

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

# Building Science

## Passive Getting Active

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## A Trip Down Memory Lane

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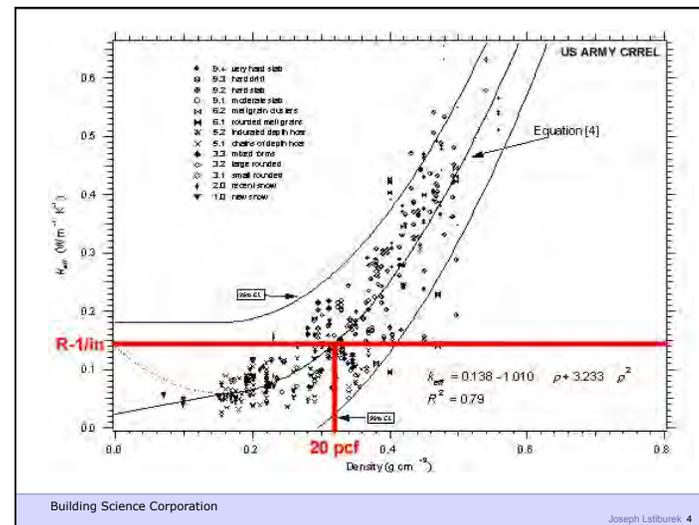
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Photo by Virgile Lafreniere, Northwest Territories, 2007

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Super Insulated  
Airtight  
Ventilated

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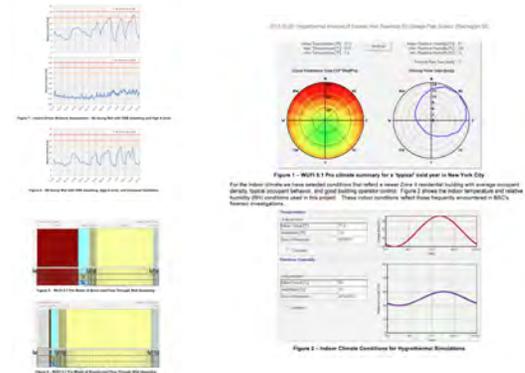


Figure 1 - WYD 5: The climate summary for a "typical" year in New York City. For the indoor climate and heat transfer conditions that reflect a typical 2-story residential building with average occupant density, typical occupant behavior, and good building envelope control. Figure 2 shows the indoor temperature and relative humidity (RH) conditions used in this project. These indoor conditions reflect those typically encountered in BSC's research investigations.

Figure 2 - Indoor Climate Conditions for Representative Simulations

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MIT – Solar I - Cambridge - 1939

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Neil Hutcheon - Canada – 1953  
enclosure fundamentals  
airtightness

Neil Hutcheon - Canada – 1964  
perfect wall

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RAIN

RAIN SCREEN

WATER THAT PENETRATES IS DIVERTED OUTWARD BY FLASHINGS

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RAIN

RAIN SCREEN

WATER THAT PENETRATES IS DIVERTED OUTWARD BY FLASHINGS

Brick veneer/stone veneer

Drained cavity

Exterior rigid insulation — extruded polystyrene, expanded polystyrene, isocyanurate, rock wool, fiberglass

Membrane or trowel-on or spray applied drainage plane, air barrier and vapor retarder

Concrete block

Metal channel or wood furring

Gypsum board

Latex paint or vapor semi-permeable textured wall finish

Vapor Profile

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Arkansas Project - USA - 1974

Harry Tschumi

Les Blades

Frank Holtzclaw

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Lyngby House - Denmark - 1975

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Joseph Lstiburek 13



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Joseph Lstiburek 14

Lyngby House - Denmark – 1975  
Null-Energi-Haus  
Vagn Korsgaard – Technical University of  
Denmark  
Double walls, R-40 walls, R-60 roof  
Air to air heat exchanger  
Double glazed windows with insulating shutters  
Solar thermal – 8,000 gal storage tank

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Provident House - Canada – 1976

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Joseph Lstiburek 17

Provident House - Canada – 1976  
Zero Energy House  
Frank Hooper – University of Toronto  
King City  
Solar thermal 70,000 gal storage  
(entire basement)

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Lo Cal House - USA - 1976

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Lo Cal House - USA – 1976  
Wayne Shick and Bud Konzo  
R-30 double stud walls  
R-30 vented roof  
Triple glazed windows  
Air to air heat exchanger

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Saskatchewan Conservation House - 1977

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Joseph Lstiburek 23

Saskatchewan Conservation House – 1977  
R-40 double stud walls  
R-60 ceiling  
Triple glazed windows  
Air to air heat exchanger  
0.8 ach@50 Pa

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Leger House - USA - 1977

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Leger House - USA – 1977  
Double wall – R 40 walls R 60 ceiling  
Airtight construction  
Air to air heat exchanger

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MIT – Solar V - Cambridge - 1978

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## Balcomb House – Santa Fe - 1979

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2010

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Balcomb House – Santa Fe – 1979  
Mass and glass  
Sun spaces and solar orientation  
Rock bed heat storage

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Parade of Homes - Saskatoon - 1980

