


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

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Green?

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R2



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R2



R4



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R2



R4

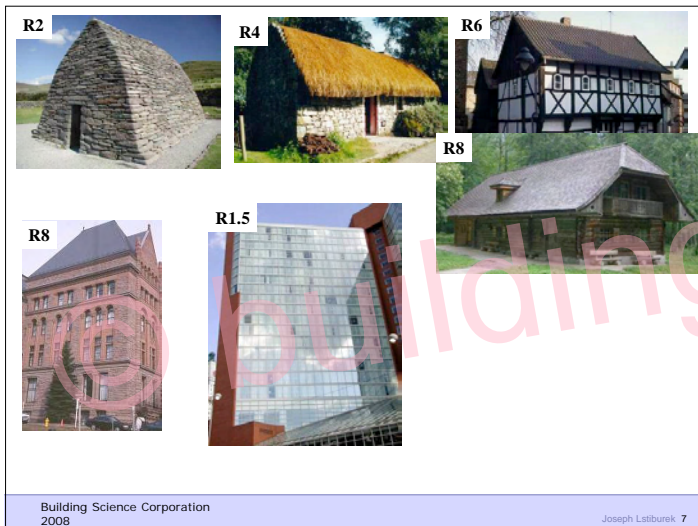
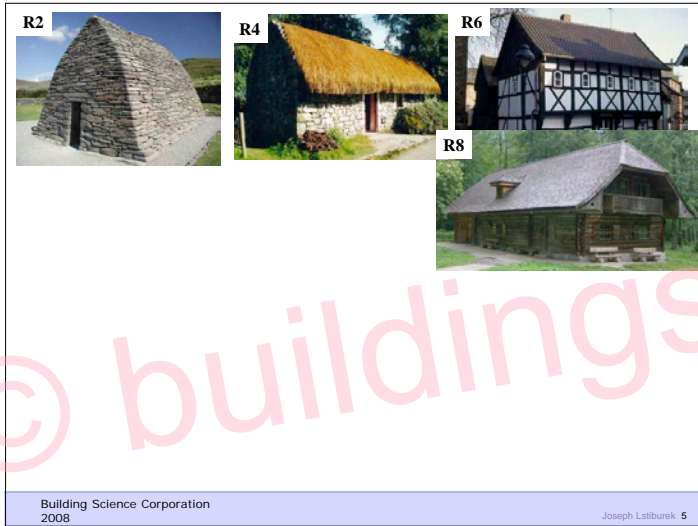


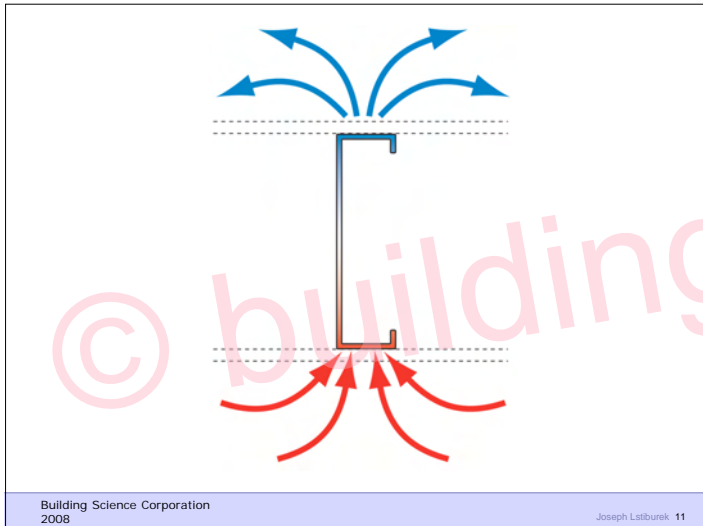
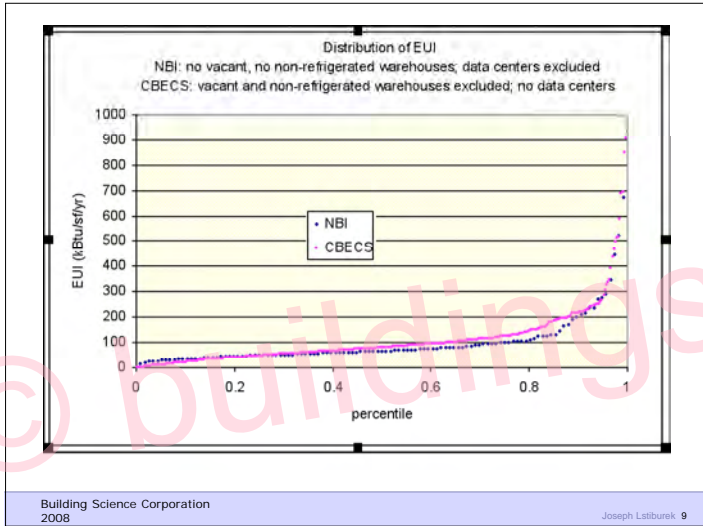
R6

