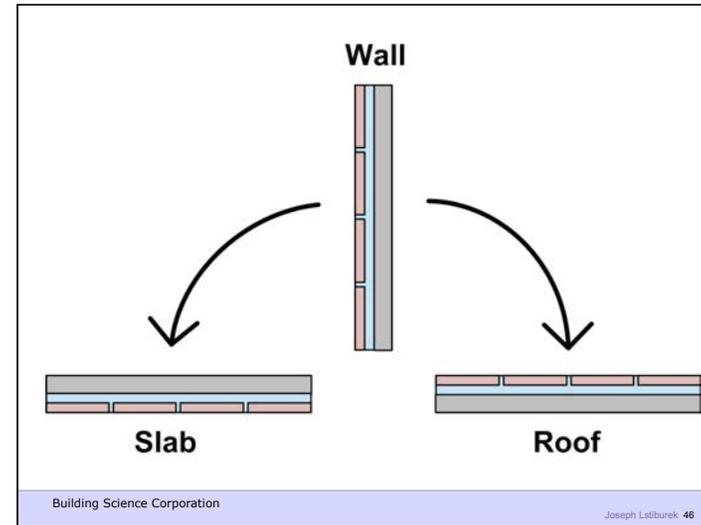
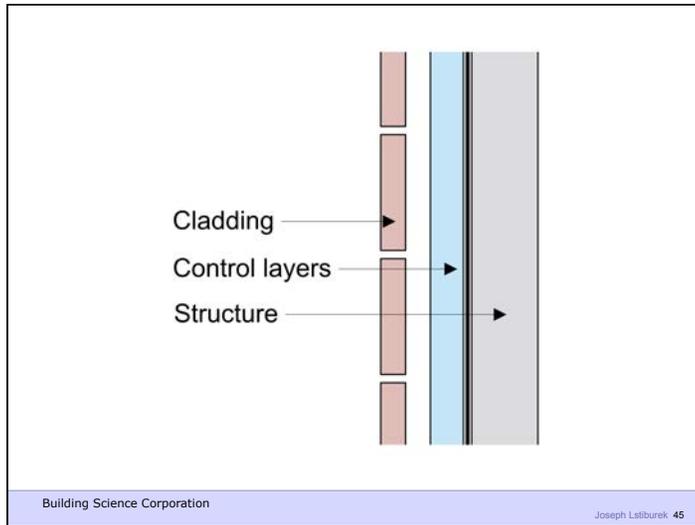


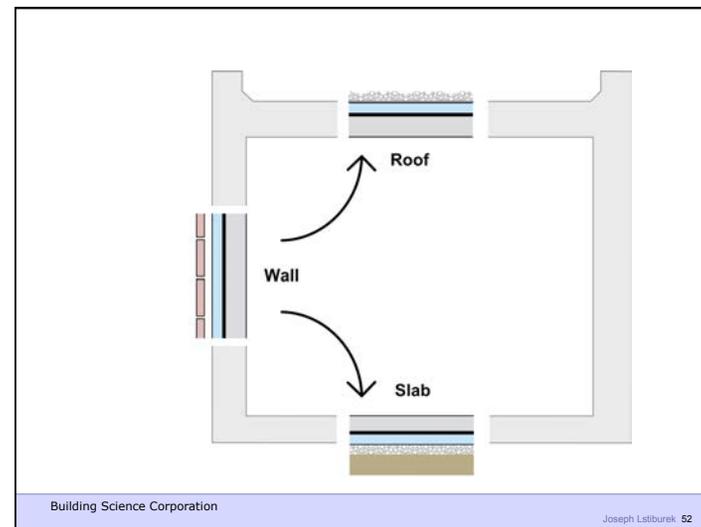
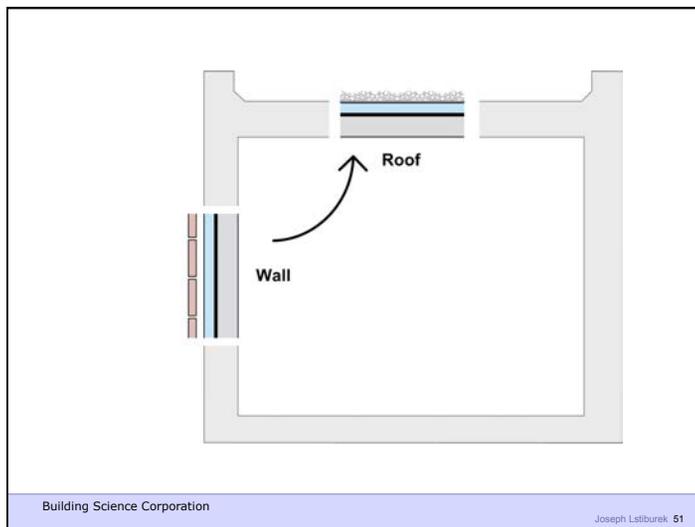
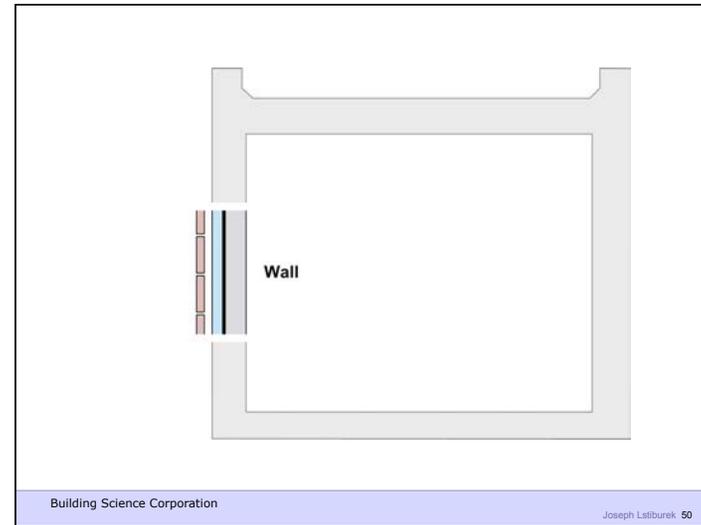
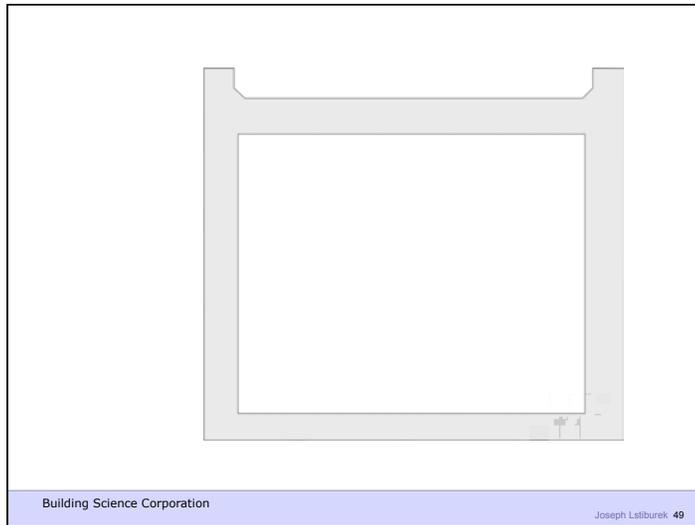
If You Need To Run A Hygrothermal Model
To Figure Out If Your Wall Works You
Have The Wrong Design

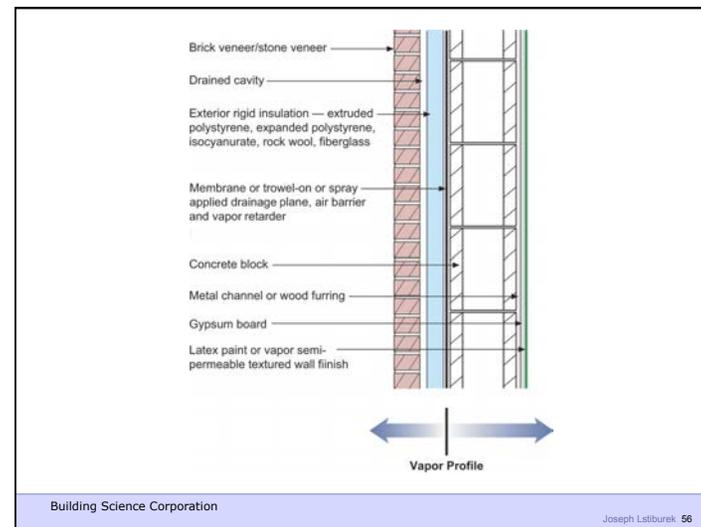
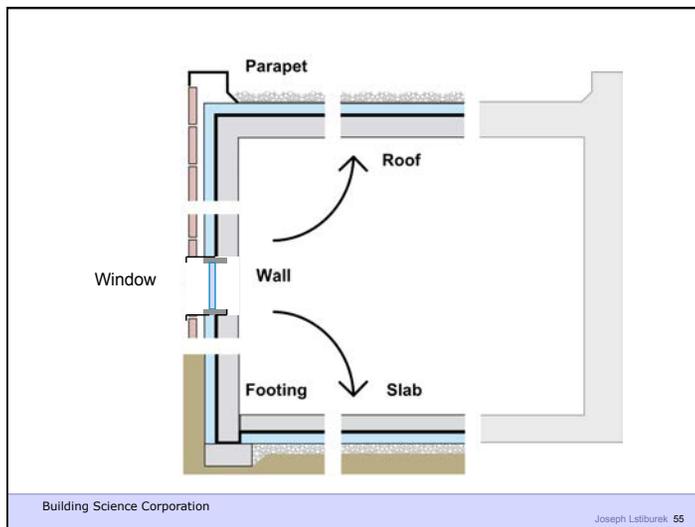
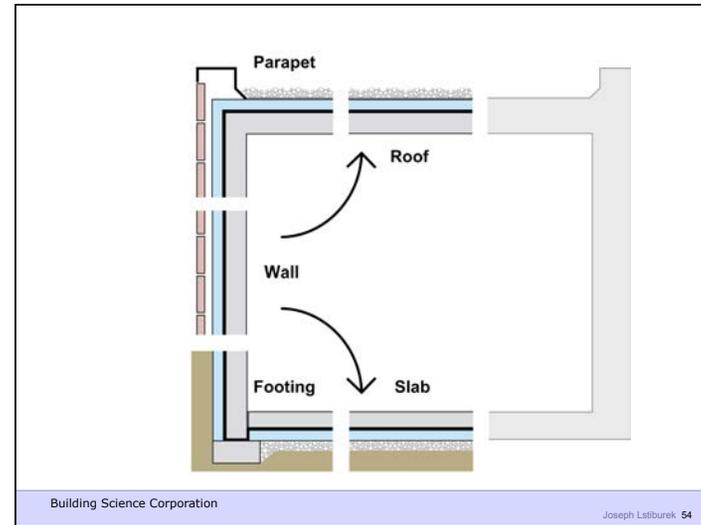
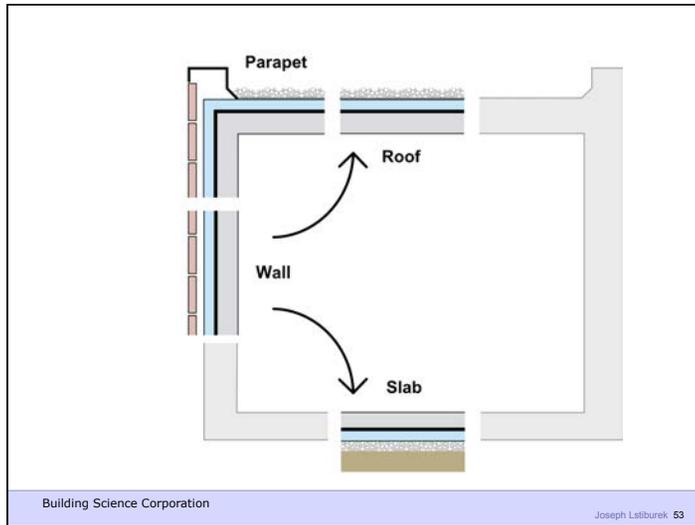
Building Science Corporation
Joseph Lstiburek 43