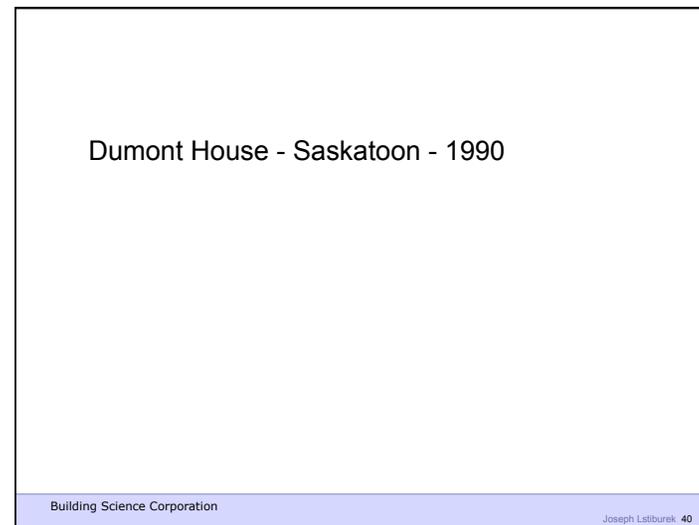
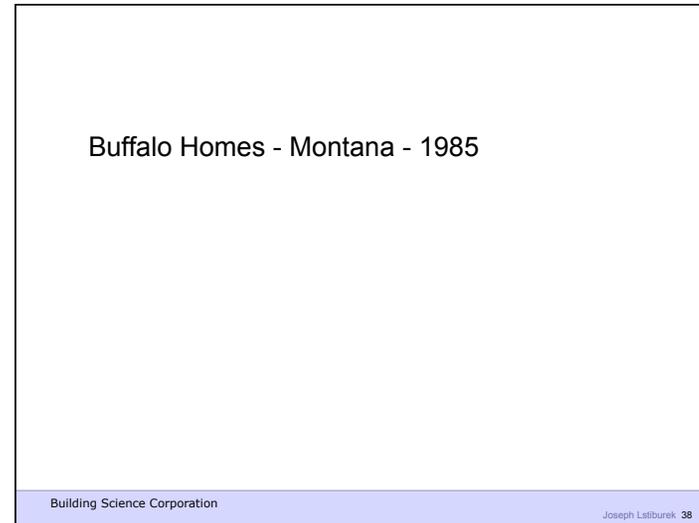
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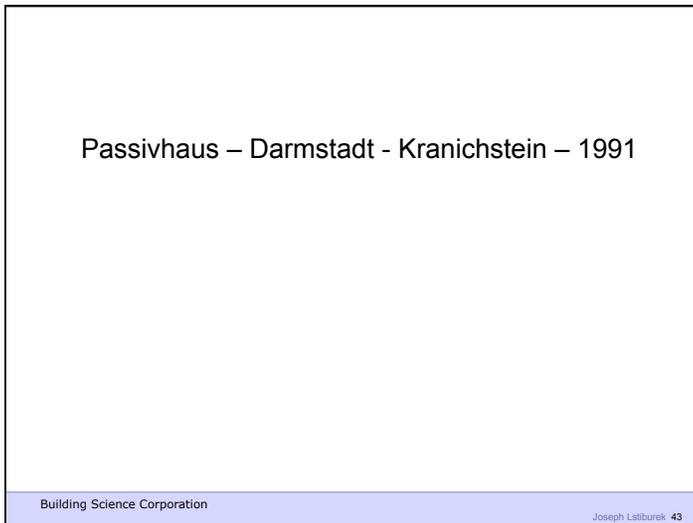
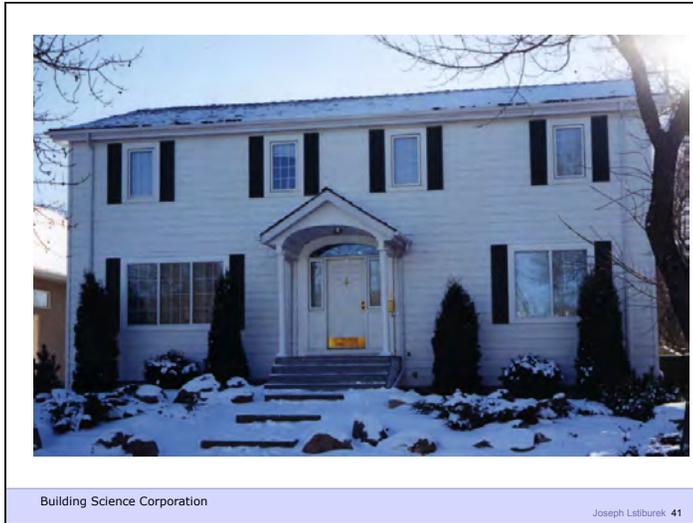


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R-2000 Program – 1982

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Passivhaus – Darmstadt - Kranichstein – 1991  
Super Insulated  
Air tight  
Air to air heat exchanger  
Subsoil heat exchanger

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How I Spent 1979, 1980 and 1981

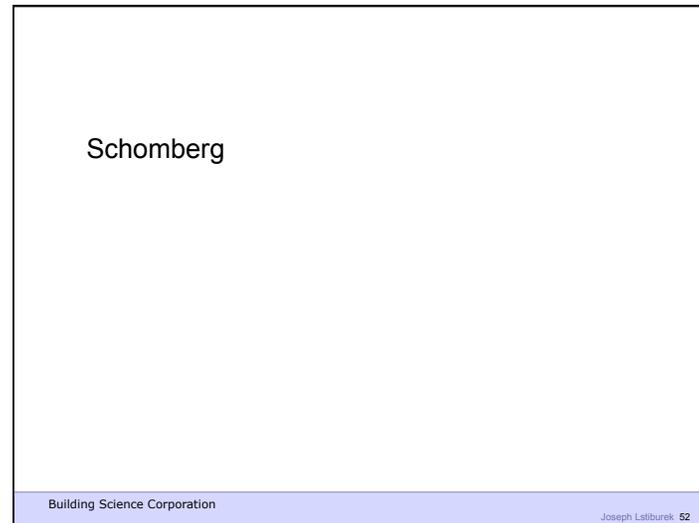
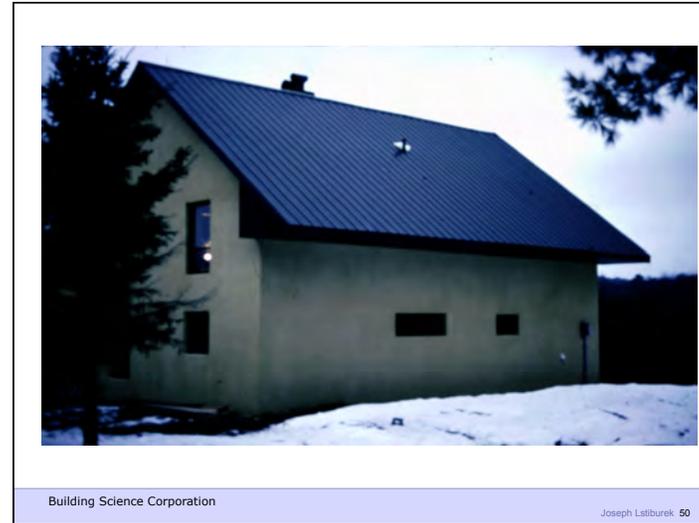
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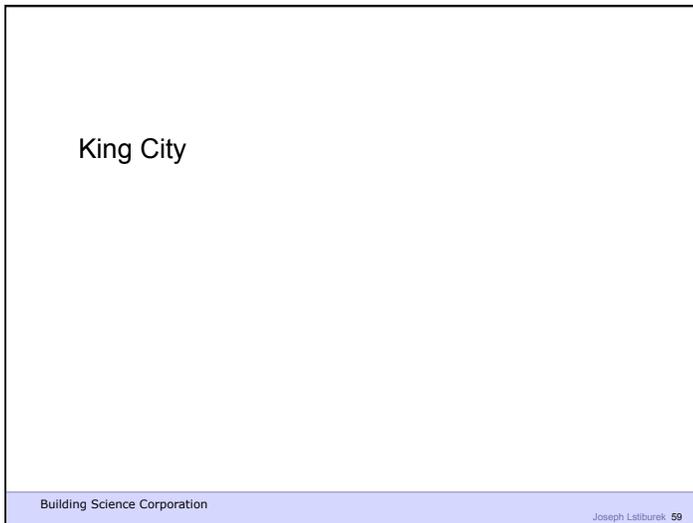
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Carnarvon