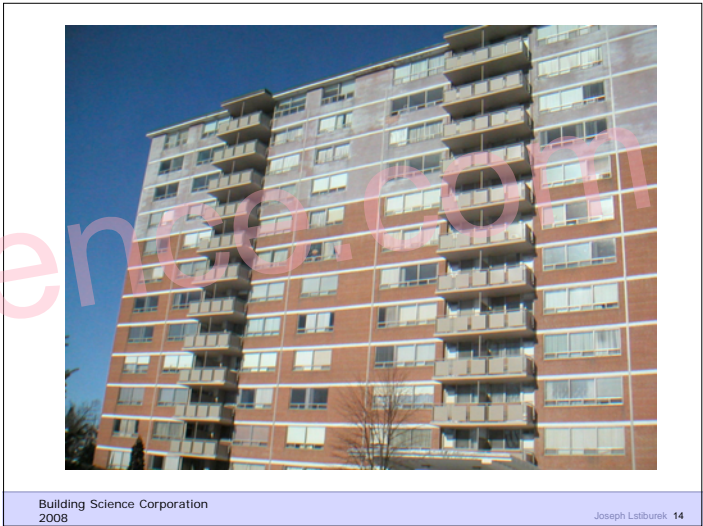


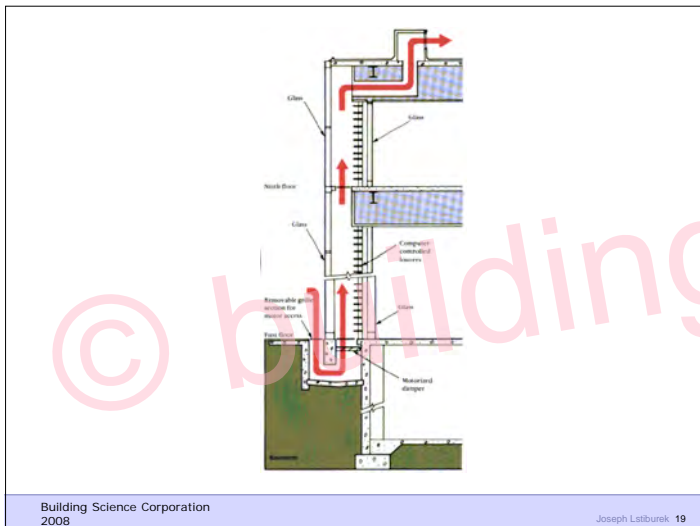
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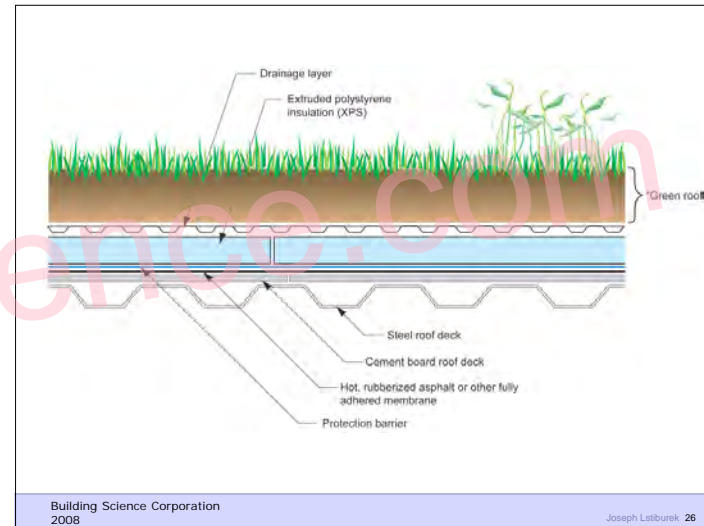






