

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

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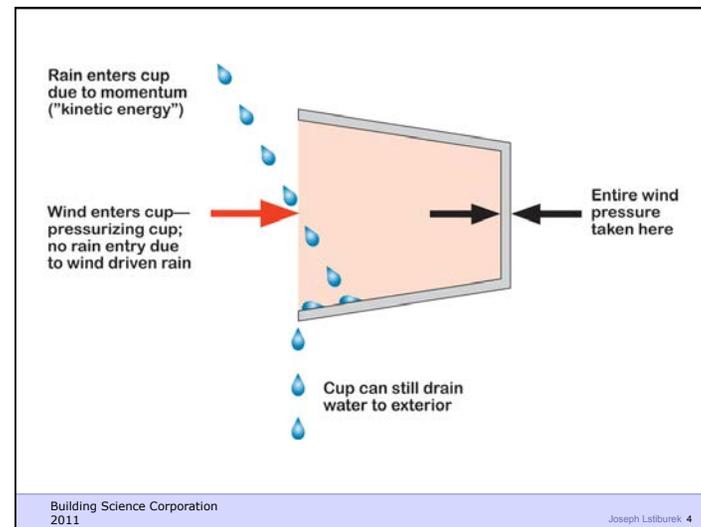
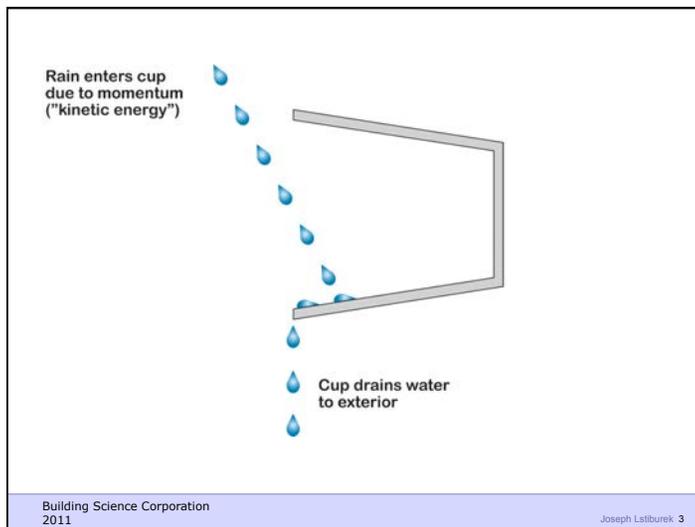
Windows, Glazing and Curtain Walls