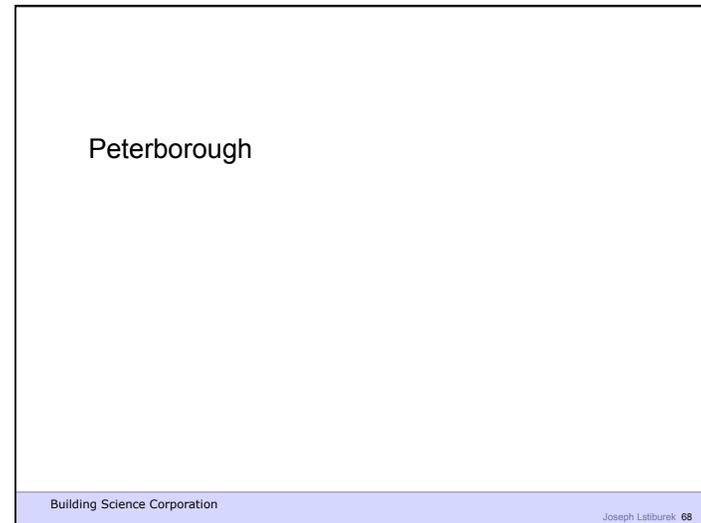
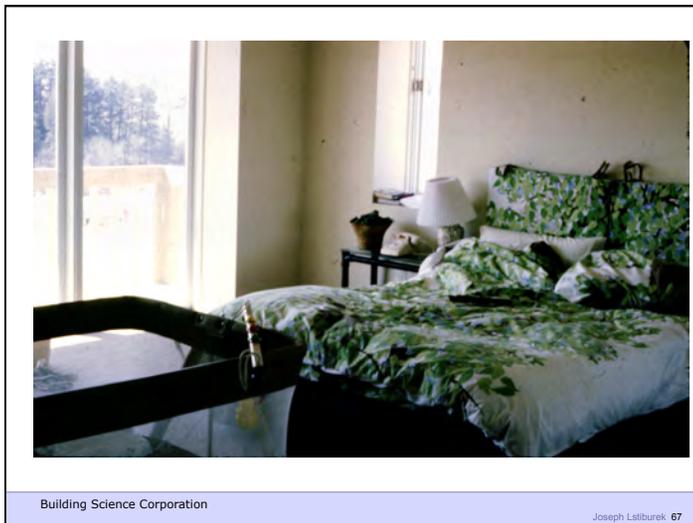
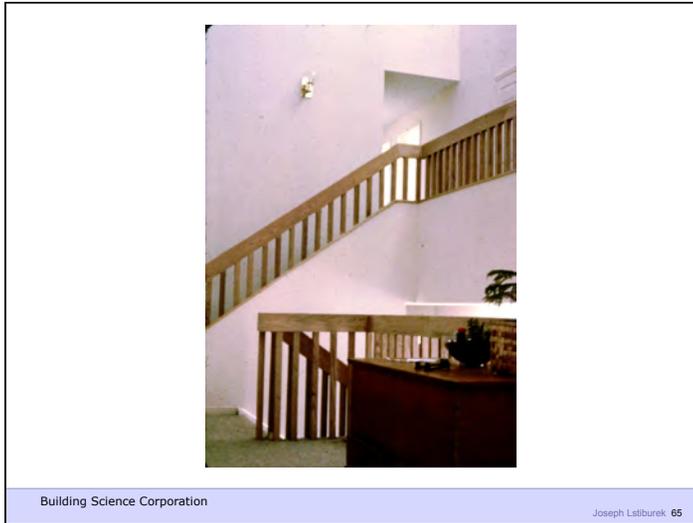
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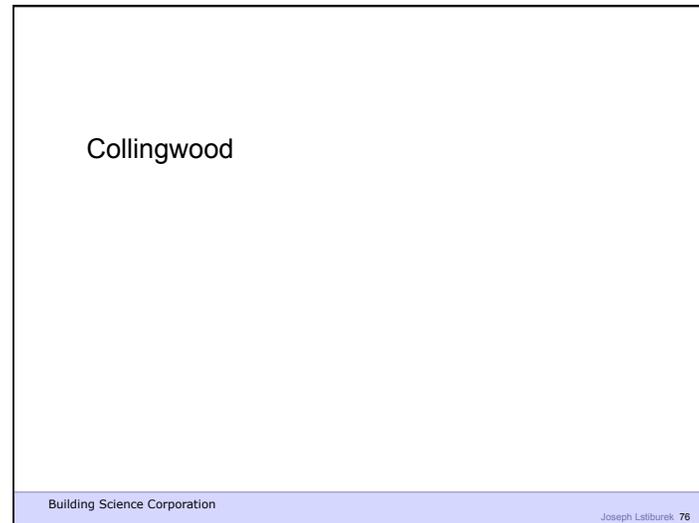




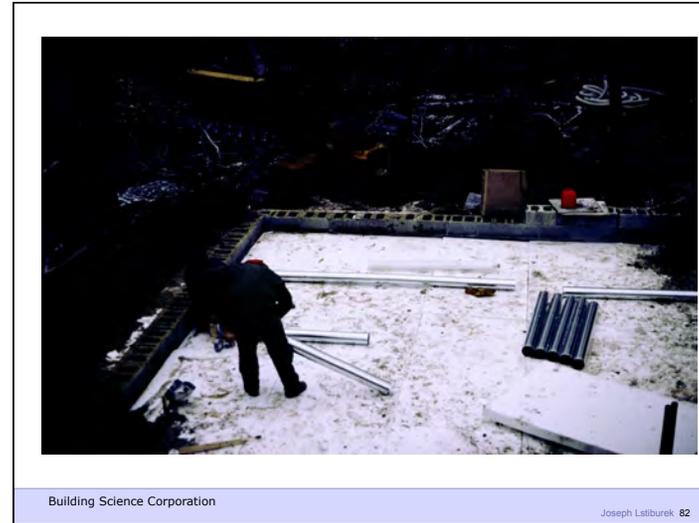
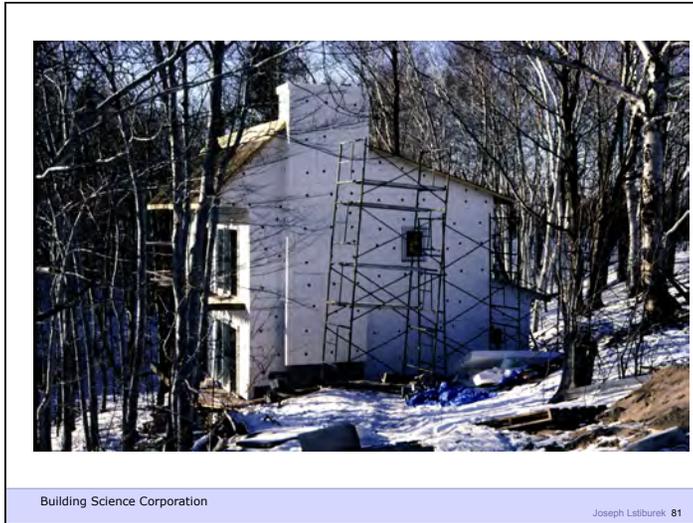