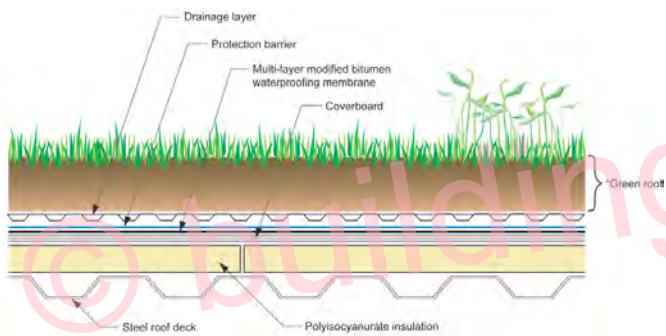
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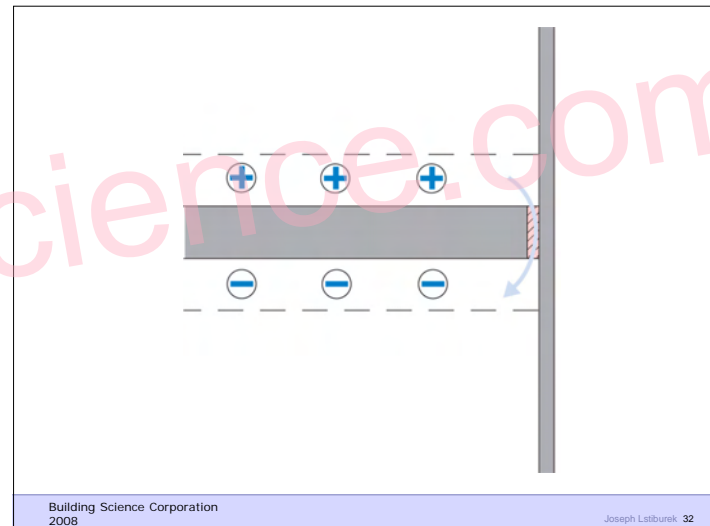
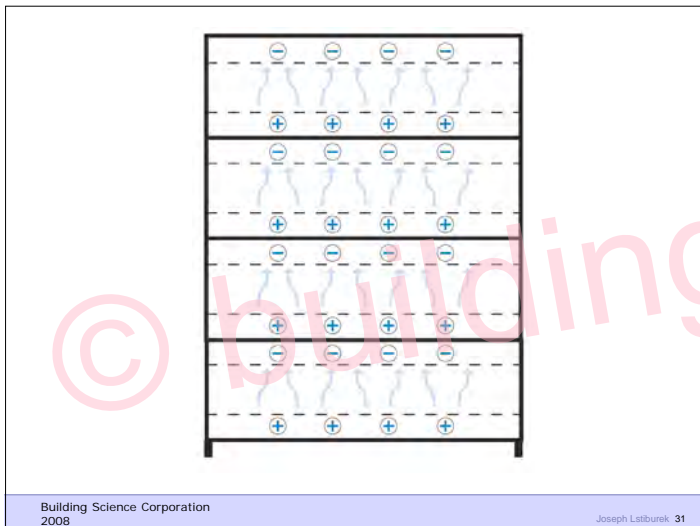
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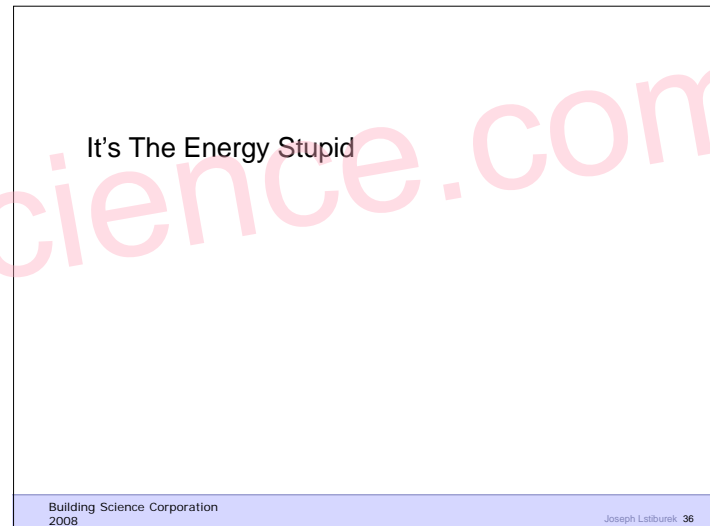
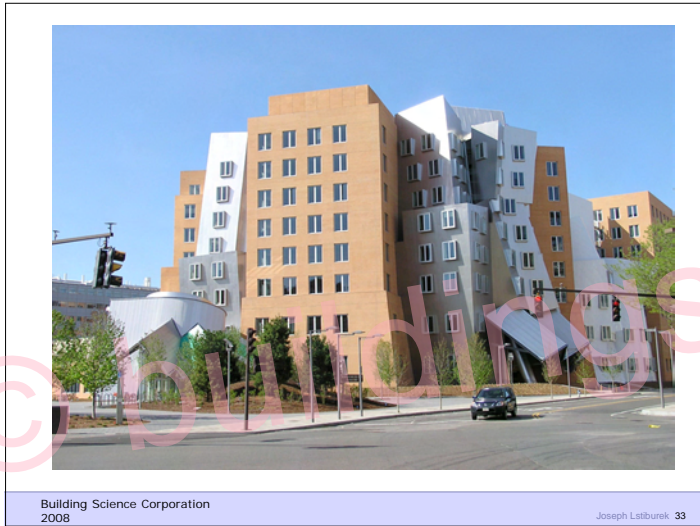
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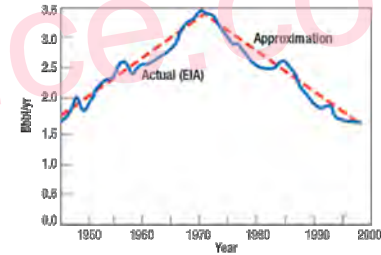
Buildings Are The Key To Energy Security And Climate Change

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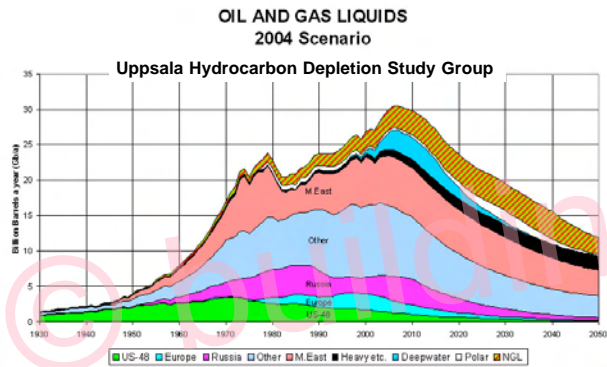
Hubbert's Peak

- Shape of oil production in the US lower 48
- Predicting the peak made Hubbert famous



Ref: Hirsch 2005

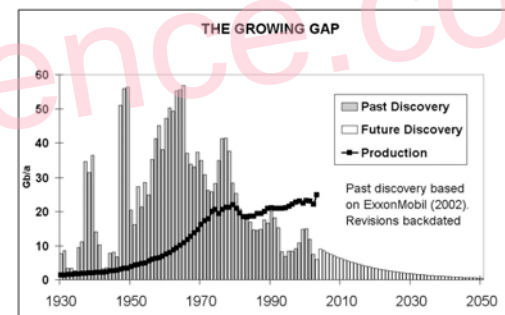
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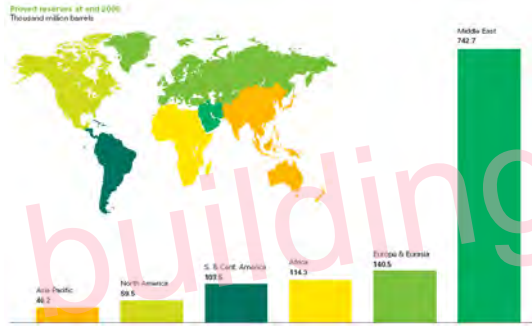
Production vs Discovery



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Where is the Oil?