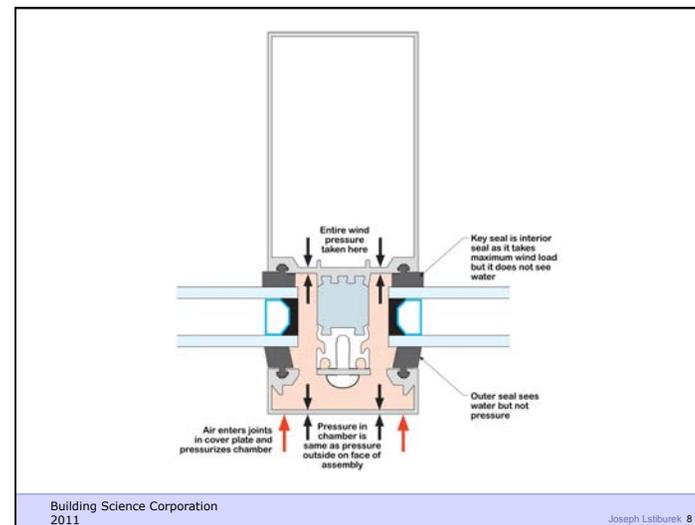
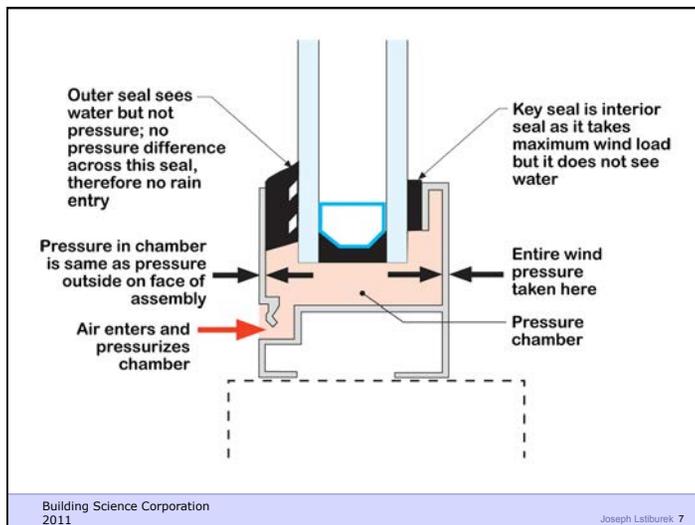
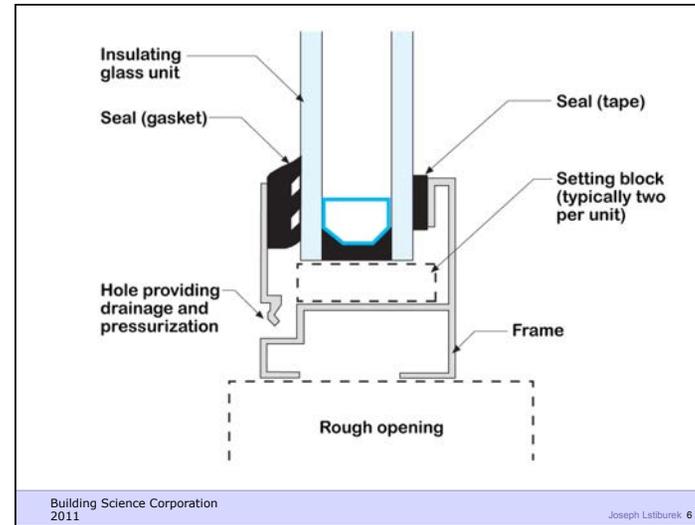
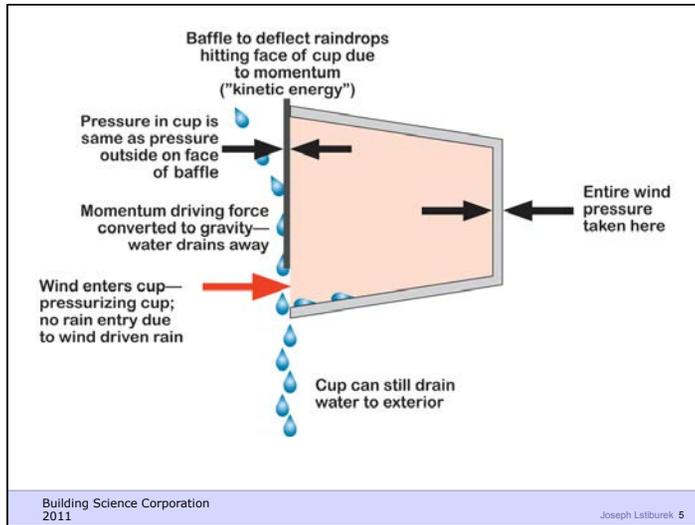
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