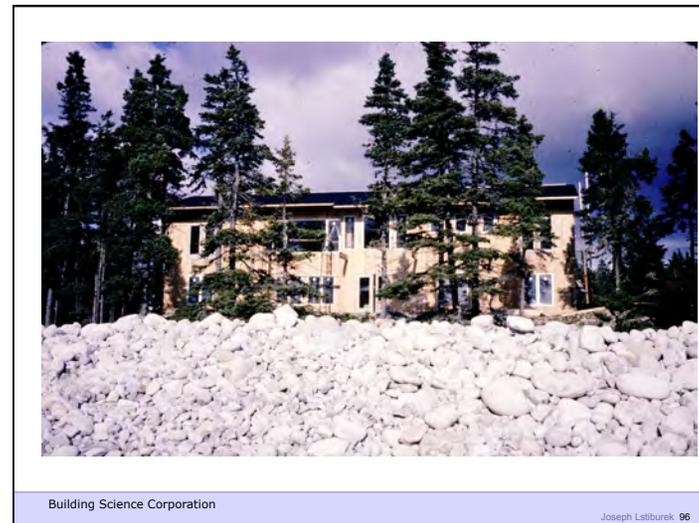




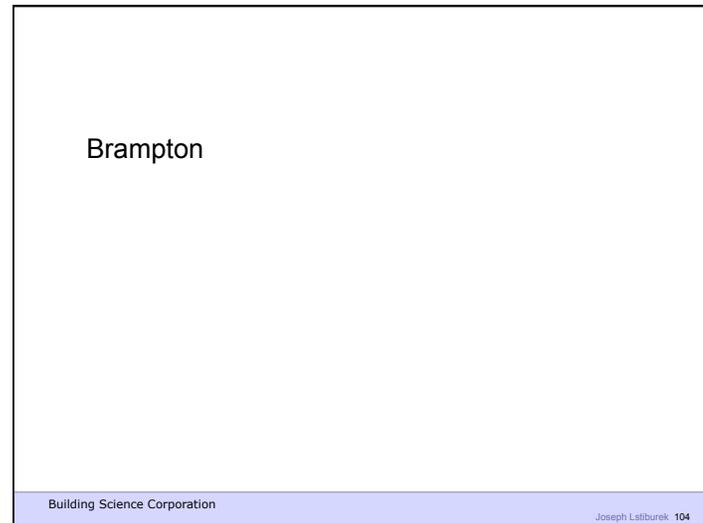














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Joseph Lstiburek 108



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Joseph Lstiburek 111

Unionville

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Joseph Lstiburek 112



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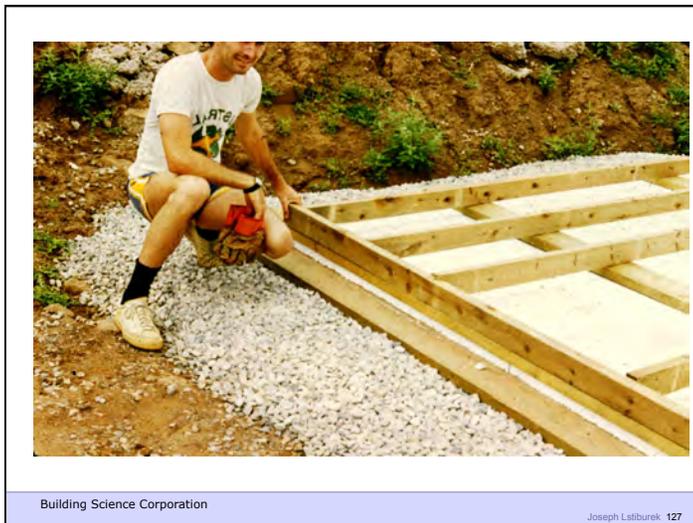
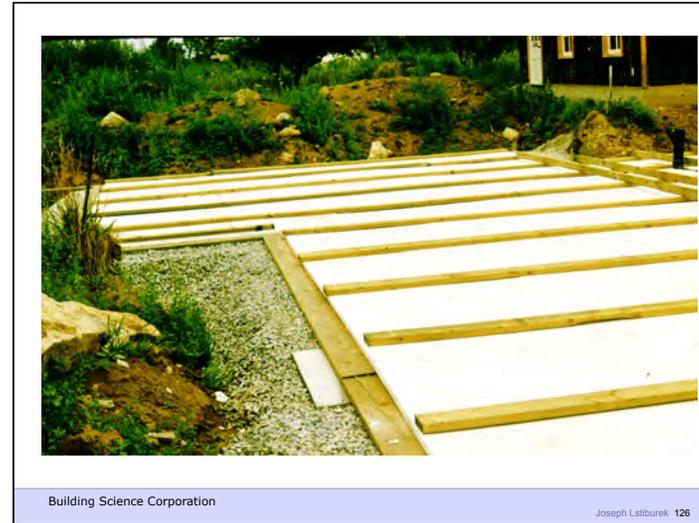
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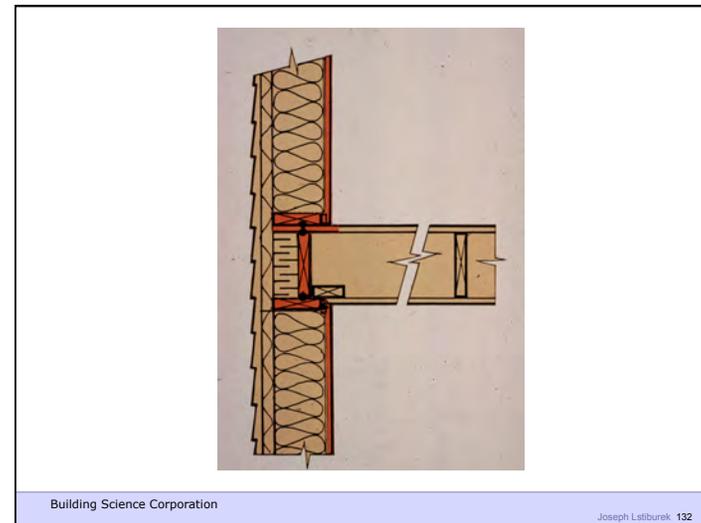


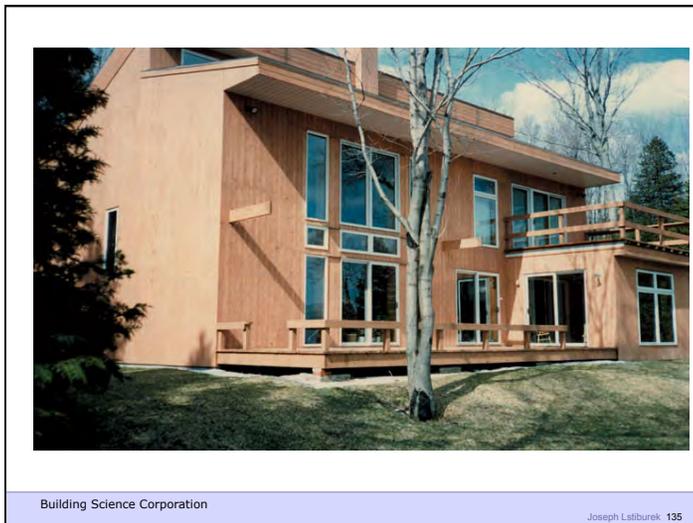
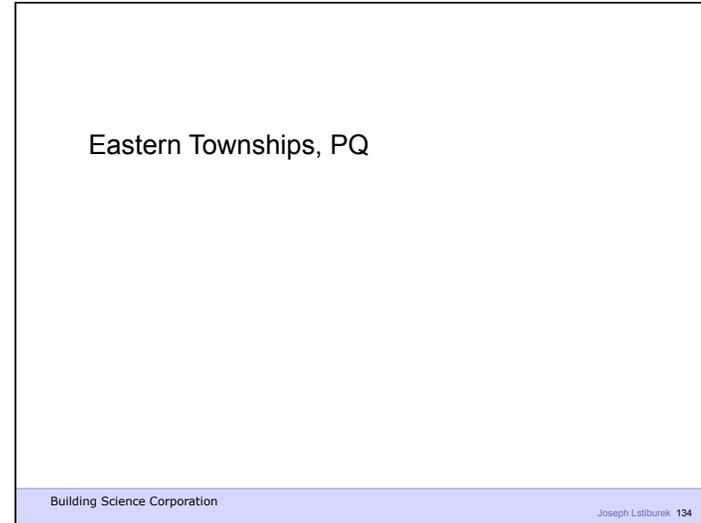