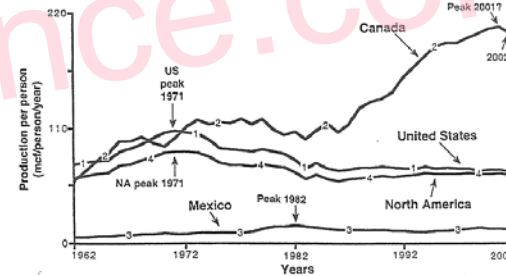


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Natural Gas

- Tight supply – likely past peak

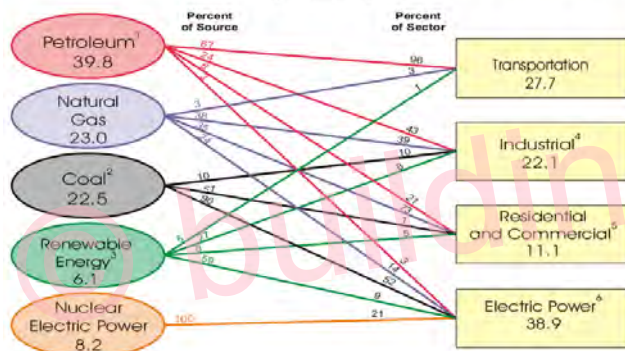


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U.S. Primary Energy Consumption by Source and Sector, 2004

(Quadrillion Btu)



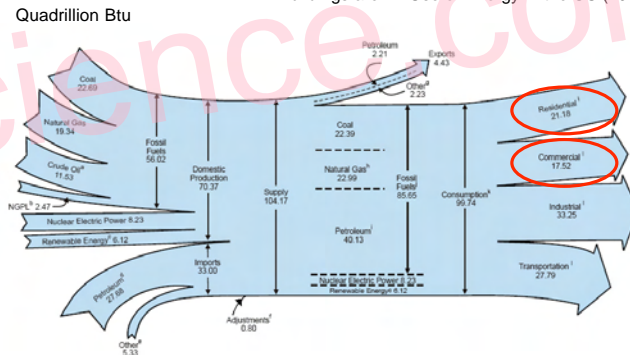
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Source: US EIA

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Total Energy

- Domestic Sources Supply 70% of Total Energy
- 40% of Total Supply is Petroleum
- 23% of Total Supply is Natural Gas
- Buildings are #1 Use of Energy in the US (40%)



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Source: US EIA

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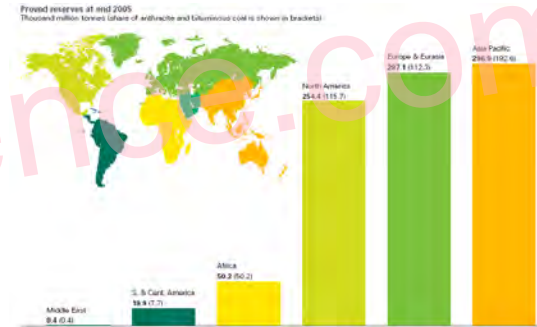
Transportation Sector Will Compete With The Building Sector For The Same Energy

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Coal

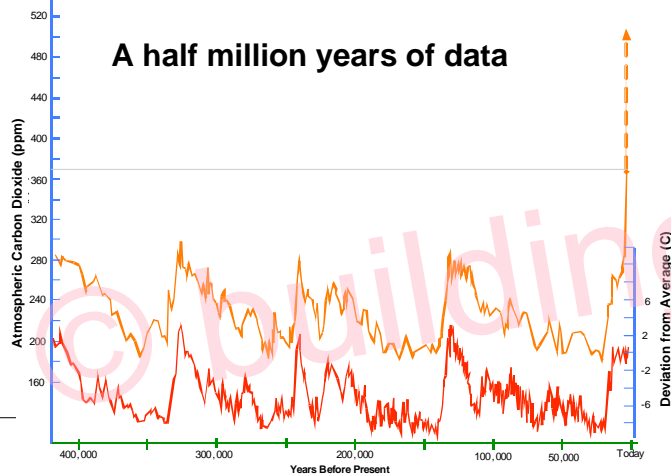
- Fastest Growing Source of Energy
- America is the "Saudi Arabia of Coal"
- Carbon Dioxide Production Twice that of Natural gas (fundamental chemistry)



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A half million years of data



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- There is No Question that Climate Change is Happening
 - The Questions are When, How Bad, Did We do it and Can We Do Anything About it?
 - Looks Like Sooner Than Expected
 - Could be Pretty Bad, But then Again Maybe Not
 - Looks Like We Did Do it, But Not Completely Sure
 - We Can Fix It - But is it Worth it?
 - One Solution – Reduce CO2 Through Efficiency & Renewables
- Energy Security is a Decoupled Issue
 - Solution - Efficiency and New Energy Sources (coal?)
- Solving Energy Security the Wrong Way Will Worsen Climate Change
- Solving Climate Change also Solves Energy Security

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It's The Energy Stupid

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Typical Family Carbon Footprint
50 % House
50% Transportation

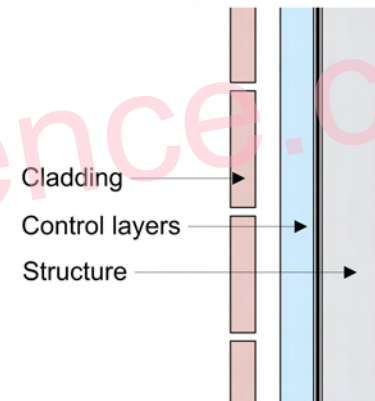
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Energy 80 percent
Water 15 percent
Materials 5 percent