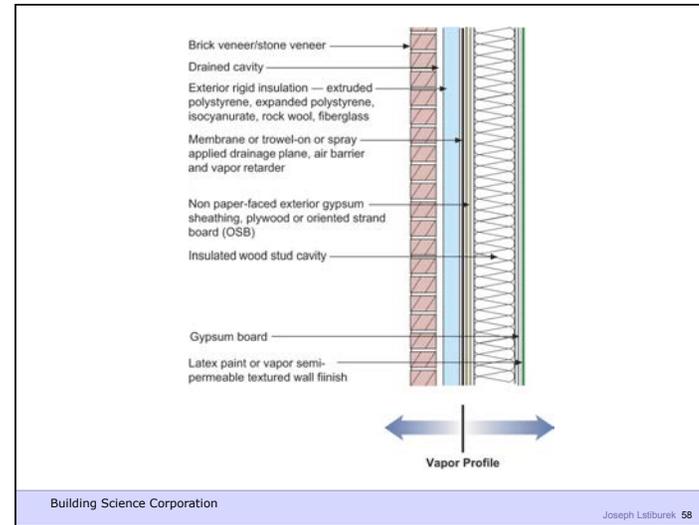
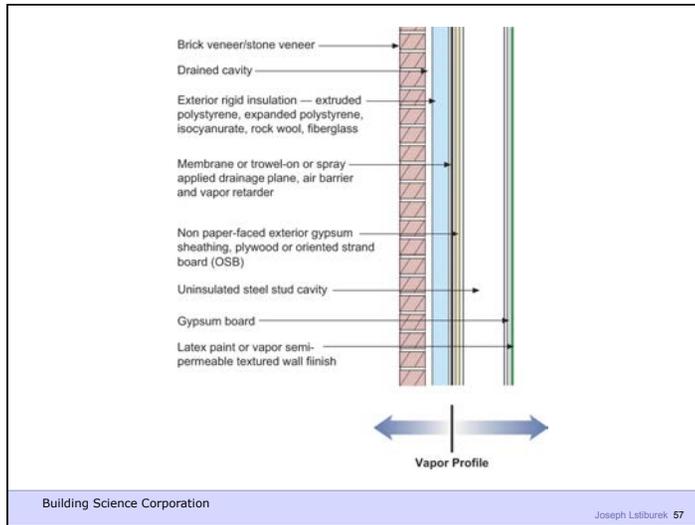
Water Control Layer
Air Control Layer
Vapor Control Layer
Thermal Control Layer

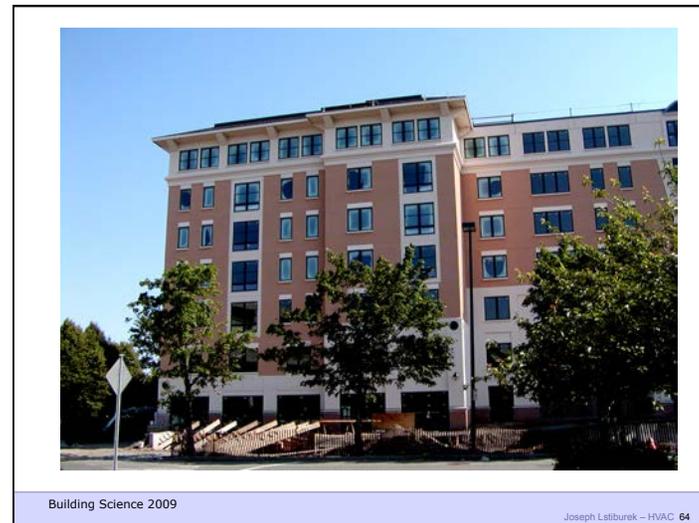
Building Science Corporation
Joseph Lstiburek 44











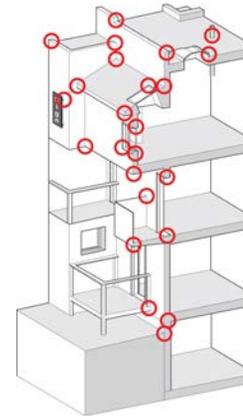
Commercial Enclosure: Simple Layers



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

Building Science Corporation

Joseph Lstiburek 65



Building Science Corporation

Joseph Lstiburek 66



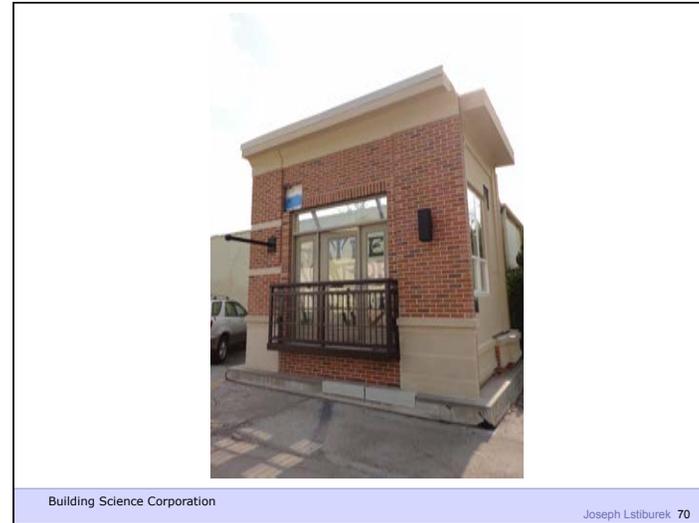
Building Science Corporation

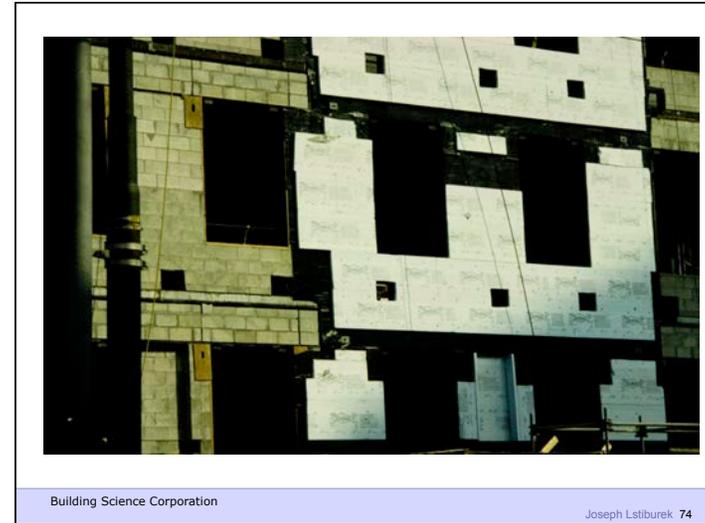
Joseph Lstiburek 67

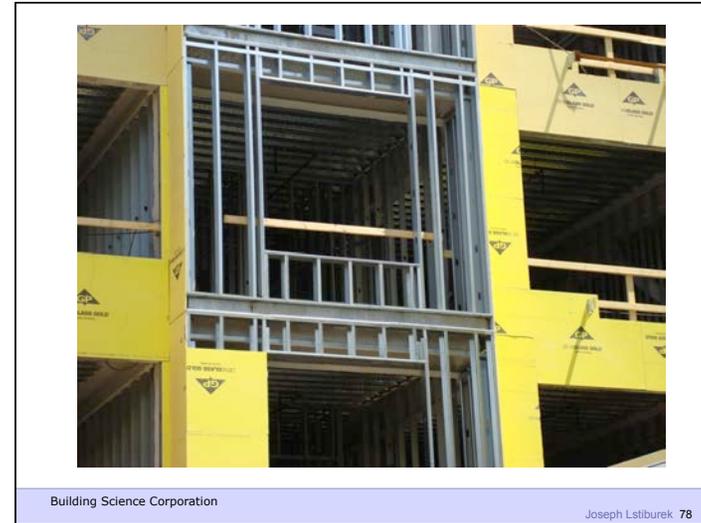


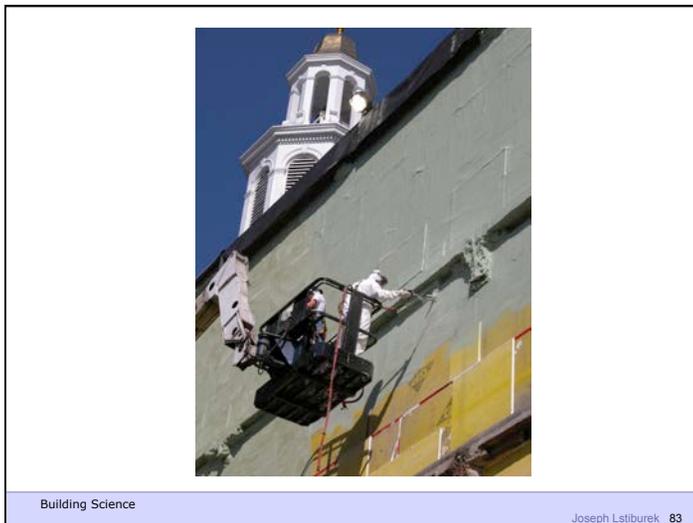
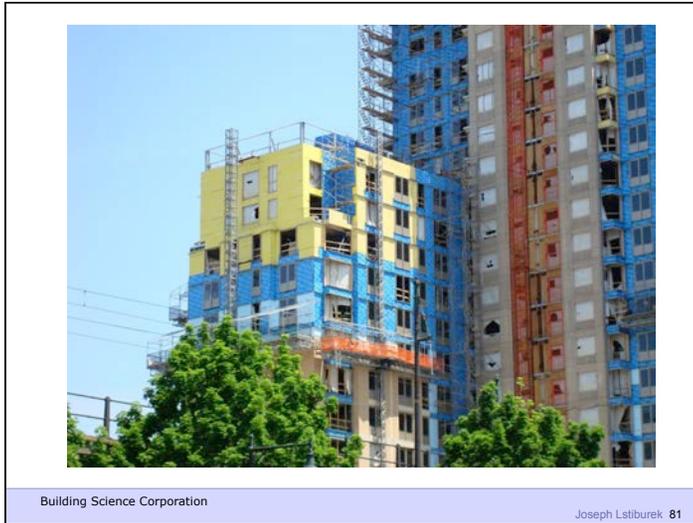
Building Science Corporation

