

# High Solar Gain Windows



Presented By:

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THERMOTECH  
fiberglass  
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## **Stephen Thwaites** - Background

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Northern Perspective



Solar Thermal Background

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## Goal

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➡ Reduce pre-PHPP pre-judgements

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## General PH suitability

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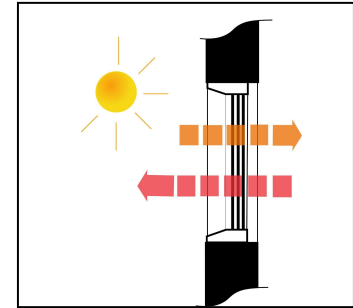
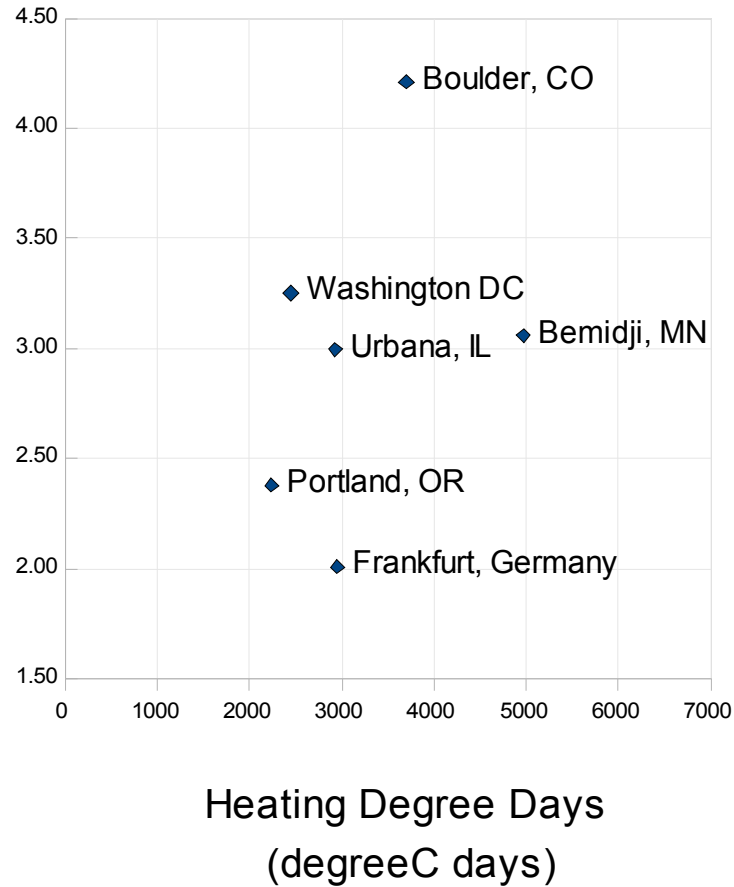


- ➡ Euro PH Inswing
    1. No air space adjustment
  
  - ➡ North American Fglass Outswing
    1. Larger glass areas, esp'y fixed
    2. Foam spacers
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# Climatic Comparison

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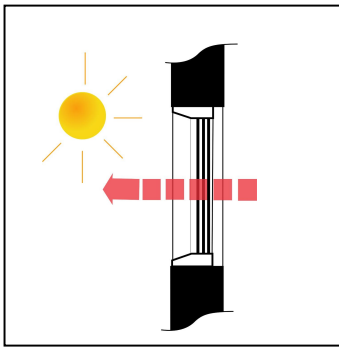
Heating Season  
Solar Radiation  
on South Facing  
Window  
(kWh/m<sup>2</sup>/day)



# PH Window requirements

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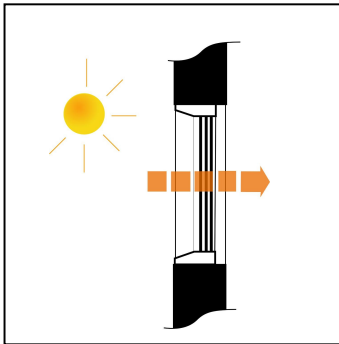
For a 1290x1430 (51x56) window



## HEAT LOSS

- intuitively important

PH:  $U \text{ window} < 0.14 \text{ hr.ft}^2\text{.F/BTU}$  (0.8)