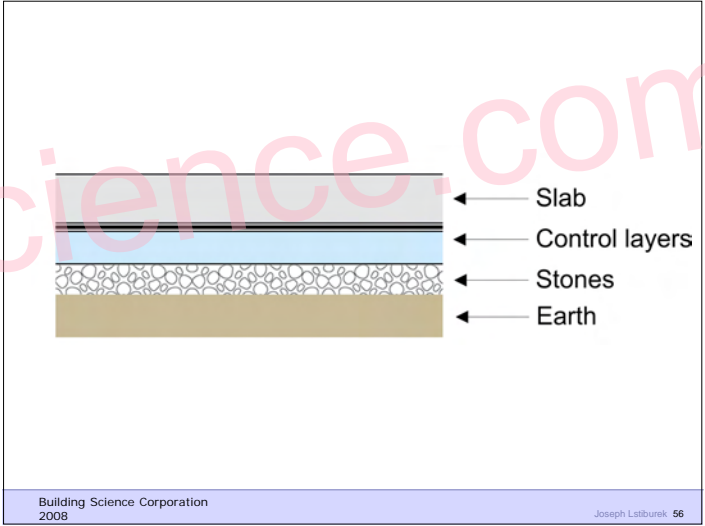
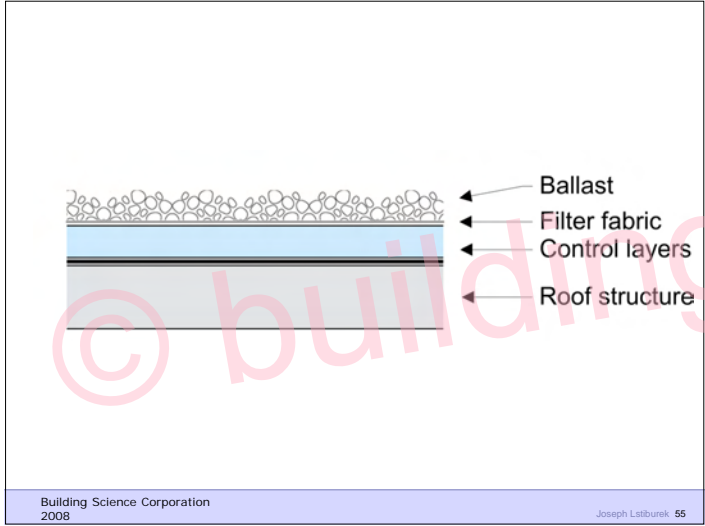
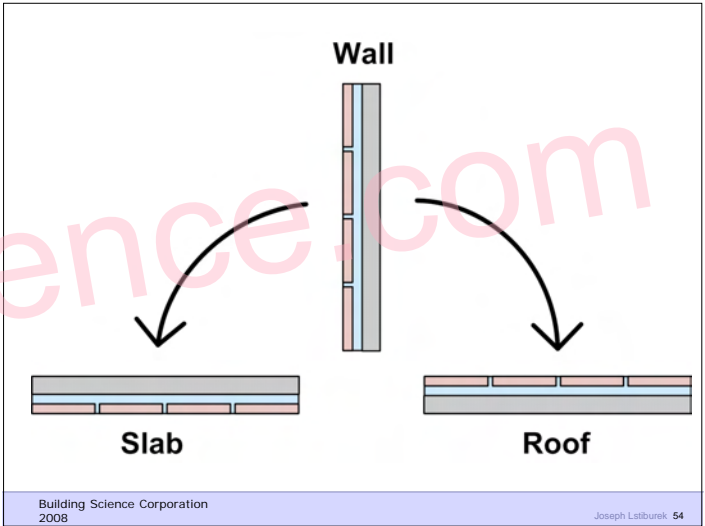
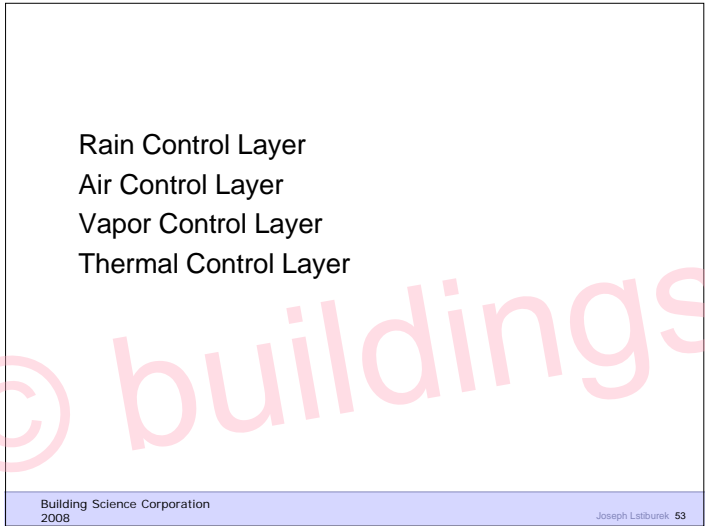
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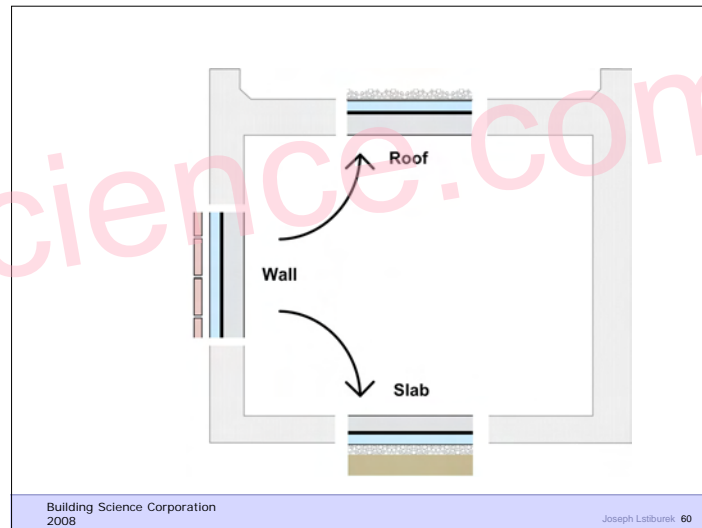
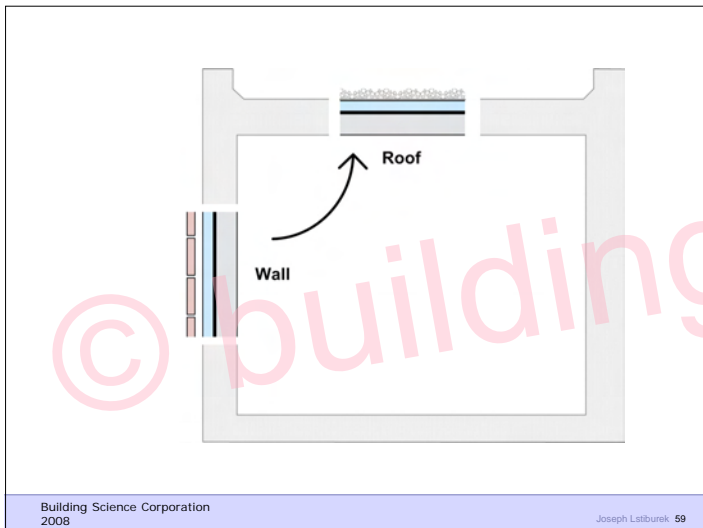