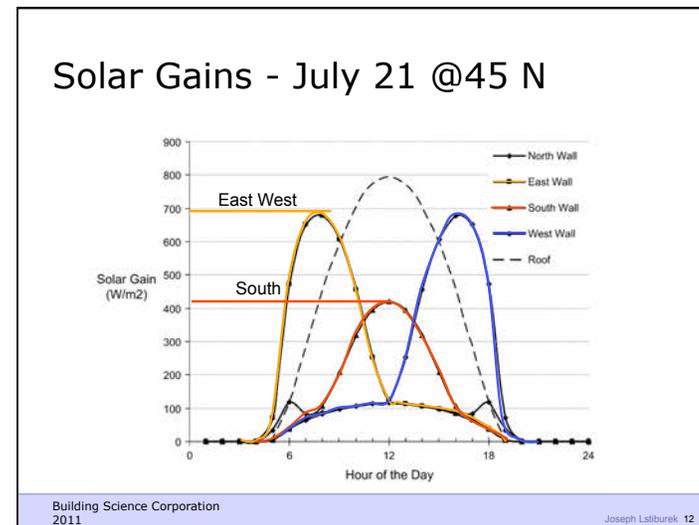
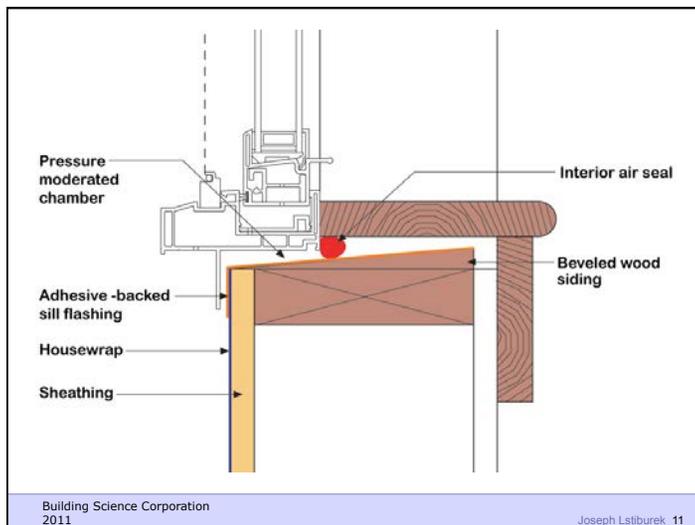
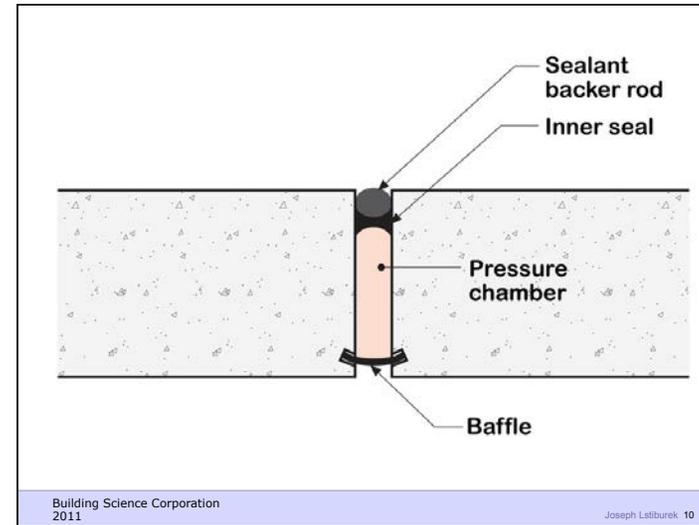
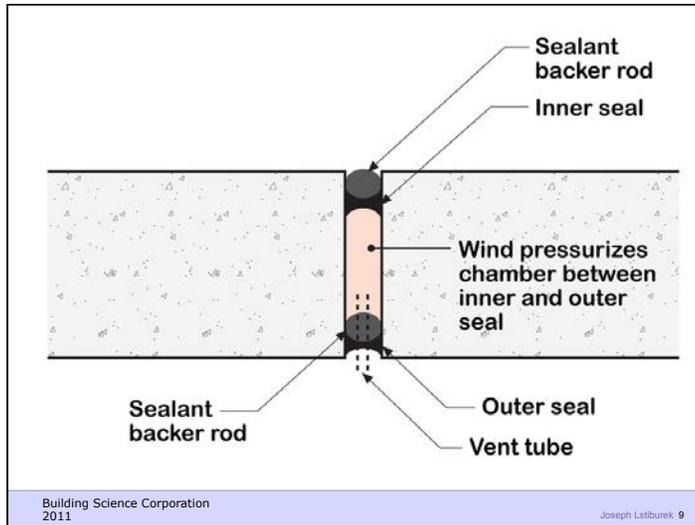
Windows