Creemore

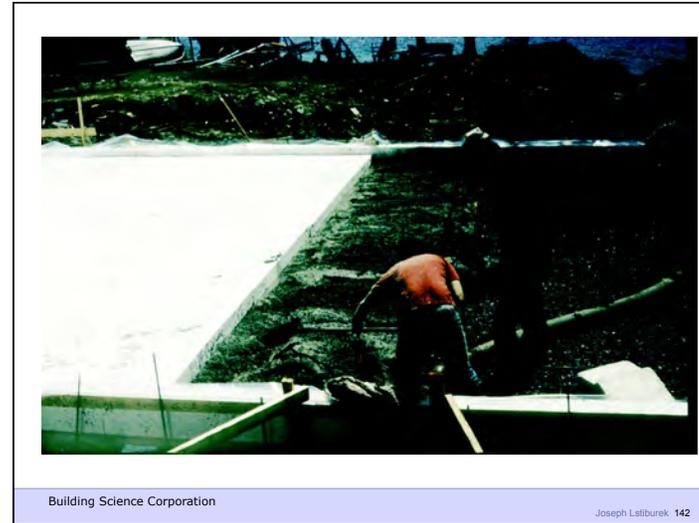
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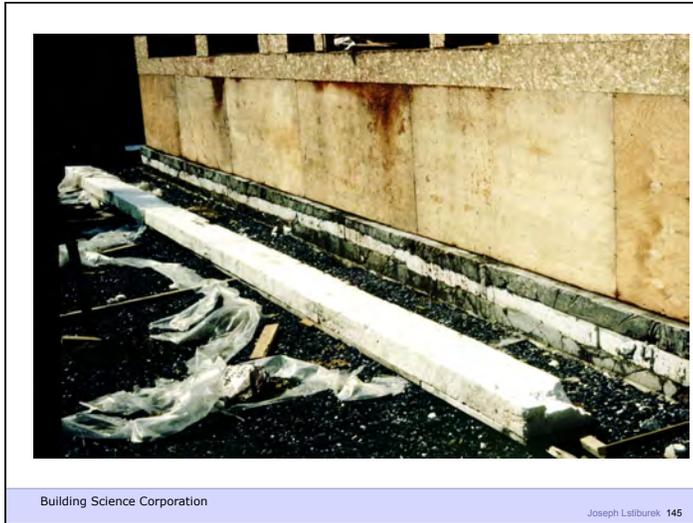


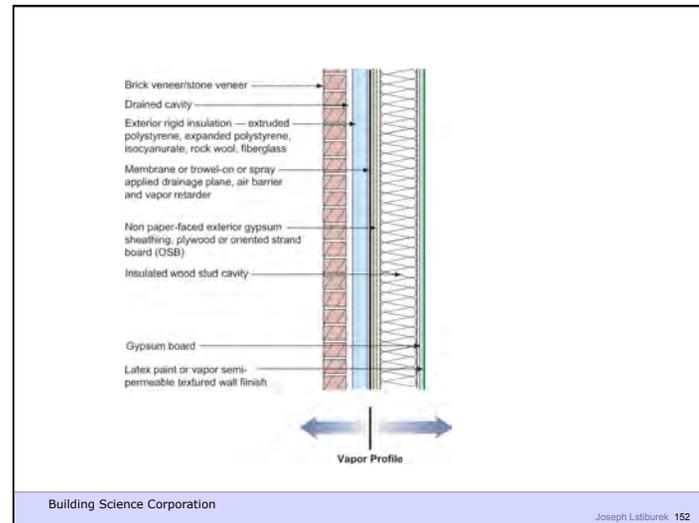


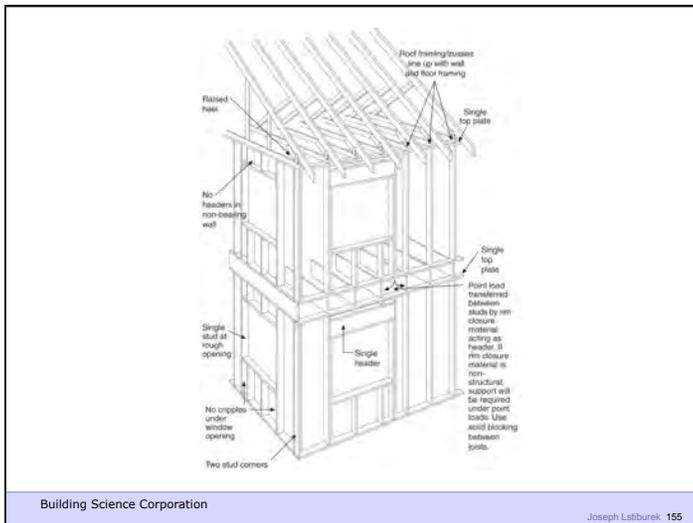
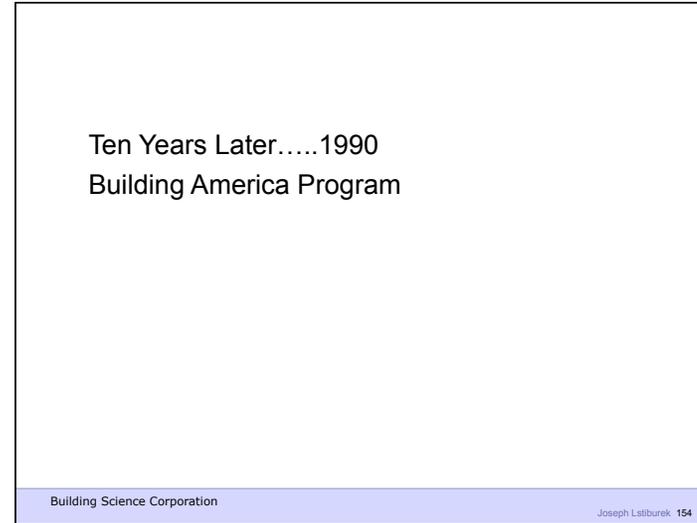
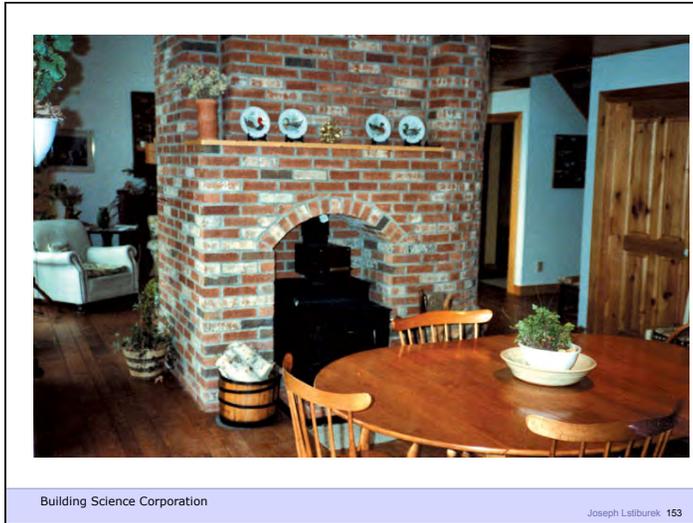