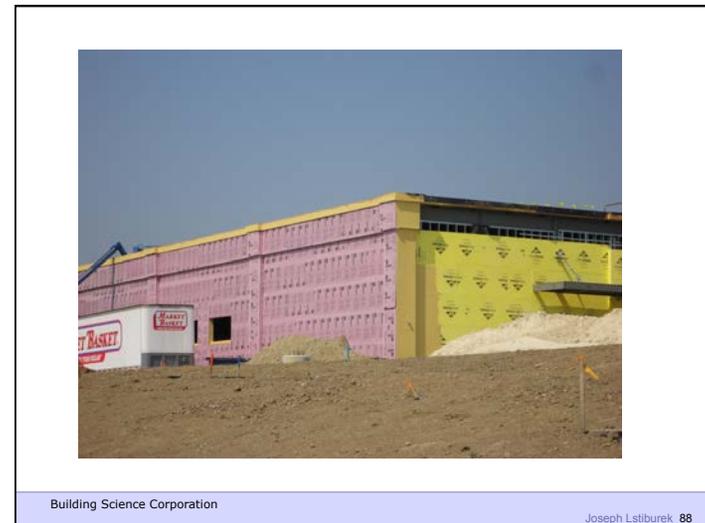
Joseph Lstiburek 68

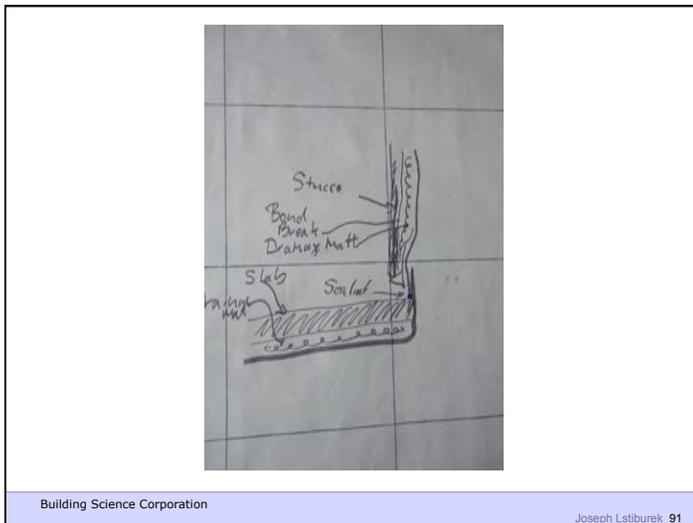
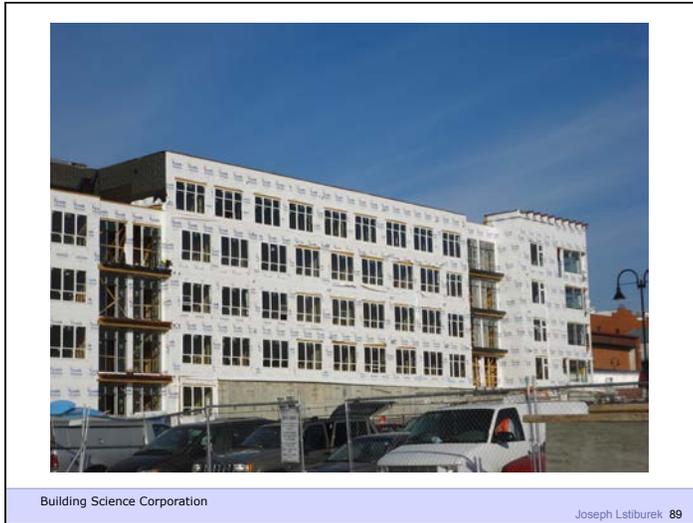




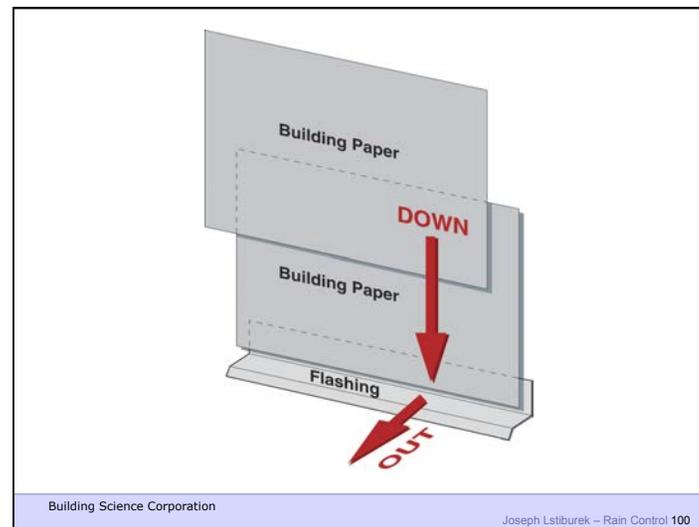
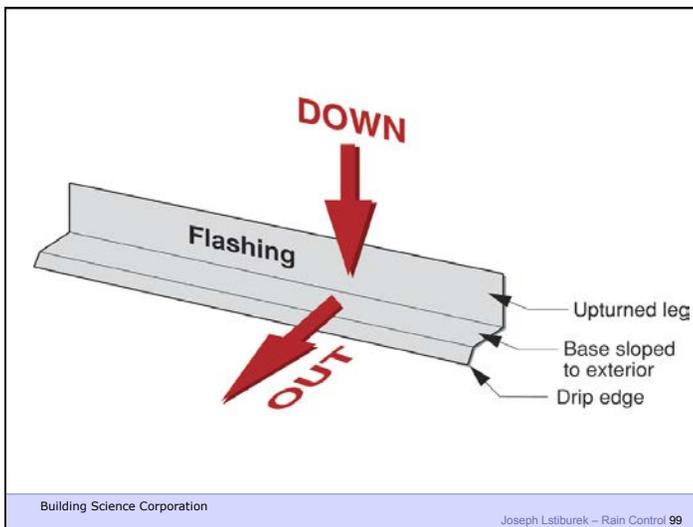
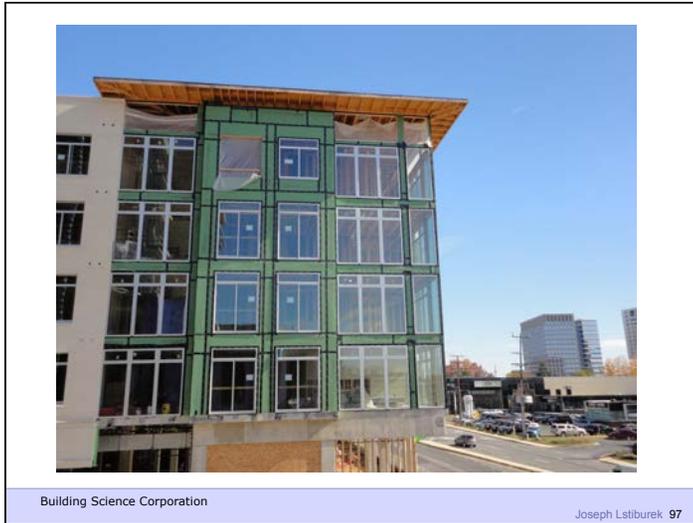


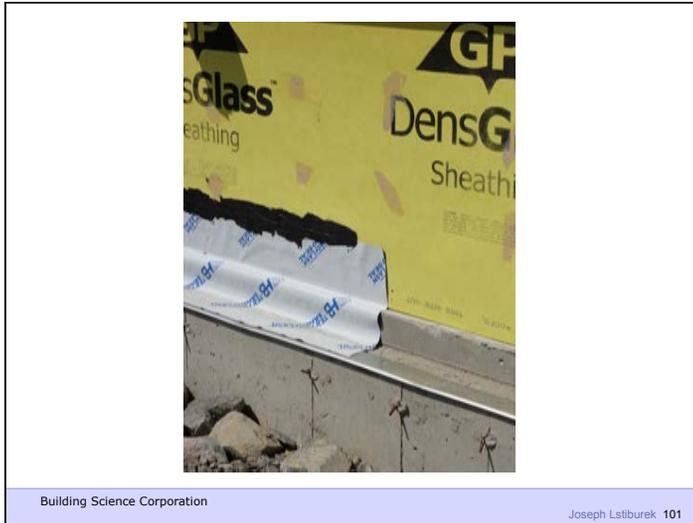


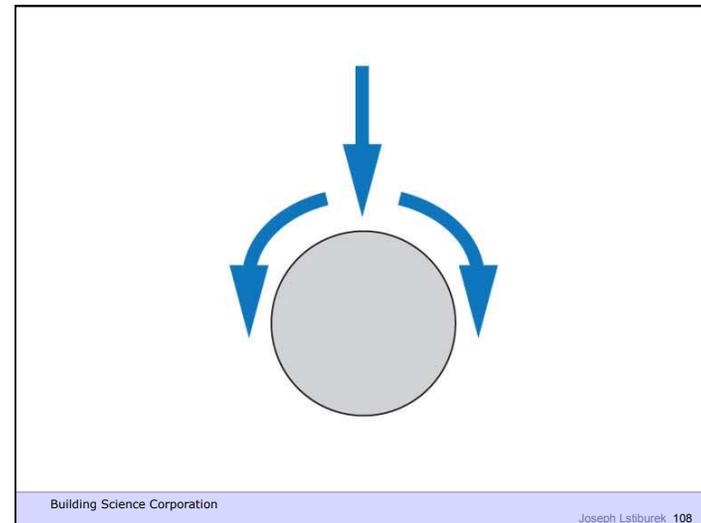
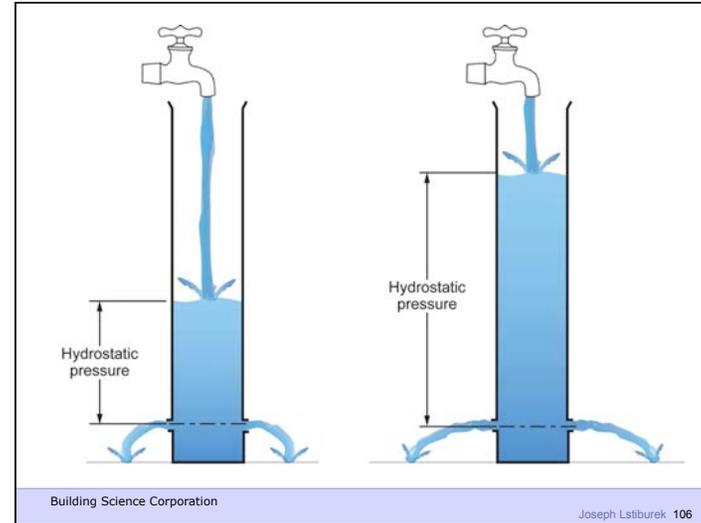