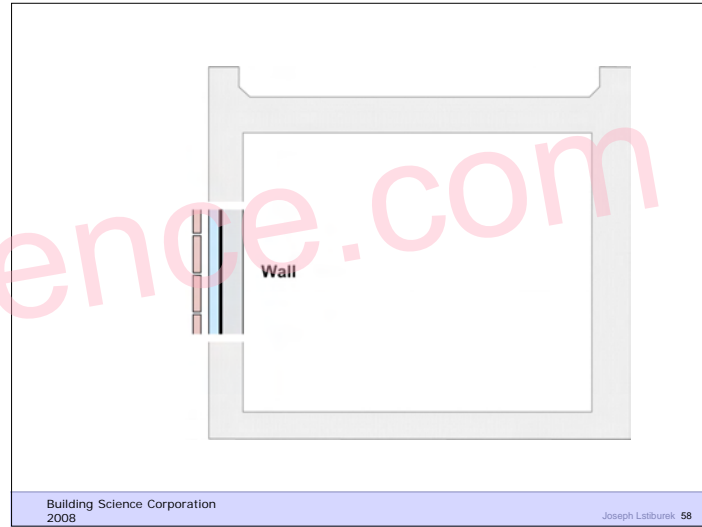
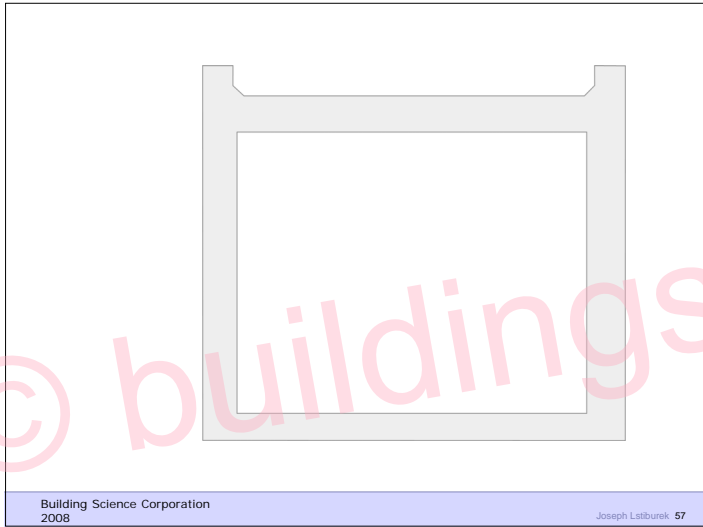
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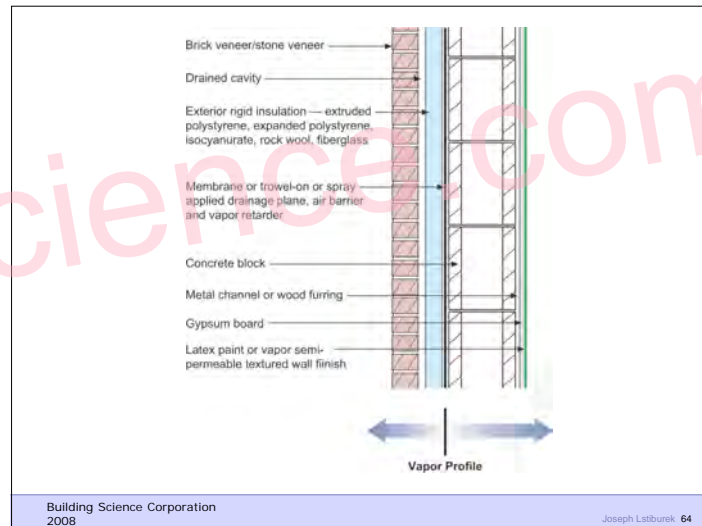
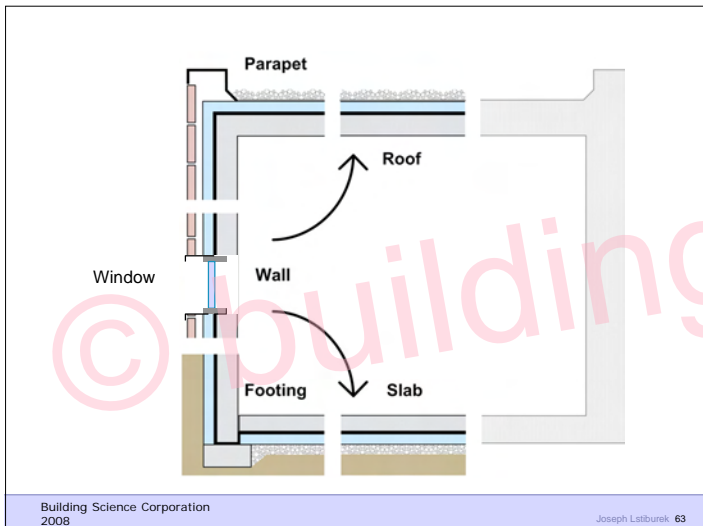
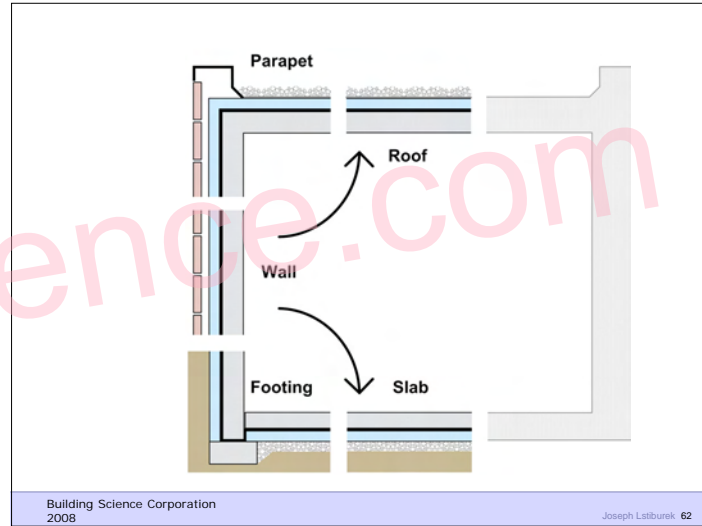
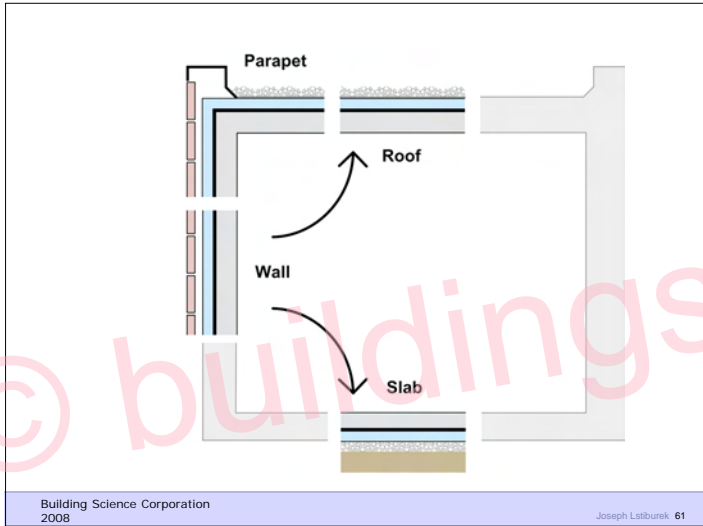