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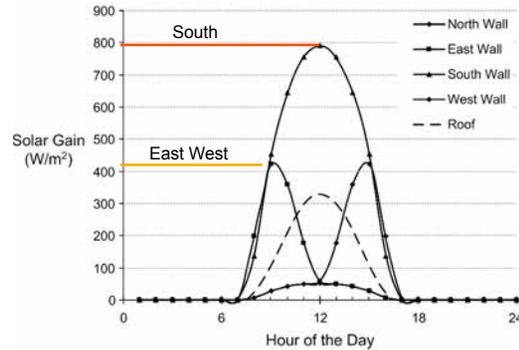
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Mother Nature is try to tell you something



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Frames

A large amount of heat can also be conducted through the frame

- Conductivity of the material (lower = better)
- Geometry of the frame

Frame Material	Conductivity W/mk	Conductivity R/inch
Wood	0.10 to 0.18	0.8 to 1.4
PVC	0.17	0.8
Fiberglass	0.30	0.5
Bronze	93	0.002
Aluminum	221	0.001

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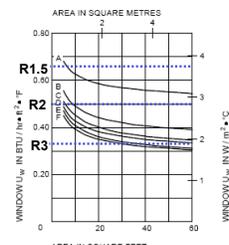
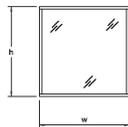
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More Frames = More Heat flow

OVERALL WINDOW U-VALUE (U_w)

For fixed window configurations as shown with height (h) equal to width (w).

Spec. one large window rather than many small ones



Kawneer Isoport 518

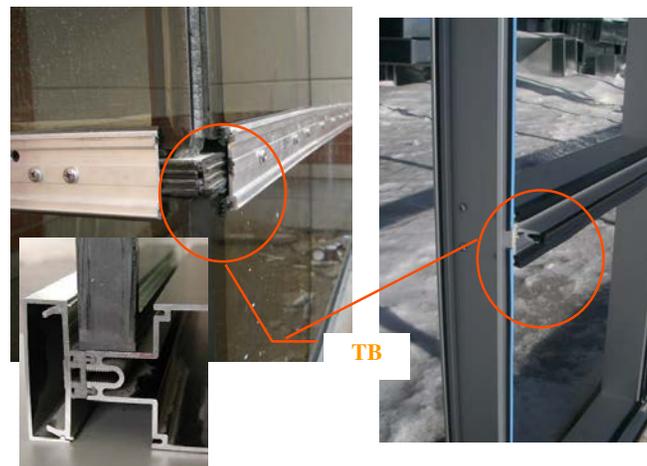
SEALED UNIT GLAZING TYPE

- A = 6mm clear / 1/2" air / 6mm clear / metal spacer
- B = 6mm clear / 1/2" air / 6mm low-e¹ / metal spacer
- C = 6mm clear / 1/2" argon / 6mm low-e¹ / metal spacer
- D = 6mm clear / 1/2" argon / 6mm low-e¹ / Helima thermally broken spacer
- E = 6mm clear / 1/2" argon / 6mm low-e² / Helima thermally broken spacer
- F = 6mm clear / 1/2" argon / 6mm low-e² / Edgetech Super Spacer[®]

- 1 - low-e coating emittance = 0.10
- 2 - low-e coating emittance = 0.03

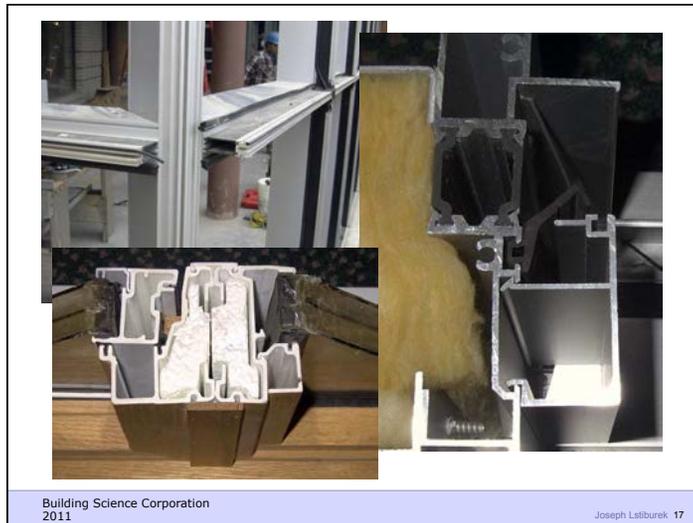
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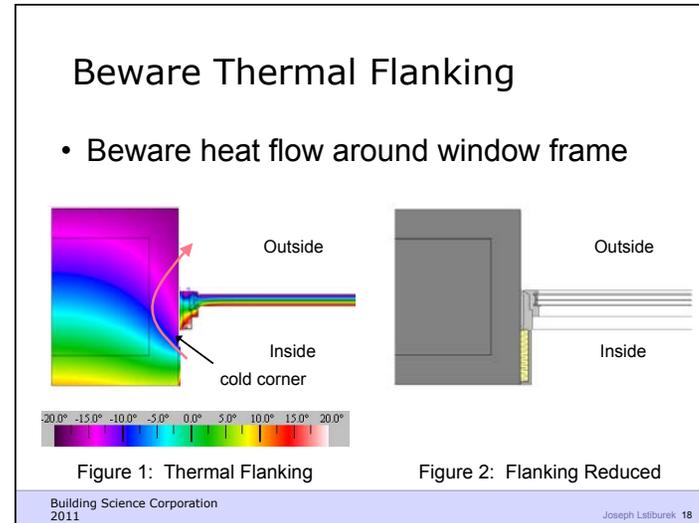
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Low-e Coatings