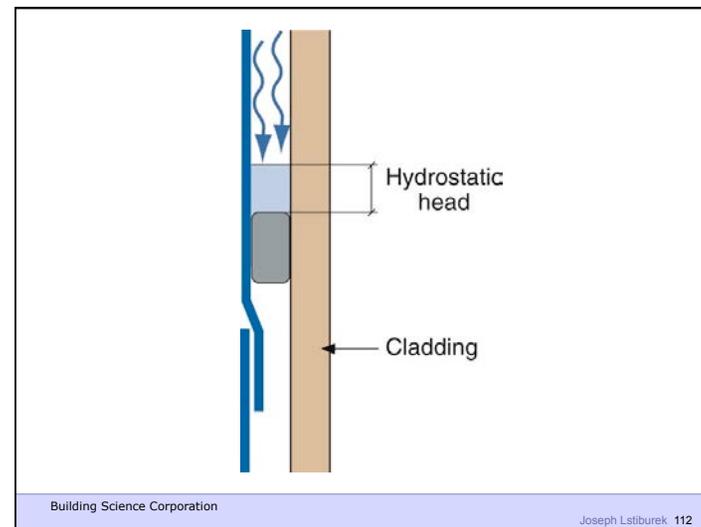
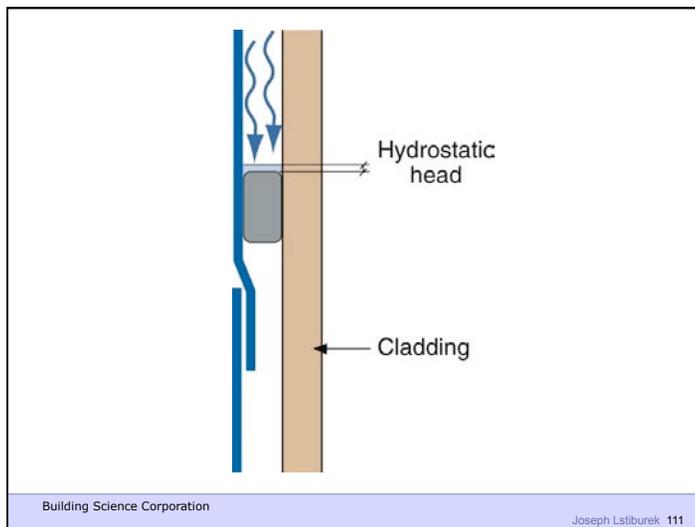
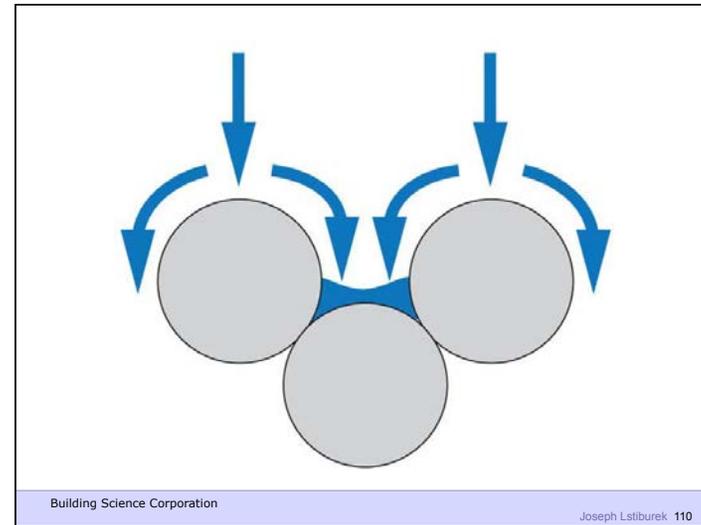
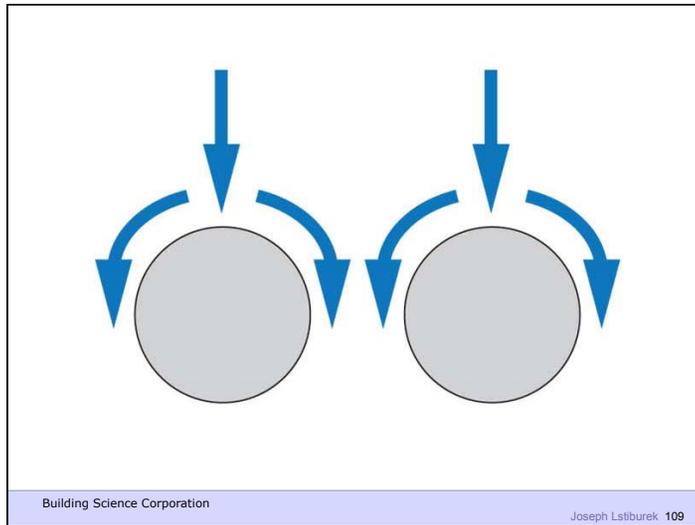


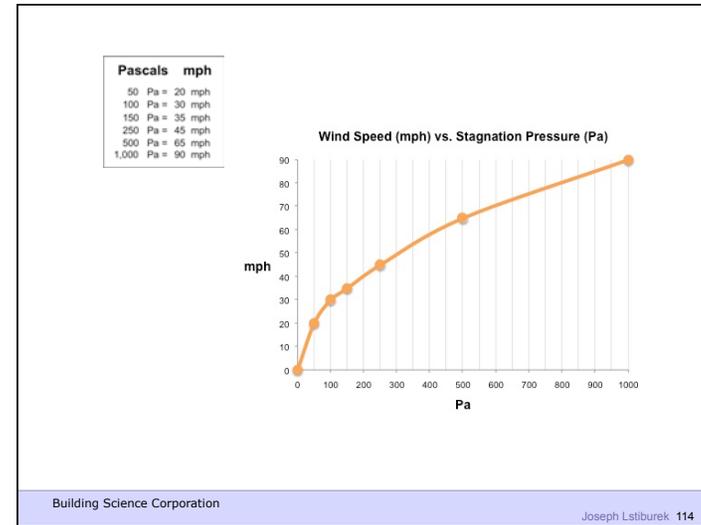
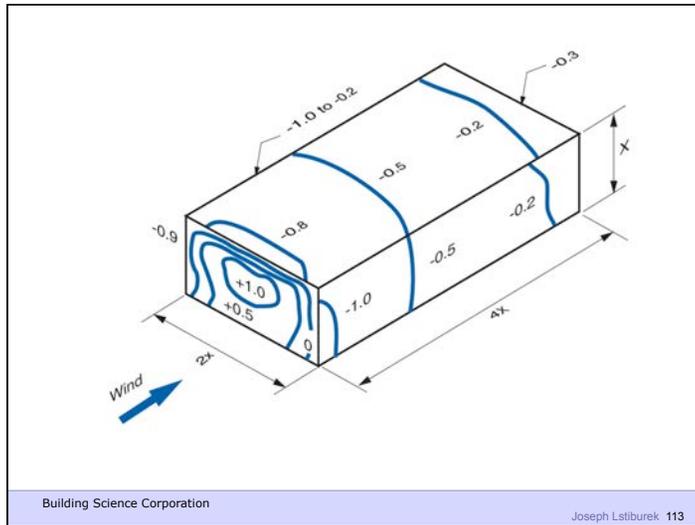


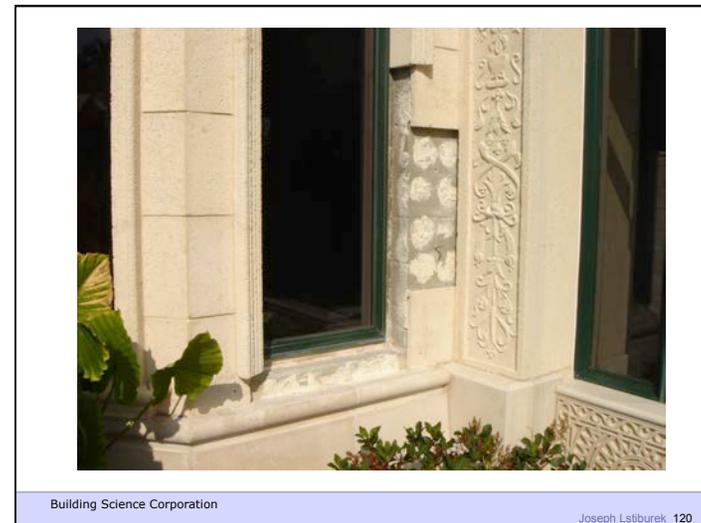
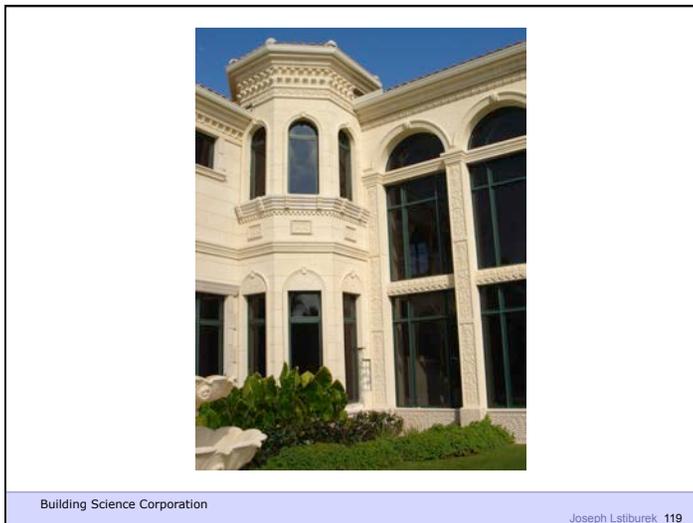


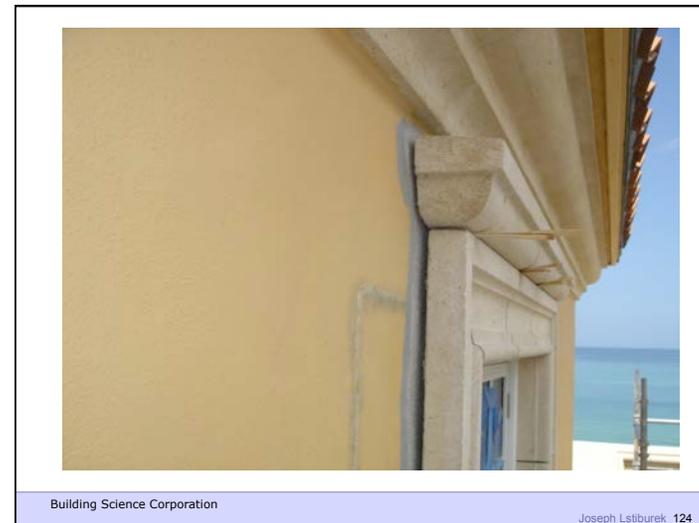
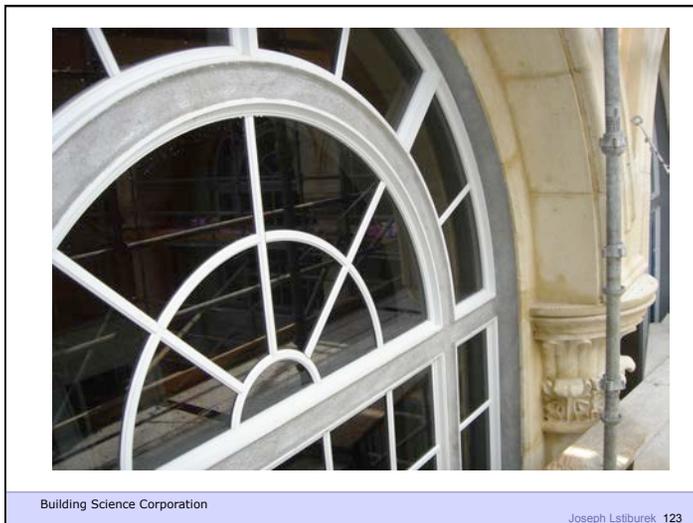