## HEAT GAIN

- not so intuitively important

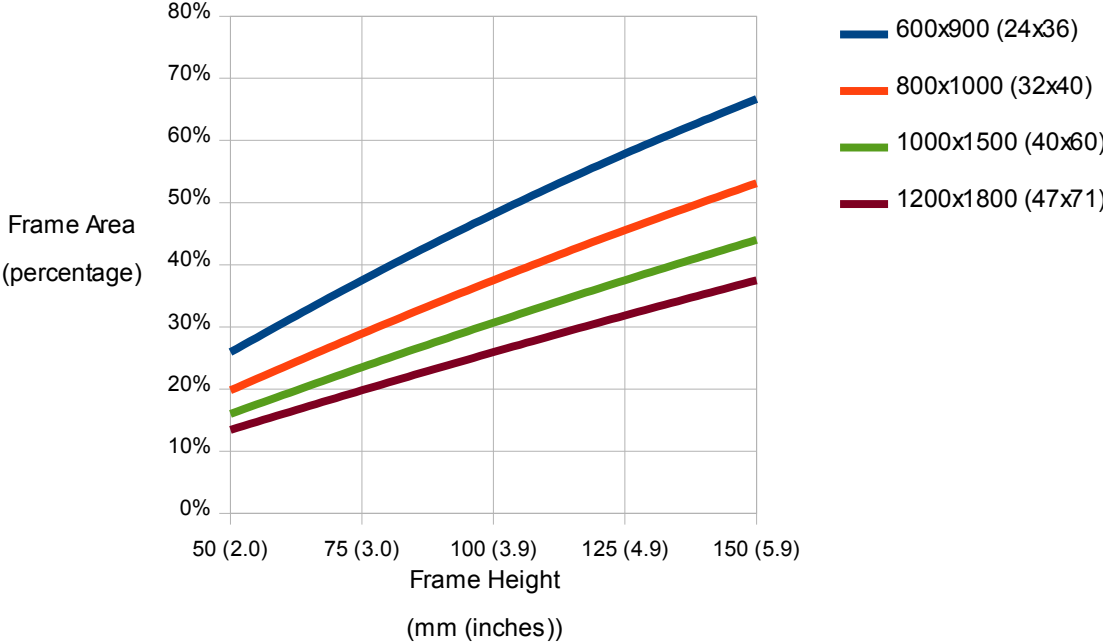
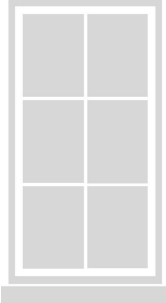
PH:  $G \text{ window} = \text{any}$

PH:  $G \text{ glass} > 0.50$

\*\*\* puts glass area issue into PHPP

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# Effect of Frame Height on Glass Area



# Effect of Frame Height

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Burlington, VT Habitat House

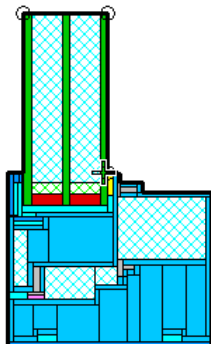
1,500 ft<sup>2</sup>, 230ft<sup>2</sup> windows (150ft<sup>2</sup> south facing)

*\*\* your mileage will vary\*\**



All windows:

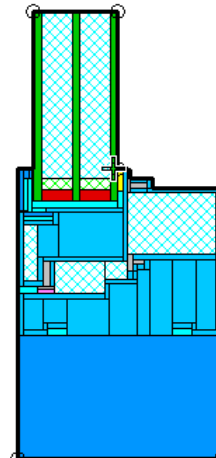
G<sub>glass</sub> 0.63, U<sub>glass</sub> 0.16 hr.ft<sup>2</sup>.F/BTU



H<sub>frame</sub> 2.68"

U<sub>frame</sub> 0.164, PS<sub>lspcr</sub> 3.47

**U<sub>window PH</sub> = 0.16** hr.ft<sup>2</sup>.F/BTU



H<sub>frame</sub> 4.68"

U<sub>frame</sub> 0.098, PS<sub>lspcr</sub> 3.47

**U<sub>window PH</sub> = 0.14** hr.ft<sup>2</sup>.F/BTU

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## Effect of Frame Height (cont'd)

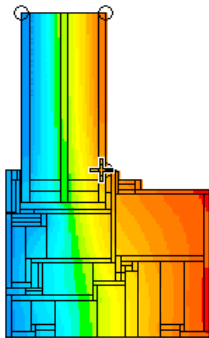
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Burlington, VT Habitat House