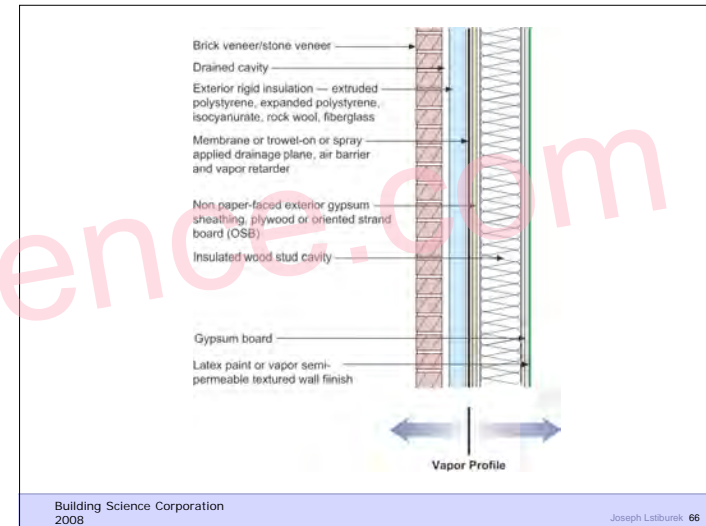
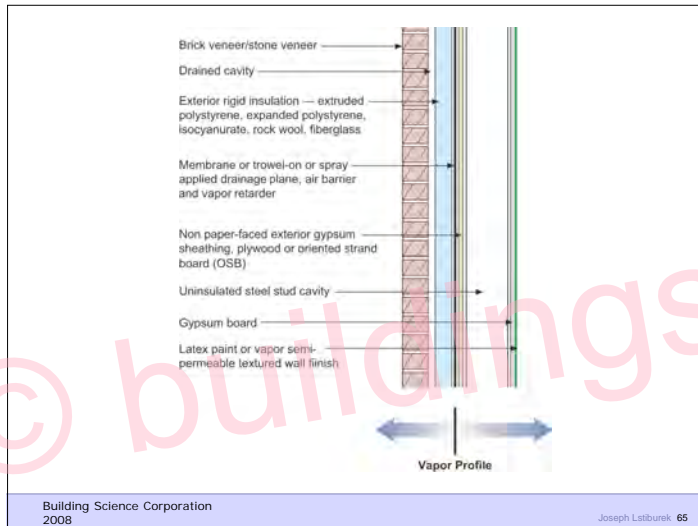
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50 % Total Energy Reduction (2,500 ft2 house over basement)