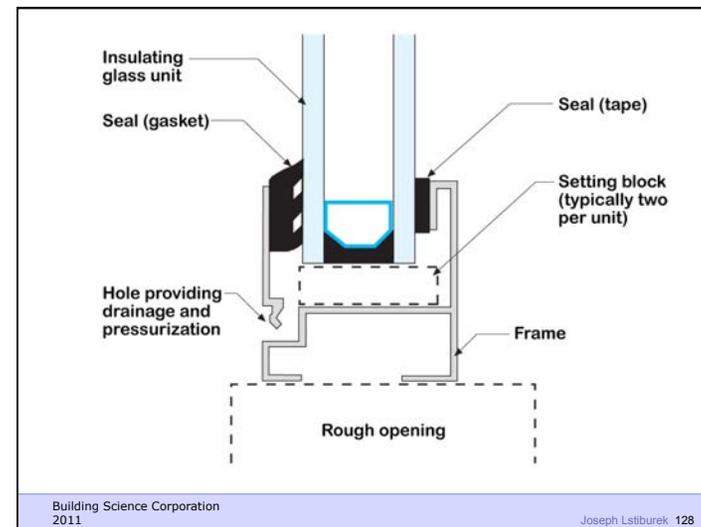
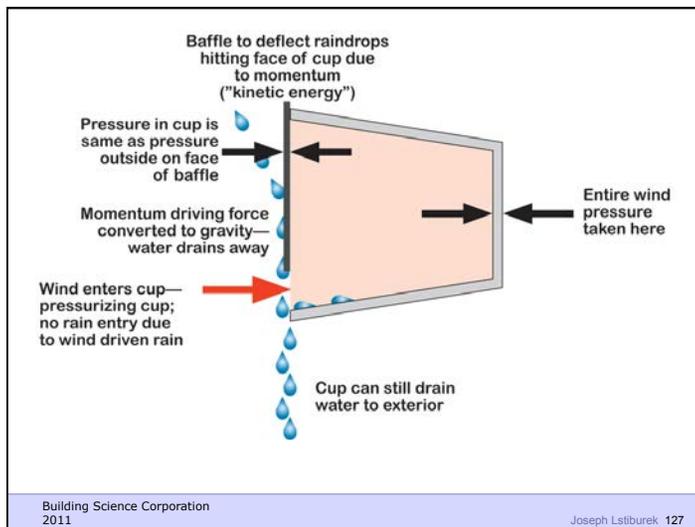
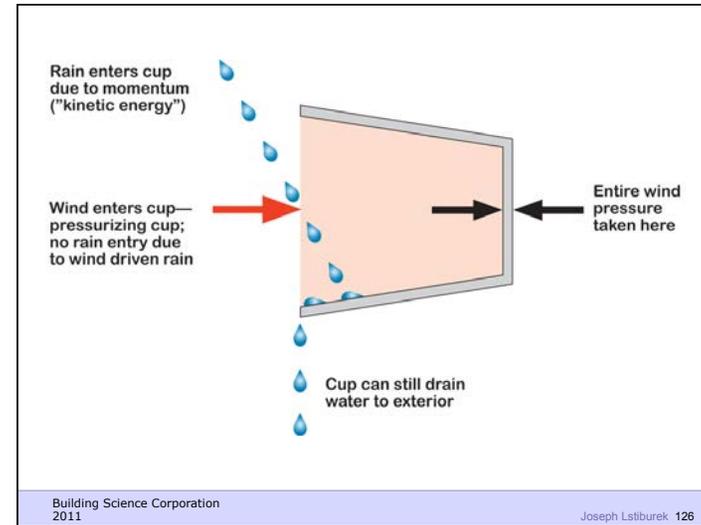
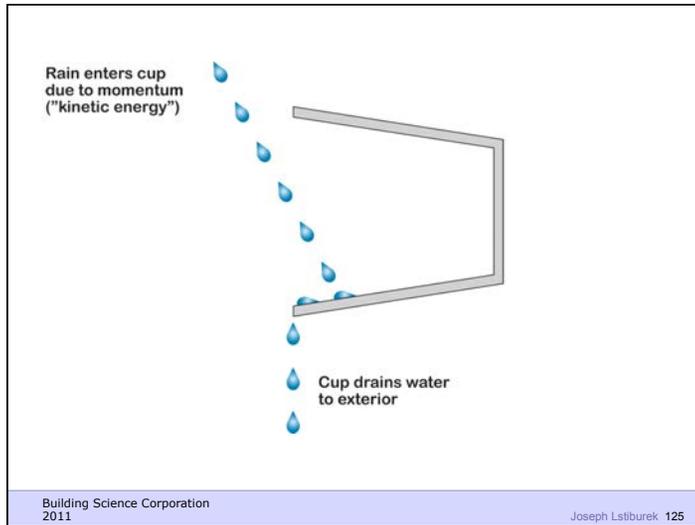


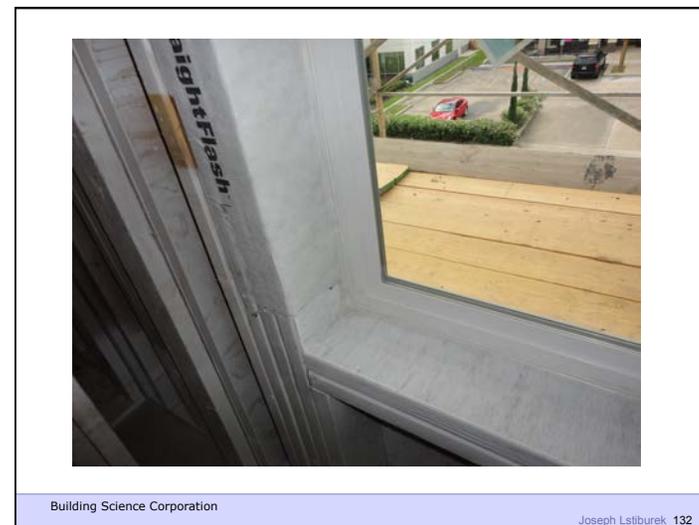
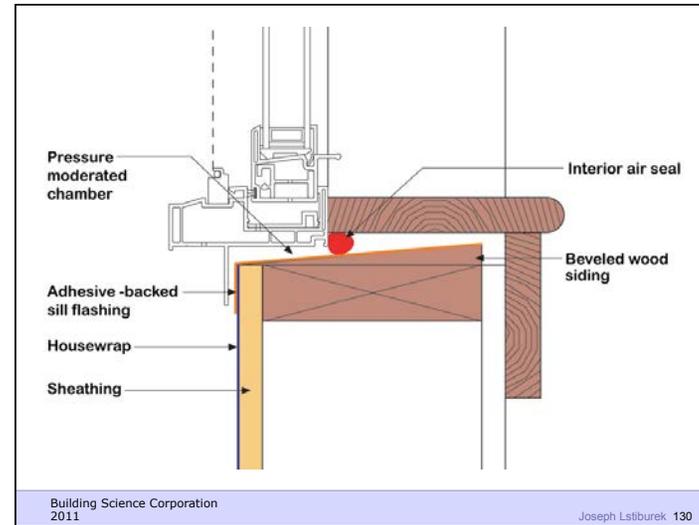
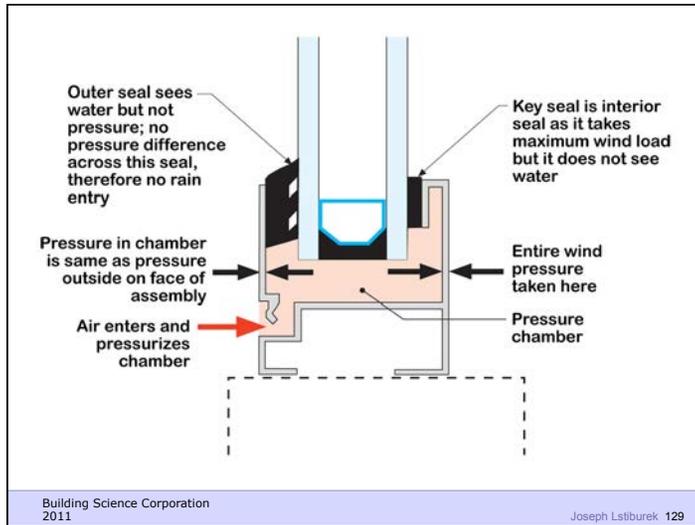