1,500 ft<sup>2</sup>, 230ft<sup>2</sup> windows (150ft<sup>2</sup> south facing)

All windows:

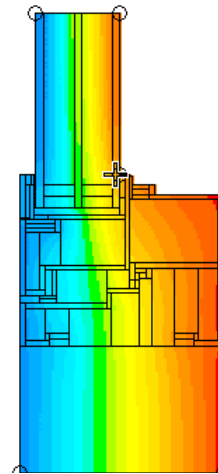
G<sub>glass</sub> 0.63, U<sub>glass</sub> 0.16 hr.ft<sup>2</sup>.F/BTU



H<sub>frame</sub> 2.68"

**U<sub>window</sub> PH = 0.92**

**Space Heat 4.13 kBTU/ft<sup>2</sup>**



H<sub>frame</sub> 4.68"

**U<sub>window</sub> PH = 0.80**

**Space Heat 4.84 kBTU/ft<sup>2</sup>**

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## Effect of higher Gglass

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Same Burlington, VT Habitat House

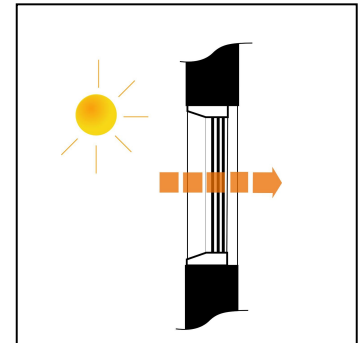
*\*\* your mileage will vary\*\**

All windows;

Uglass 0.16 hr.ft<sup>2</sup>.F/BTU

U frame 0.16 hr.ft<sup>2</sup>.F/BTU

PSIspr 3.47 hr.ft<sup>2</sup>.F/BTU.in



Gglass	Space Heat (kBTU/ft <sup>2</sup> )
0.61	4.45
0.64	4.15

➡ 5% higher G, lowers Space to 4.15

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## Effect of lower Uglass

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Same Burlington, VT Habitat House

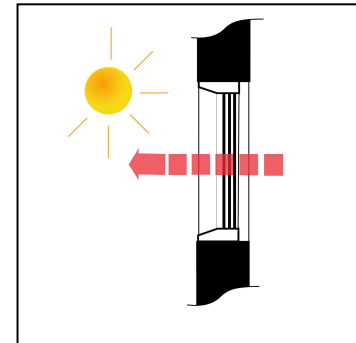
*\*\* your mileage will vary\*\**

All windows;

Gglass 0.61

U frame 0.16 hr.ft<sup>2</sup>.F/BTU,

PSIspr 3.47 hr.ft<sup>2</sup>.F/BTU.in



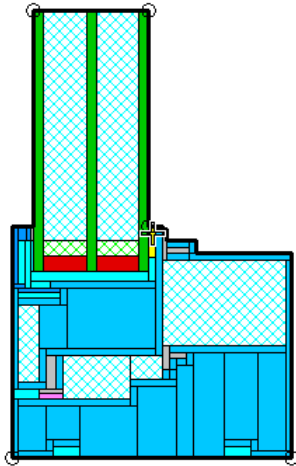
Uglass hr.ft <sup>2</sup> .F/BTU	Space Heat (kBTU/ft <sup>2</sup> )
0.160	4.45
0.143	4.15

➡ 10% lower Uglass lowers Space Heat to 4.15

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## Looks the same ≠ Is the same

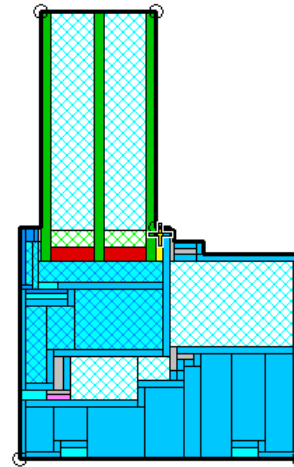
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Insulated sash

1/8" bite

**Uframesp 0.26** hr.ft<sup>2</sup>.F/BTU



Hollow sash

0" bite

**Uframesp 0.35** hr.ft<sup>2</sup>.F/BTU

**\*\* Uframesp** includes effect of PSIs<sub>pcr</sub>

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## **Conclusions**

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Window is not a wall -

**Solar gains as important as losses**

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Hidden advantage of slim frames -

**Need to run PHPP to see it**

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Looks similar not good enough -

**Use frame specific characteristics**

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