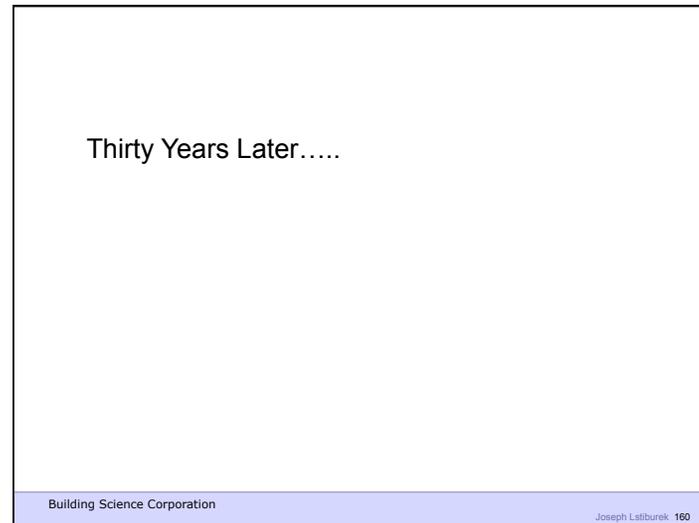
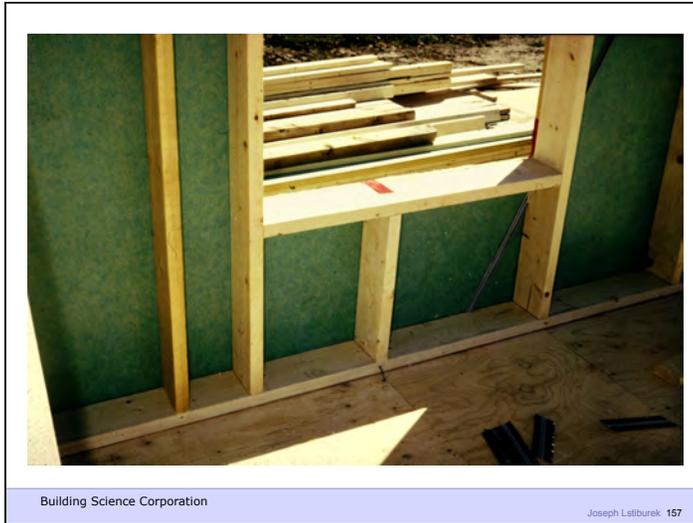












Westford House.....

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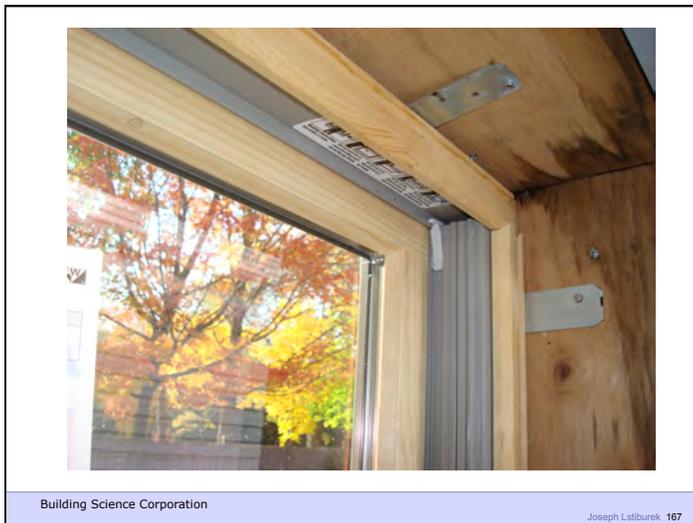
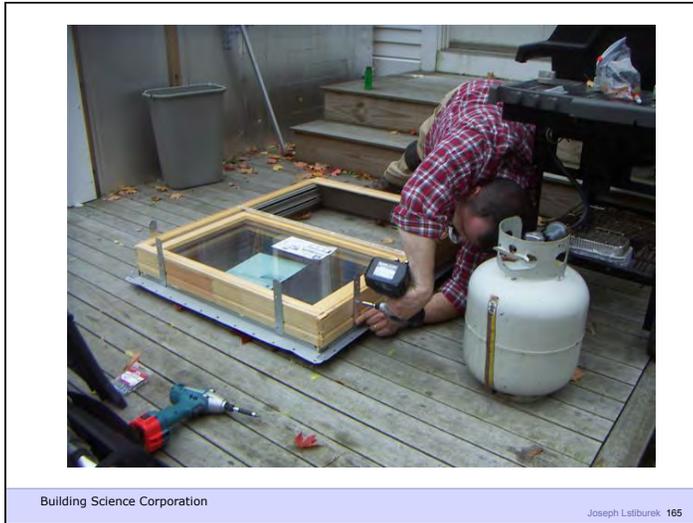
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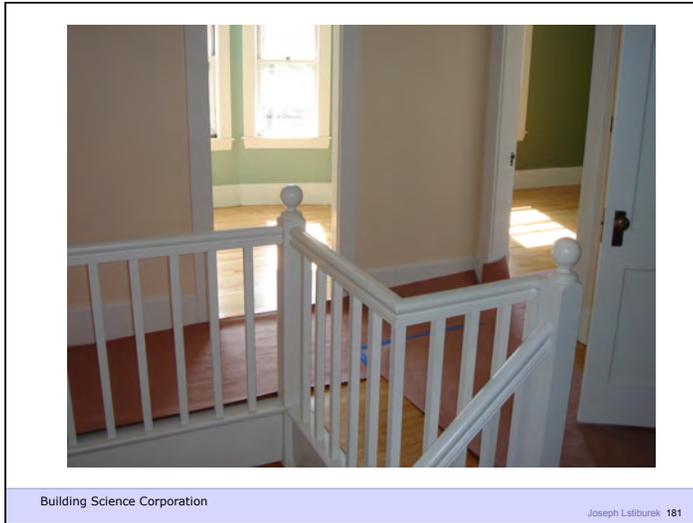
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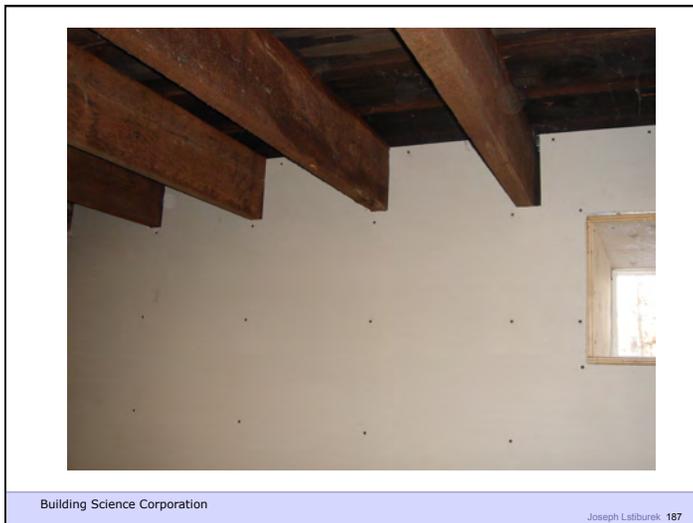
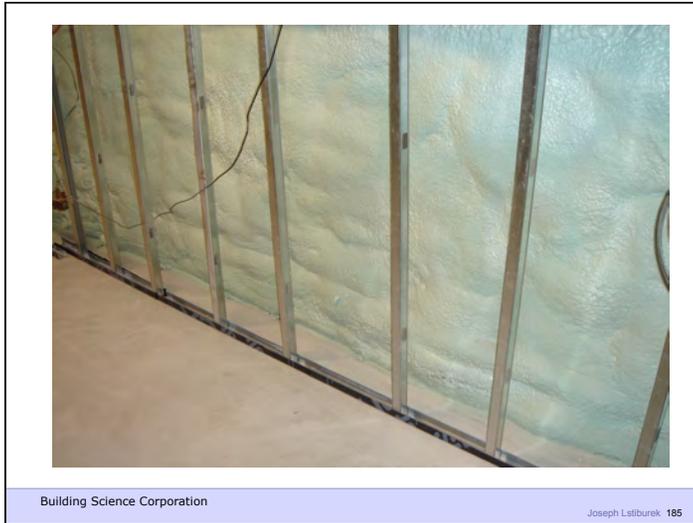