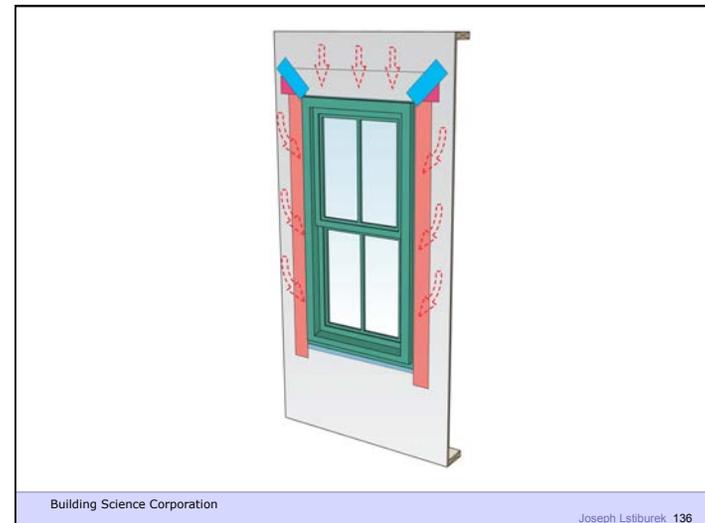


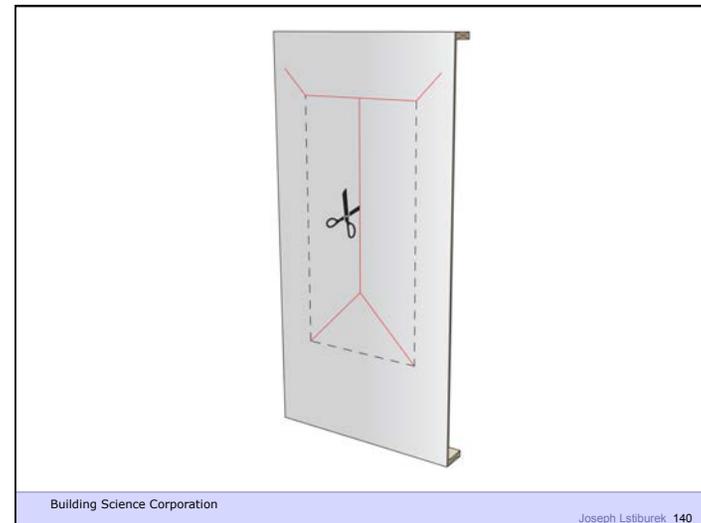
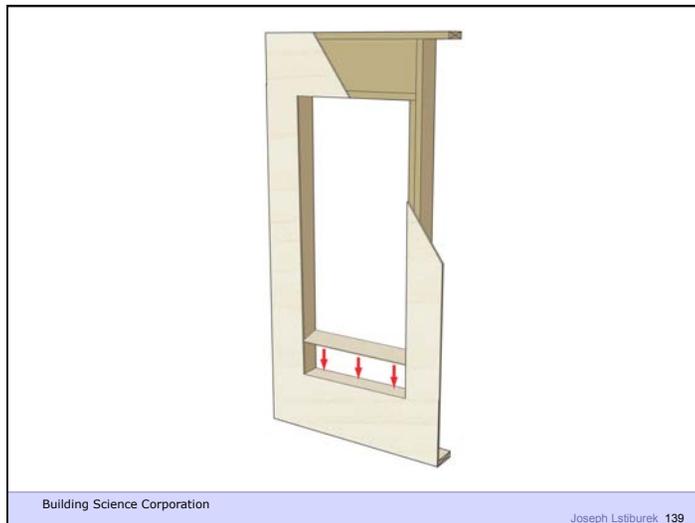
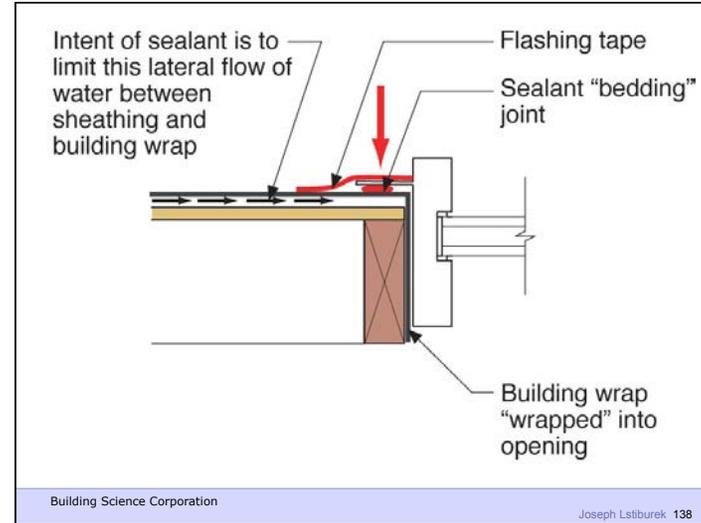
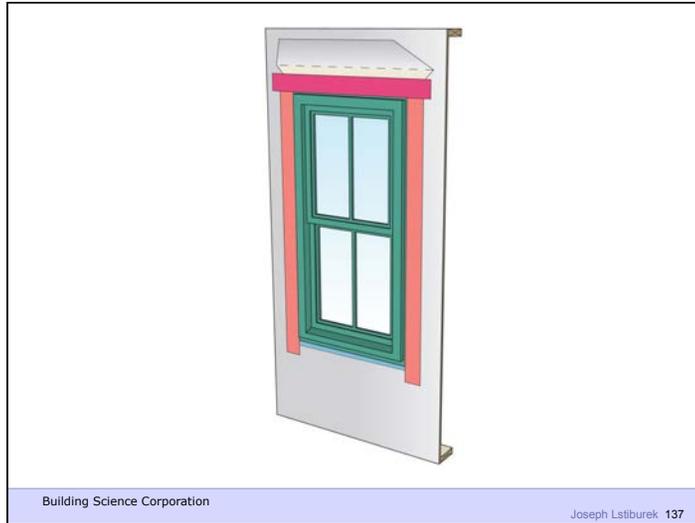


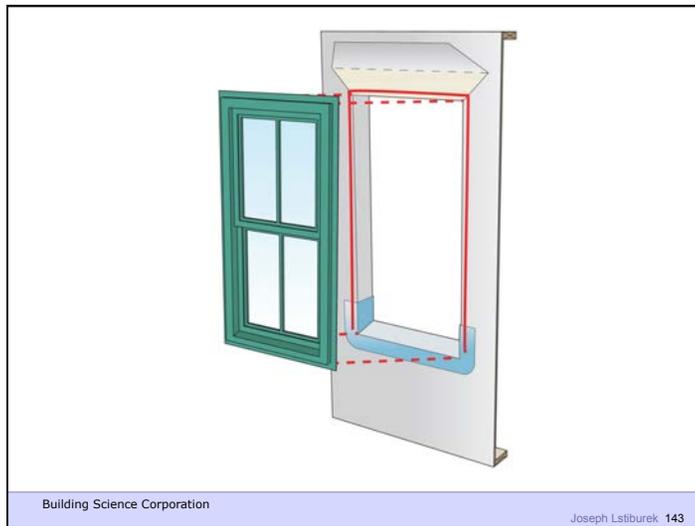
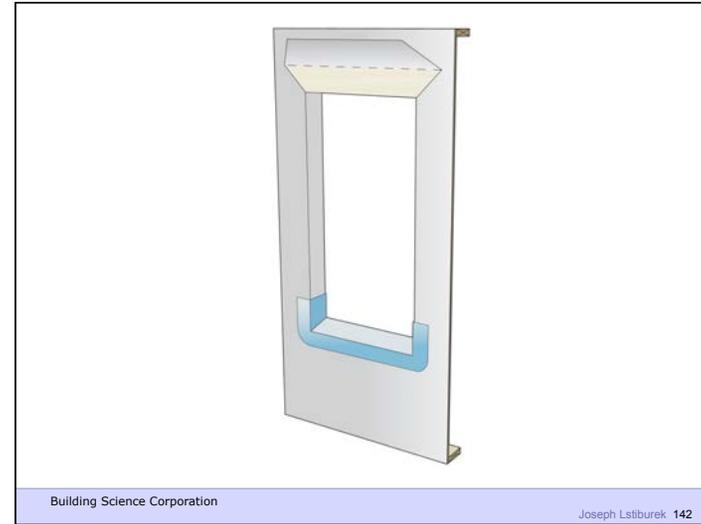
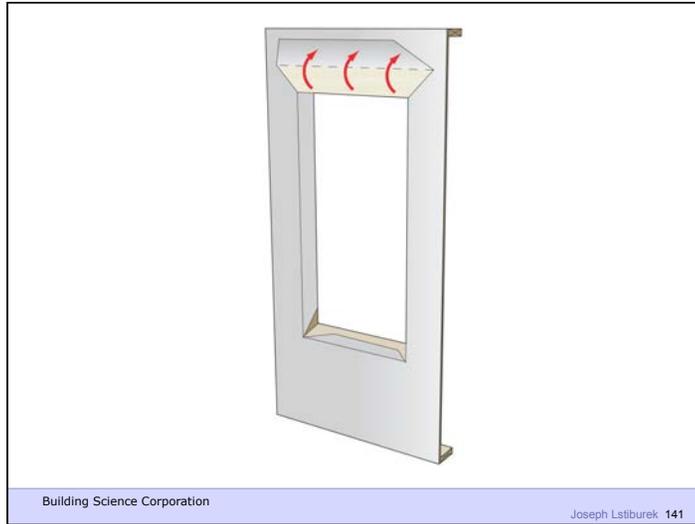


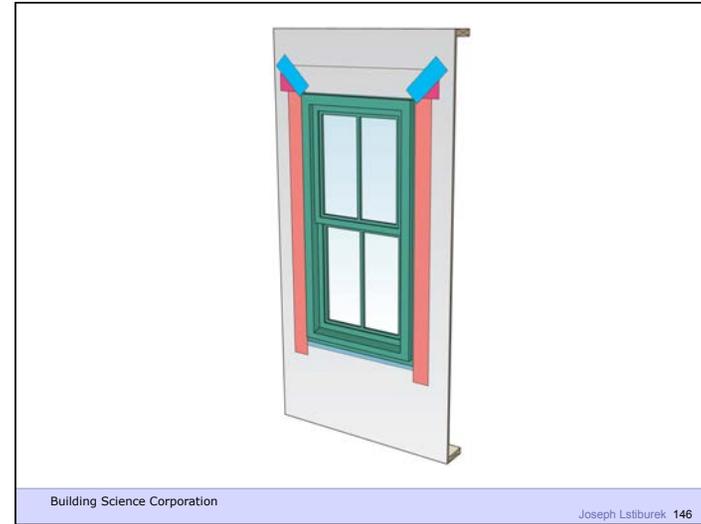


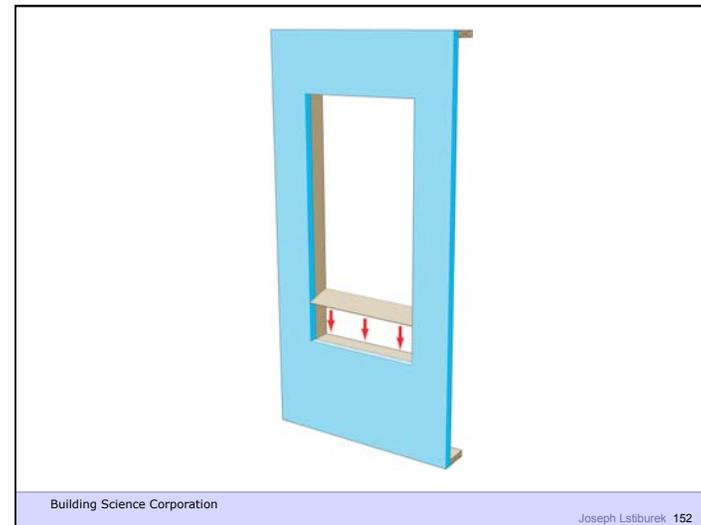
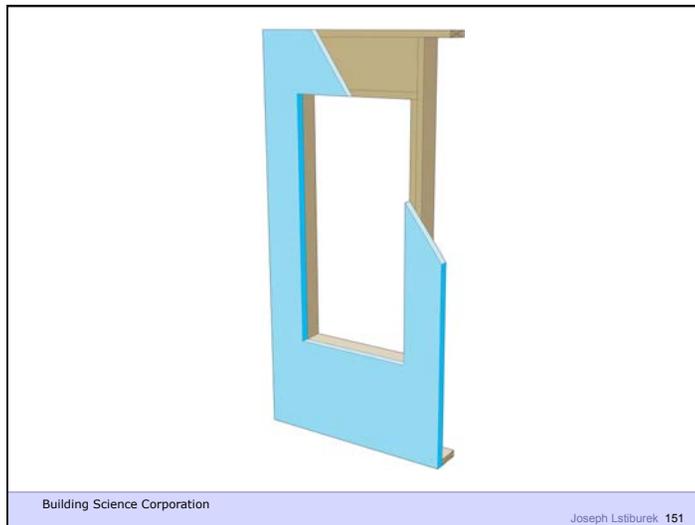


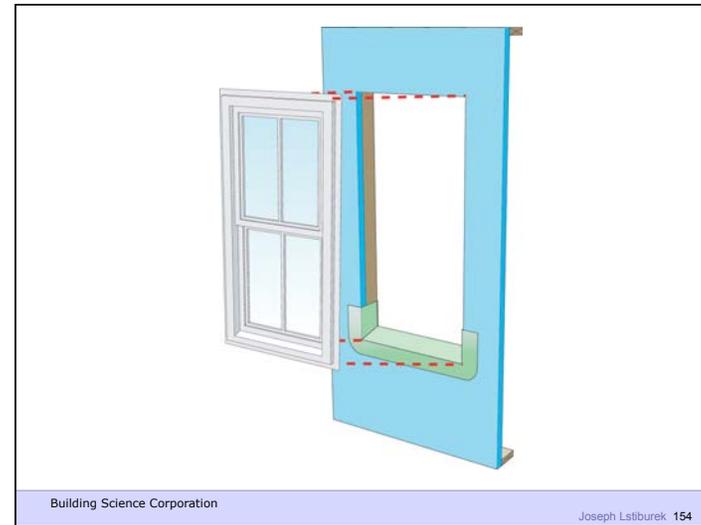
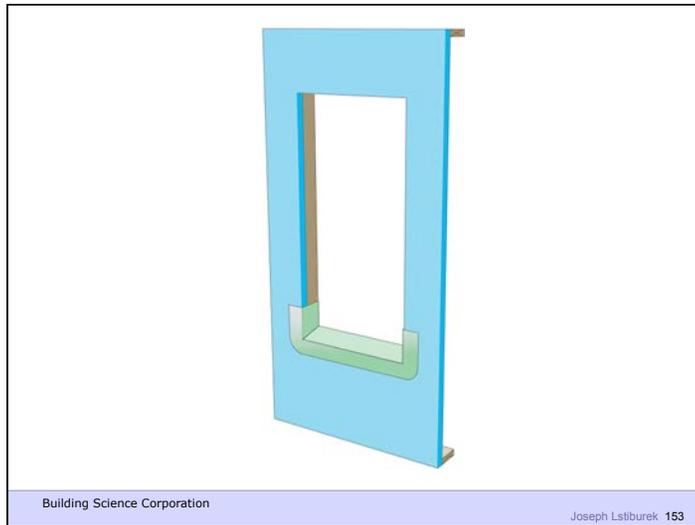


