# The Efficient Windows Collaborative

## Info on Energy Efficient Windows and Storm Windows

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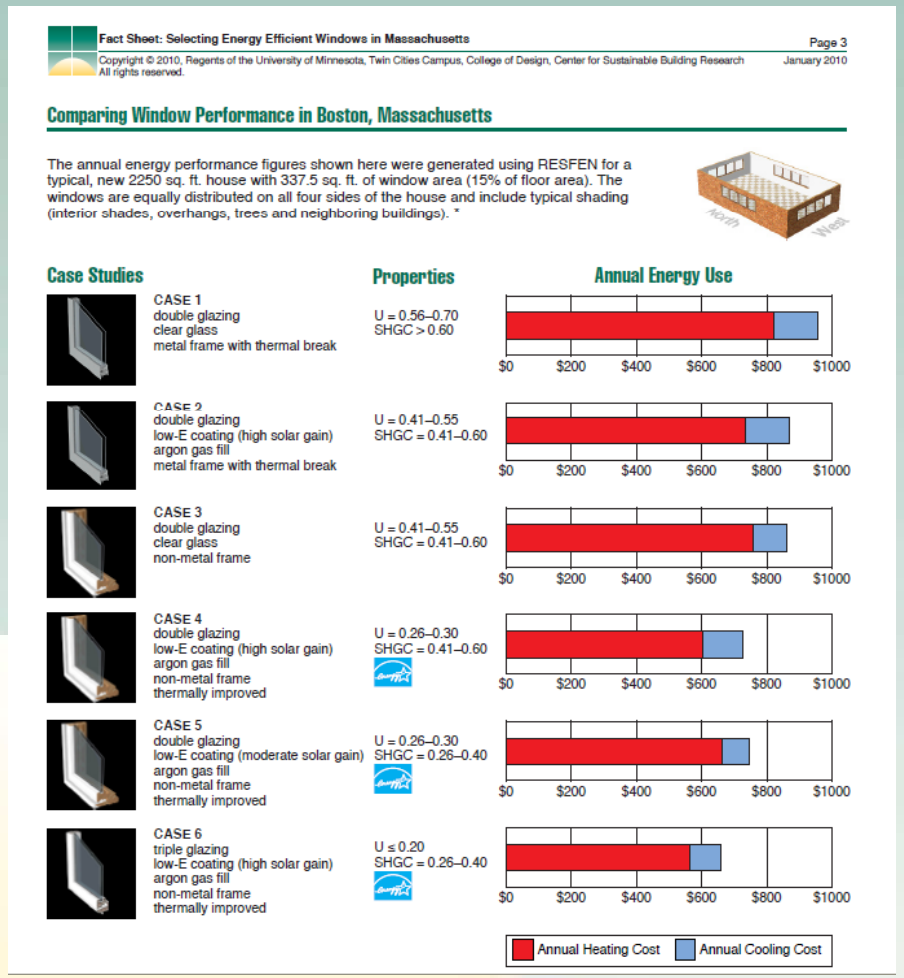
# Efficient Windows Collaborative Resources

## www.efficientwindows.org

Information on energy-efficient windows by:

- Alliance to Save Energy
- University of Minnesota
- Lawrence Berkeley National Laboratory
- More than 80 industry and non-profit members

Funding from DOE
plus EWC member contributions



Fact Sheet: Selecting Energy Efficient Windows in Massachusetts

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**Comparing Window Performance in Boston, Massachusetts**