- Low-e coatings reduce the amount of heat transferred by radiation

Coating	Emissivity	Radiation Reduction
Uncoated Glass	0.84	-
Low-e 0.2	0.20	62%
Low-e 0.1	0.10	79%
Low-e 0.03	0.03	93%

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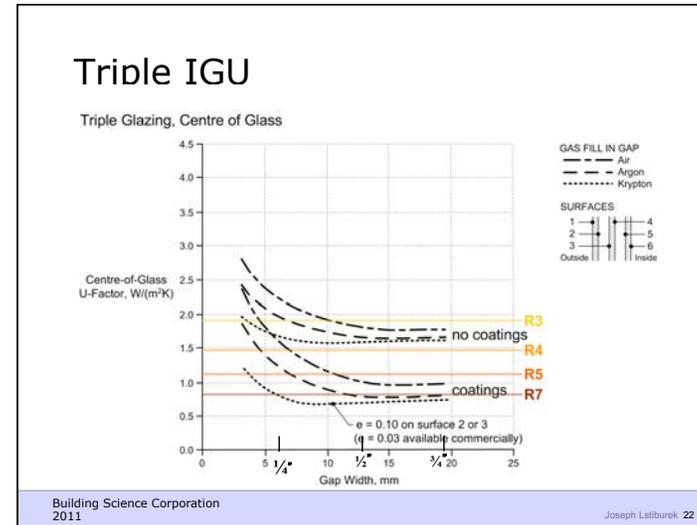
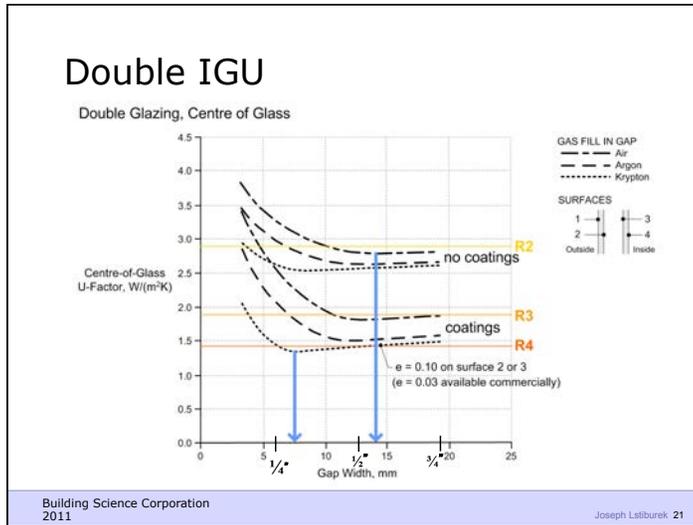
Gas Fills

- Gas fills reduce the amount of heat transferred by conduction and convection through the space in the glazing unit

Fill	Conductivity W/mK	Conductivity R/inch	Reduction in Conduction
Air	0.0241	6.0	-
Argon	0.0162	8.9	33%
Krypton	0.0086	16.8	64%
Xenon	0.0051	28.3	79%

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Overall - Performance

Typical Window Performance Numbers

Including Frame	U	SHGC	VT
Double-glazed broken Alu	0.64	0.62	0.62
Dbi Clr Wood/vinyl	0.49	0.56	0.58
Dbi Low-E Gain Wood/vinyl	0.36	0.52	0.53
Dbi Low-E Solar Wood/vinyl	0.32	0.30	0.50
Triple Low E Fibreglass	0.18	0.39	0.49
Alu Curtainwall – no TB	1.2	0.60	0.60
Alu Curtainwall – normal TB	0.60	0.60	0.60
Alu Curtainwall –high perf TB	0.40	0.25	0.55

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