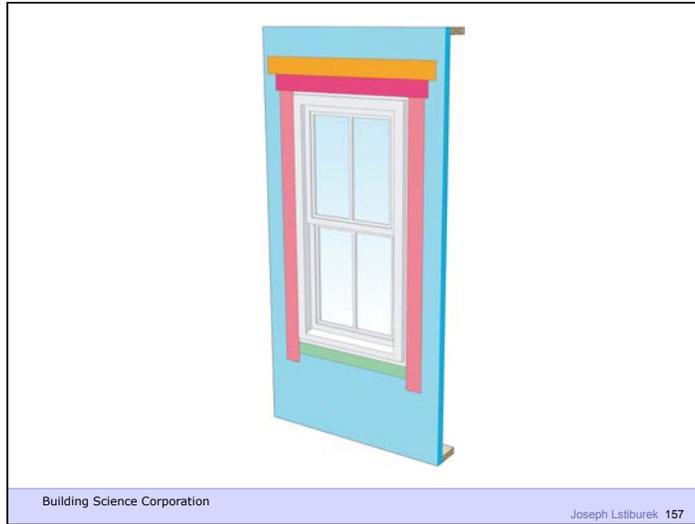


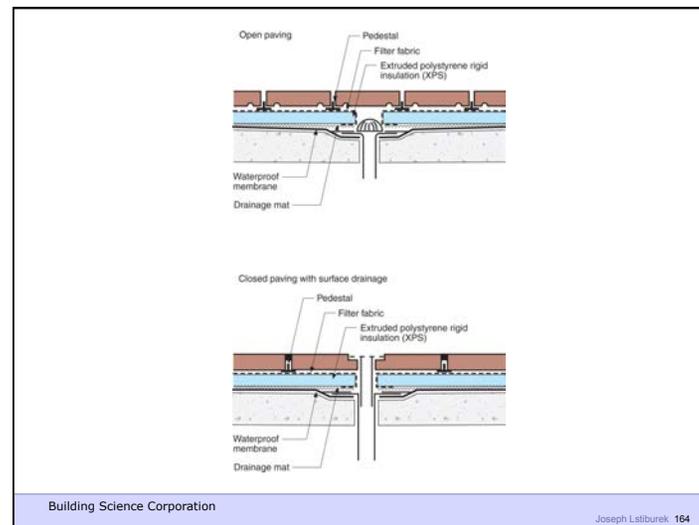
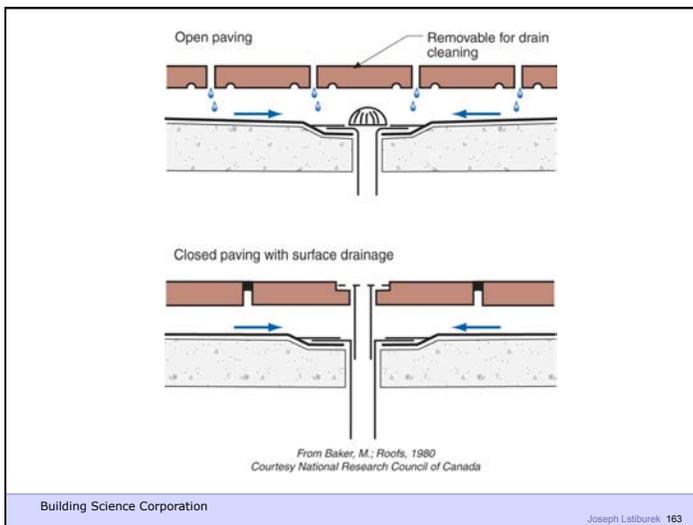
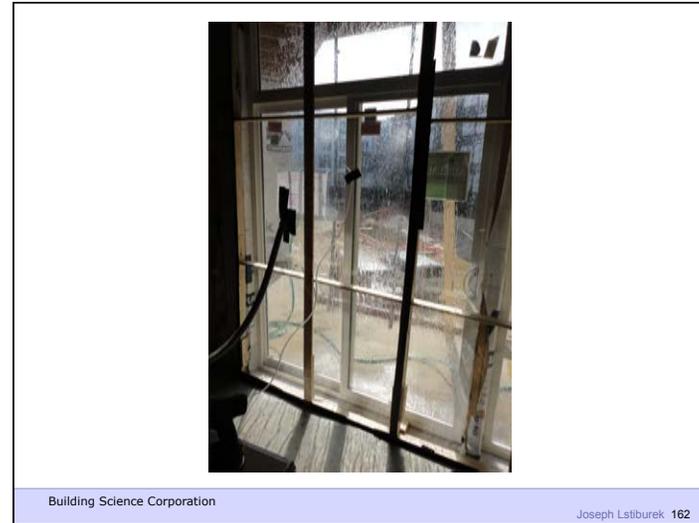


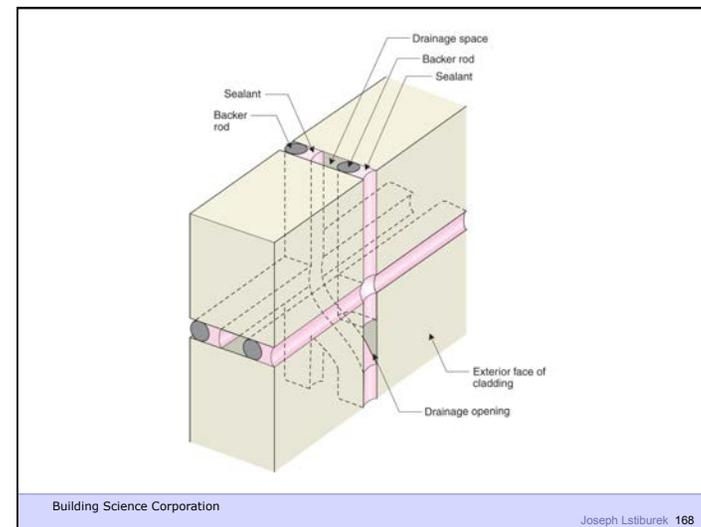
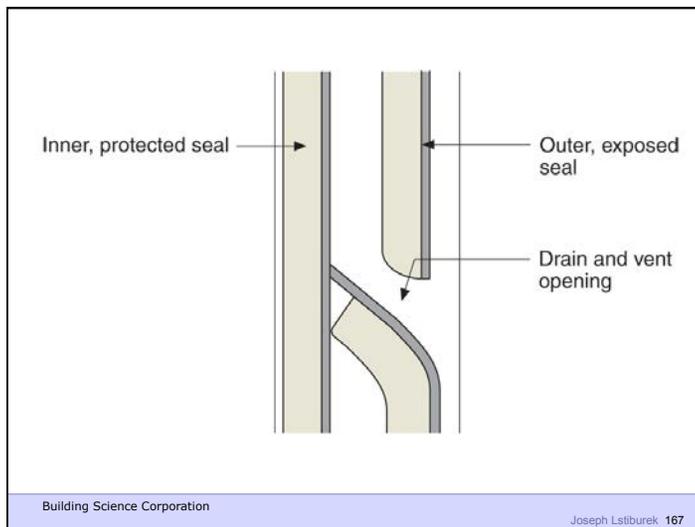
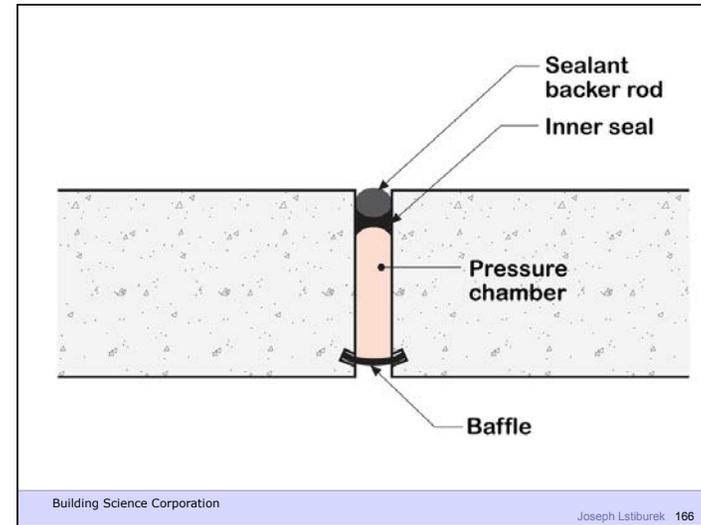
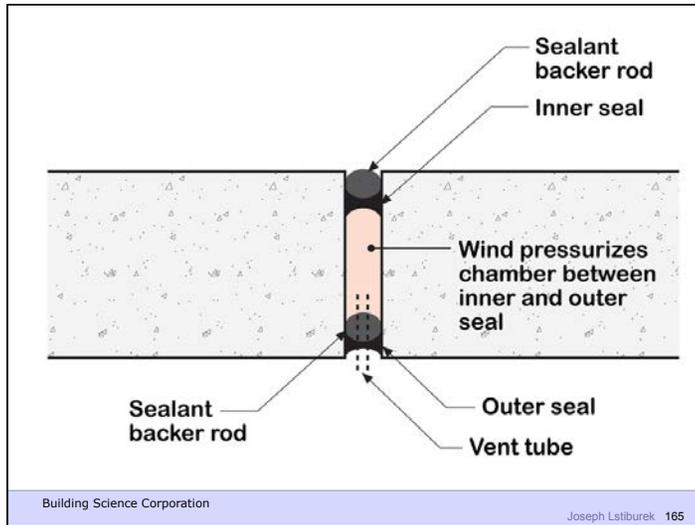