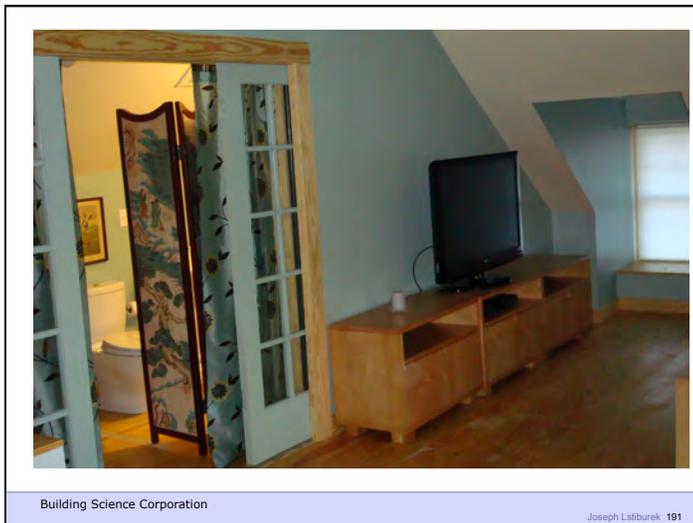
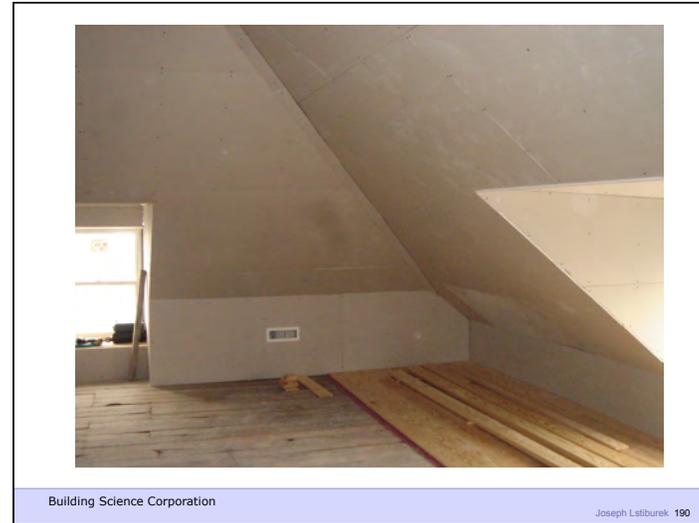
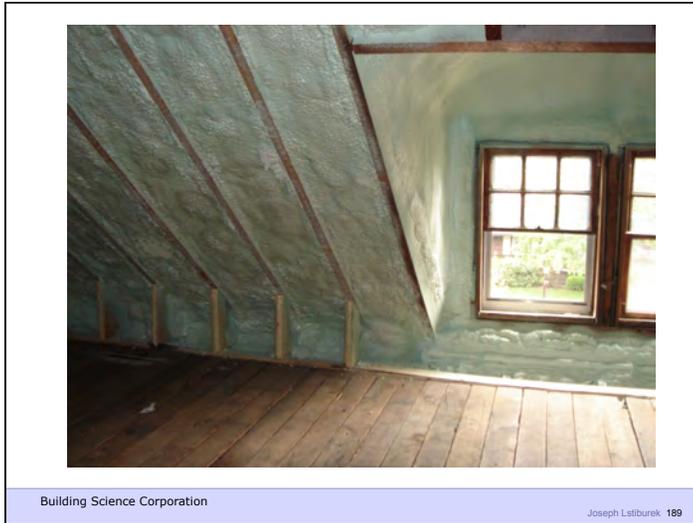


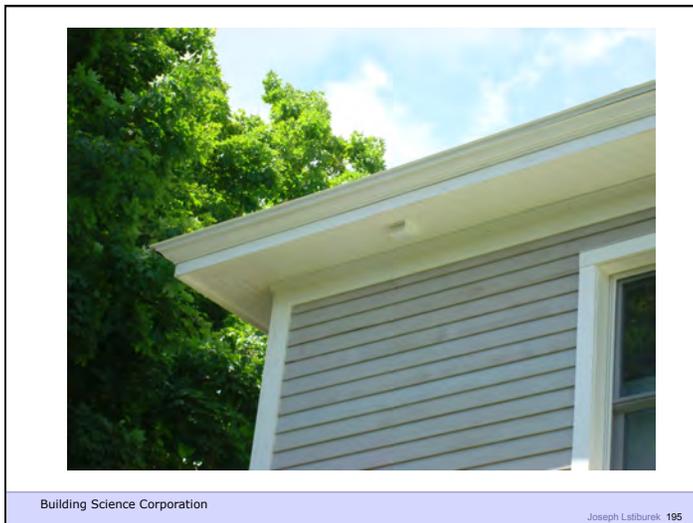
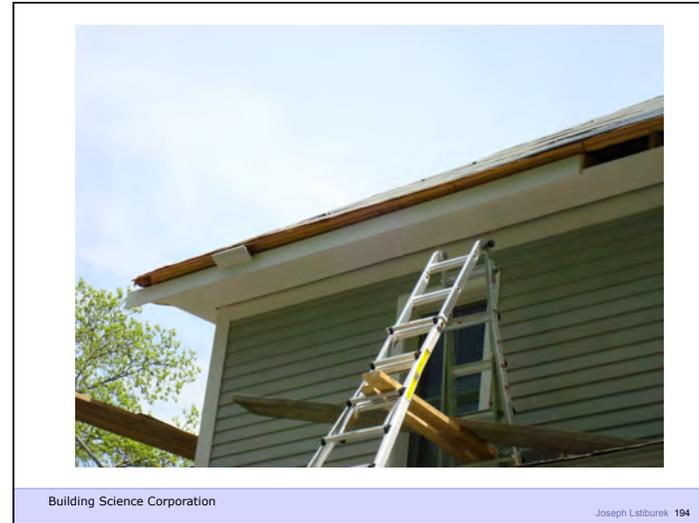