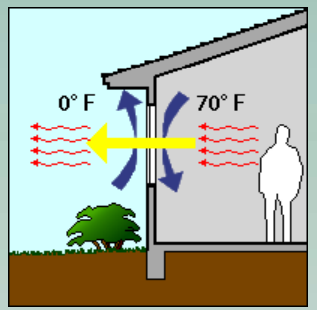
The annual energy performance figures shown here were generated using RESFEN for a typical, new 2250 sq. ft. house with 337.5 sq. ft. of window area (15% of floor area). The windows are equally distributed on all four sides of the house and include typical shading (interior shades, overhangs, trees and neighboring buildings). *

| Case Studies | Properties | Annual Energy Use |
|---|---|---|
| CASE 1<br>double glazing<br>clear glass<br>metal frame with thermal break | U = 0.56–0.70<br>SHGC > 0.60 | |
| CASE 2<br>double glazing<br>low-E coating (high solar gain)<br>argon gas fill<br>metal frame with thermal break | U = 0.41–0.55<br>SHGC = 0.41–0.60 | |
| CASE 3<br>double glazing<br>clear glass<br>non-metal frame | U = 0.41–0.55<br>SHGC = 0.41–0.60 | |
| CASE 4<br>double glazing<br>low-E coating (high solar gain)<br>argon gas fill<br>non-metal frame<br>thermally improved | U = 0.26–0.30<br>SHGC = 0.41–0.60 | |
| CASE 5<br>double glazing<br>low-E coating (moderate solar gain)<br>argon gas fill<br>non-metal frame<br>thermally improved | U = 0.26–0.30<br>SHGC = 0.26–0.40 | |
| CASE 6<br>triple glazing<br>low-E coating (high solar gain)<br>argon gas fill<br>non-metal frame<br>thermally improved | U ≤ 0.20<br>SHGC = 0.26–0.40 | |