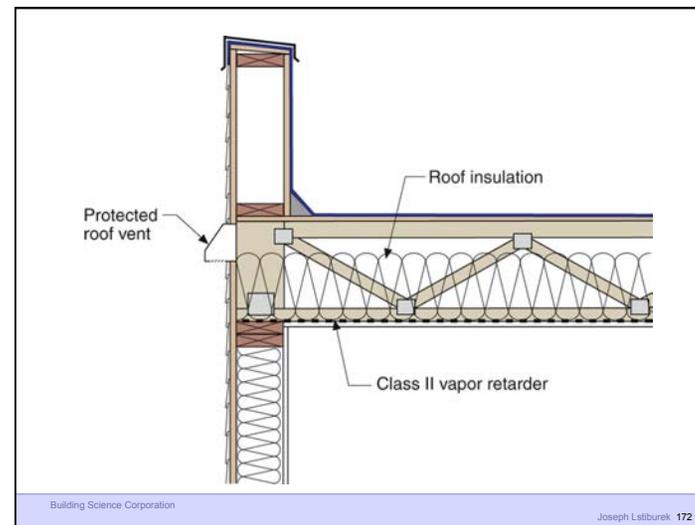
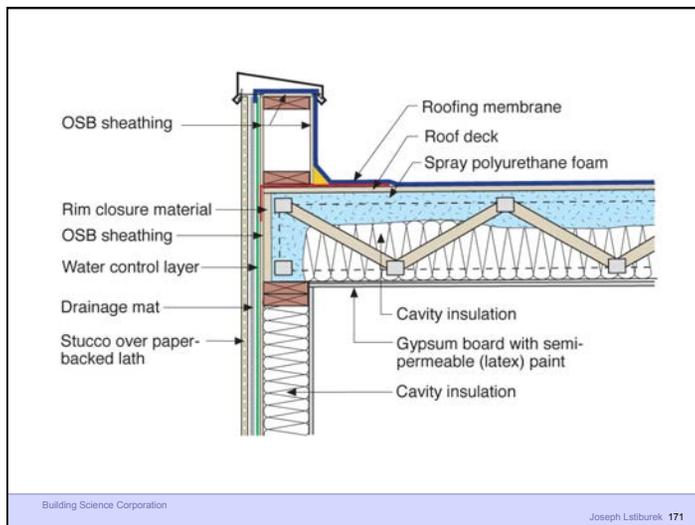
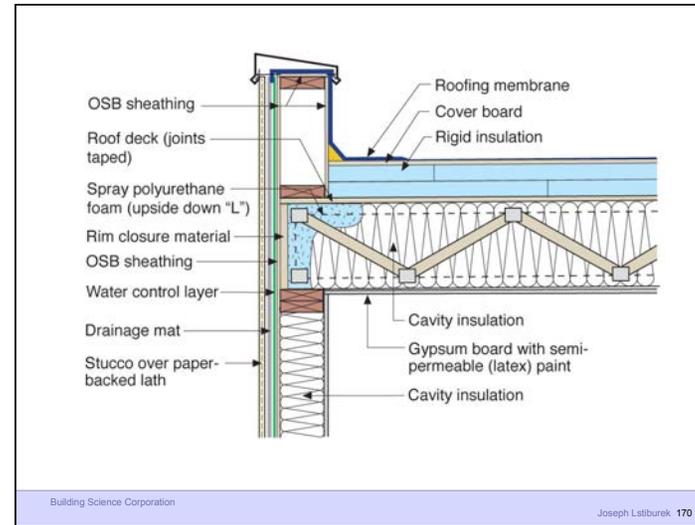
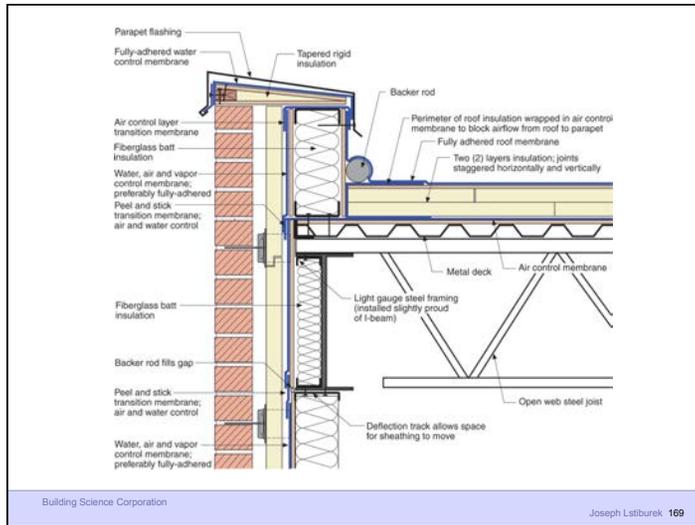


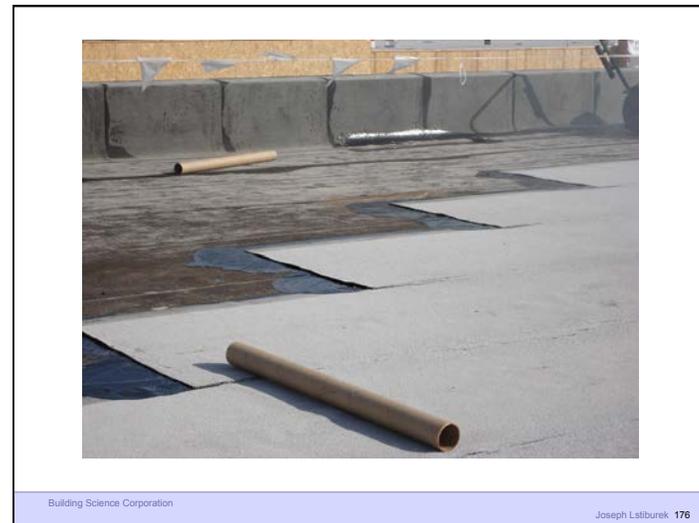
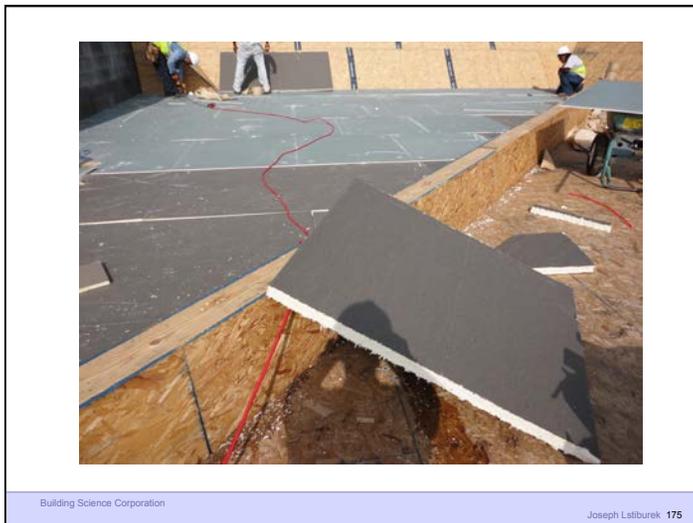
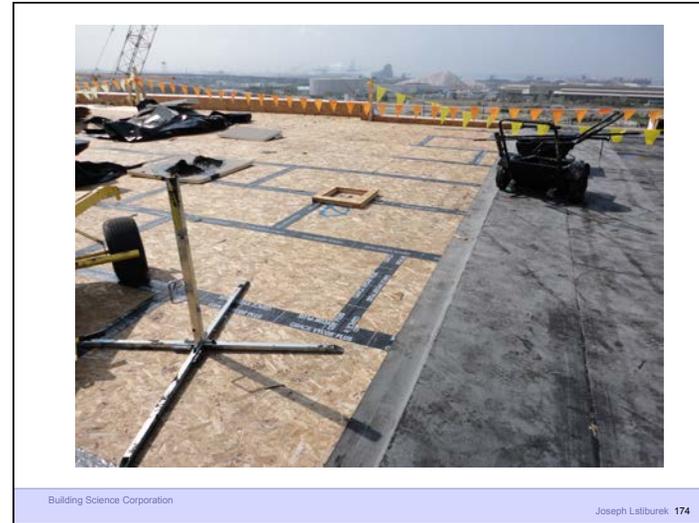


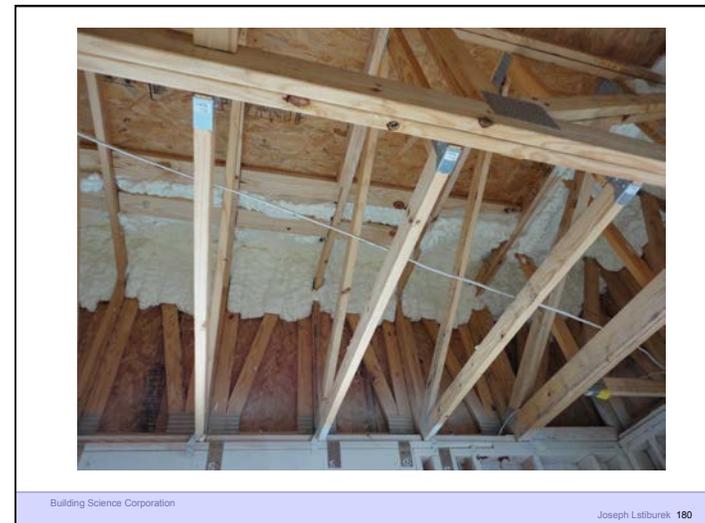
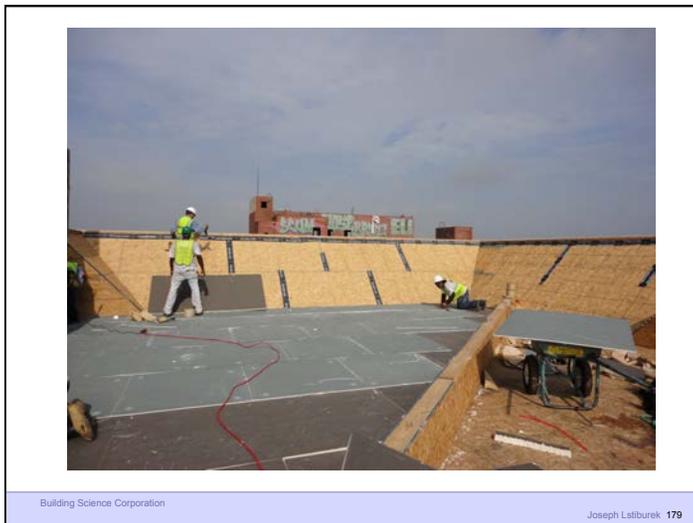
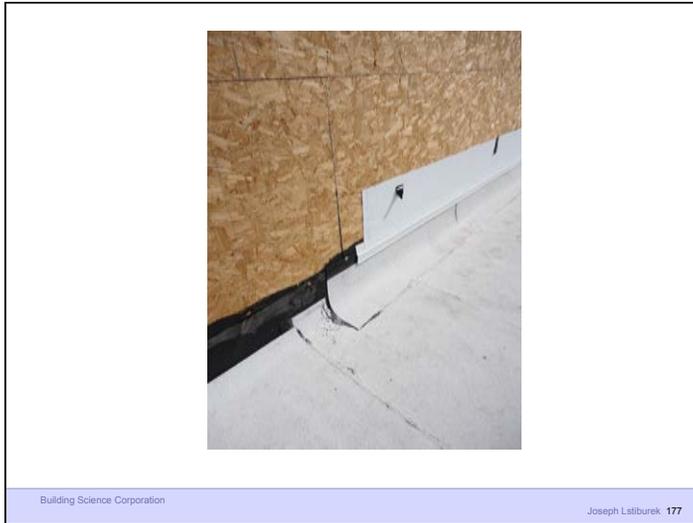












Air Barrier Metrics

Material	0.02 I/(s-m2)@75 Pa
Assembly	0.20 I/(s-m2)@75 Pa
Enclosure	2.00 I/(s-m2)@75 Pa

Building Science Corporation Joseph Lstiburek 181