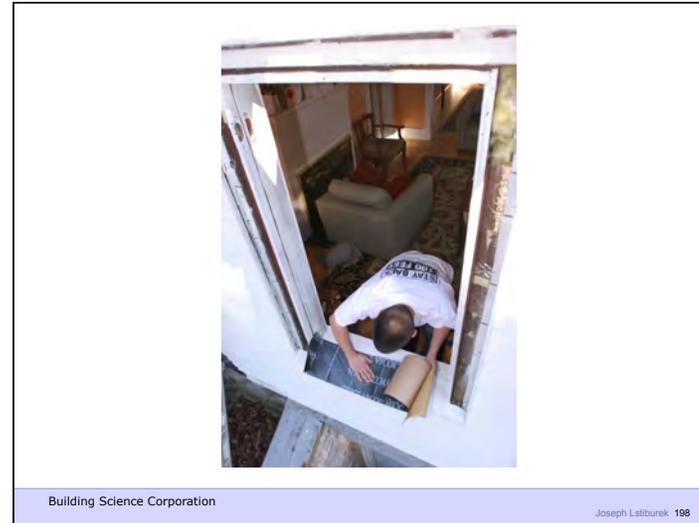
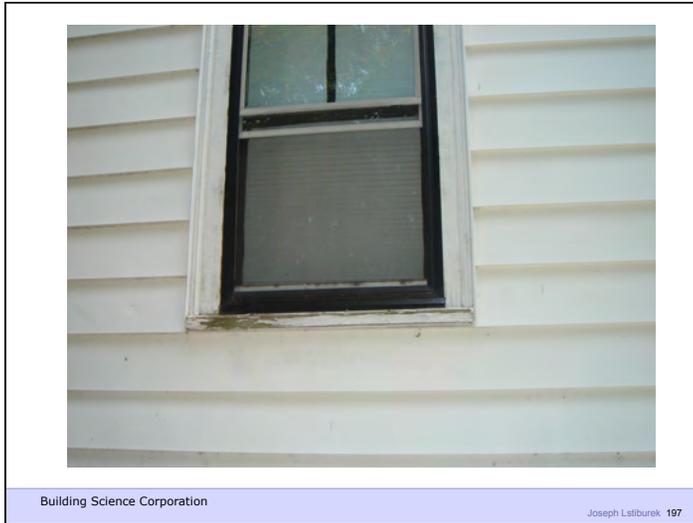


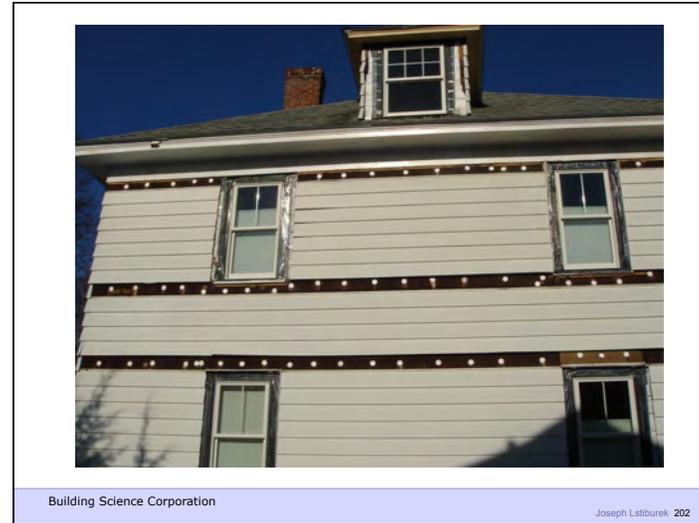
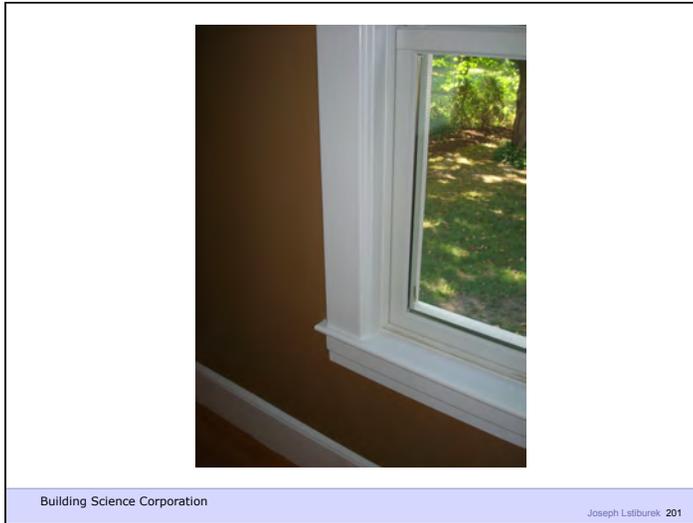




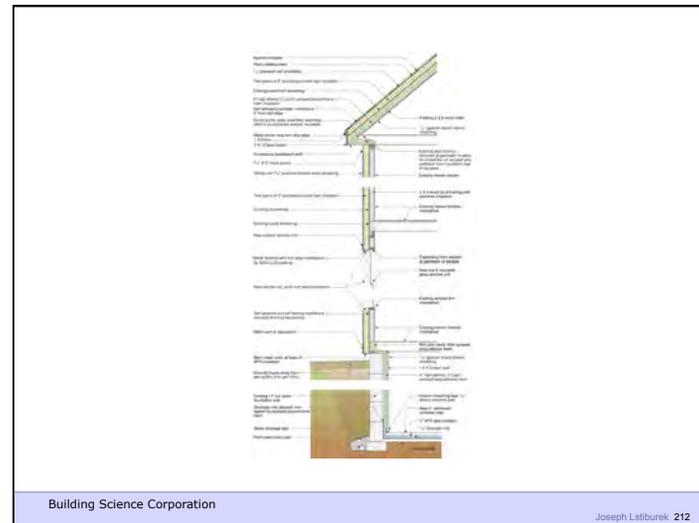
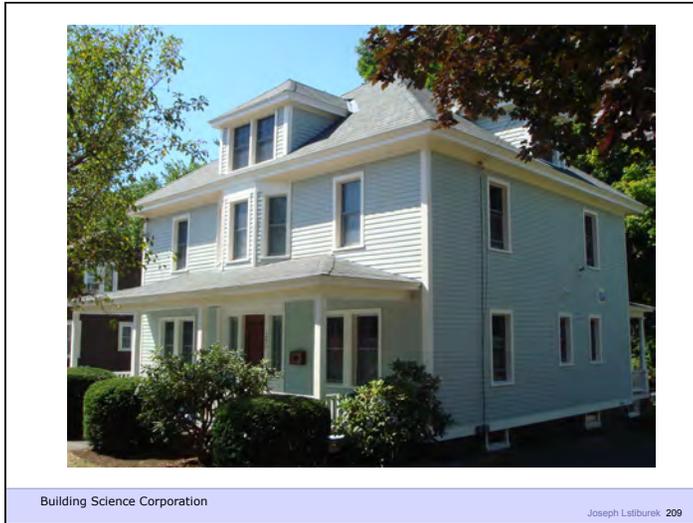












NIST Net Zero Demonstration.....

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