Advanced Framing	- less \$1000
Insulating Sheathing	- wash
95 % Furnace	- add \$200
Simplified Ductwork	- less \$500
Basement Insulation	- add \$1000
Cavity and Roof Insulation	- add \$750
Windows	- add \$1000
Heat Exchanger	- add \$1500
Air Sealing	- add \$250
16 SEER a/c	- add \$450
Tankless DHW	- add \$575
Compact Fluorescent Lighting	- add \$250
Energy Star Appliances	- add \$750
	Approximately \$5,500 more

50 % Total Energy Reduction (2,500 ft2 house over basement)

Costs Approximately \$5,500 more

Financed For Approximately \$50/month

Saves \$100/month in Utilities

Cash Flow is \$50/month positive

We Don't Have An Energy Problem
We Have A Stupid Problem

We're Stupid

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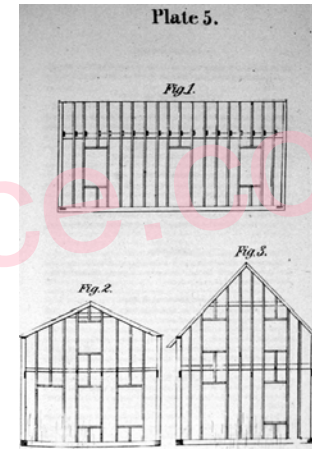
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Advanced Framing
Use Less Stuff Better

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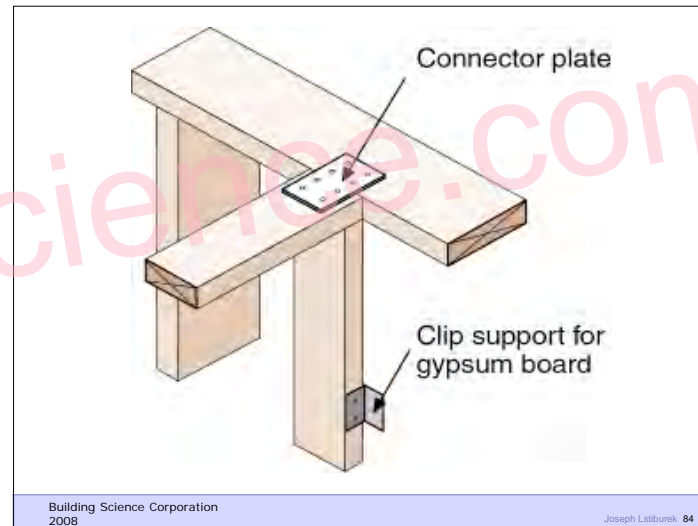
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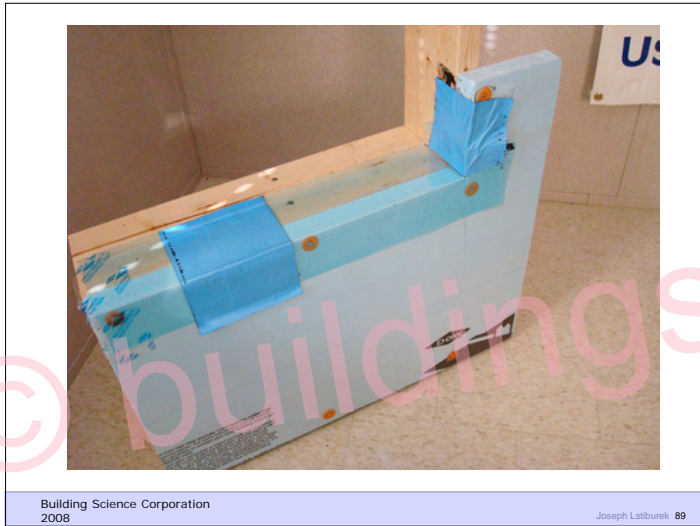
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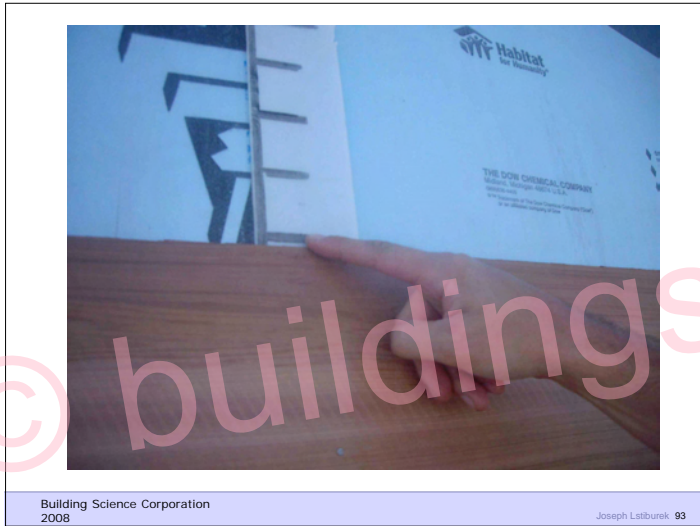
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