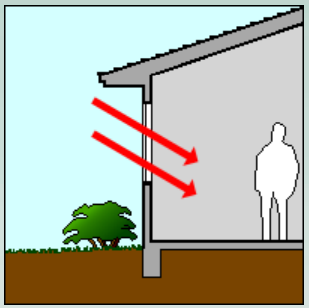
$0 $200 $400 $600 $800 $1000

Annual Heating Cost | Annual Cooling Cost

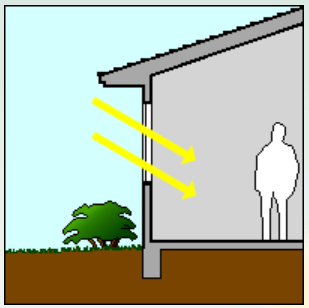
# Window Energy Performance Indicators




**U-factor**
Lower = less heat loss

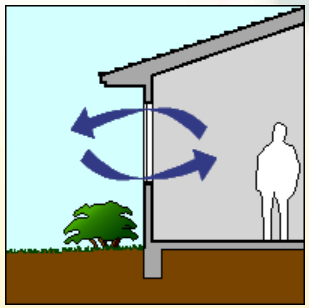


**Solar Heat Gain Coefficient (SHGC)**
Ratio of solar heat gain



**Visible Transmittance (VT)**
Higher = more daylight

The National Fenestration Rating Council (NFRC) label



**Air Leakage (AL)**
Higher = more infiltration

Not commonly shown on NFRC label

# NFRC Whole Window Ratings

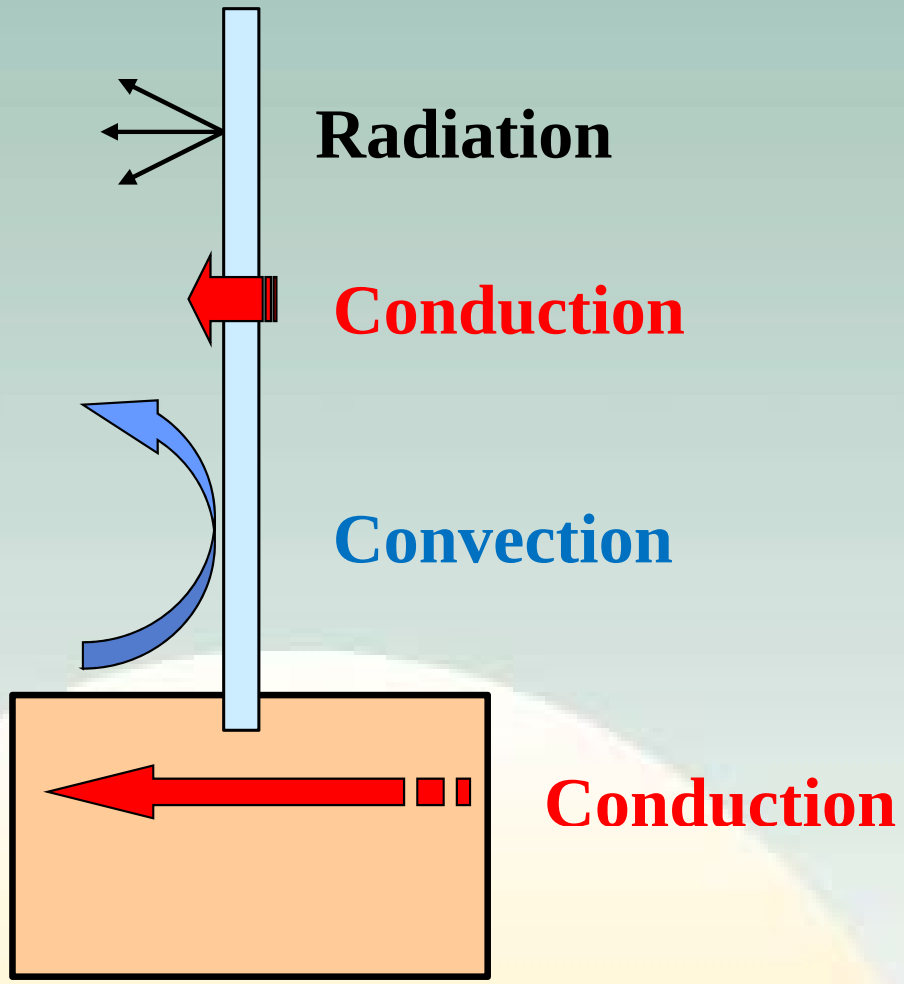
NFRC ratings = aggregated performance of whole window, including:

- frame
- glass
- gas fill
- spacer

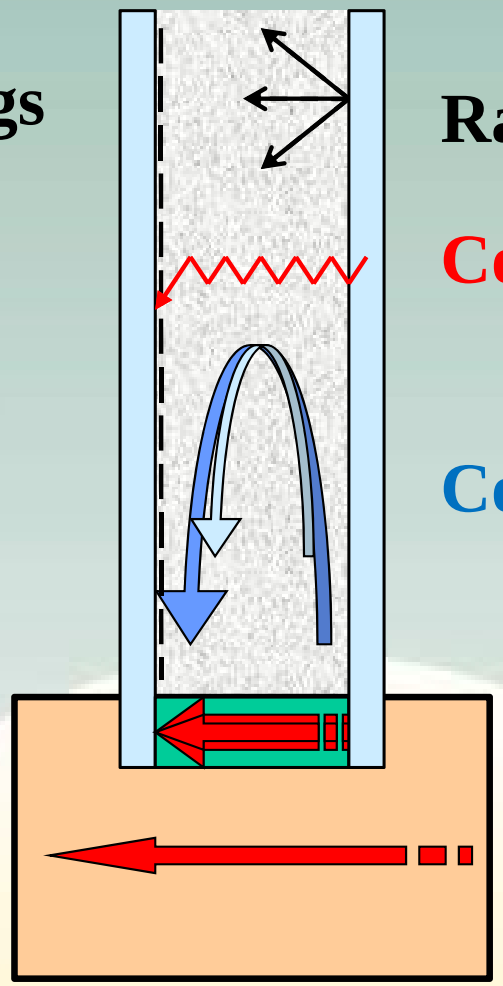
Spacers and frame typically transmit more heat than efficient, insulated glass.

→ U-factor of the glass alone doesn't tell the whole story.

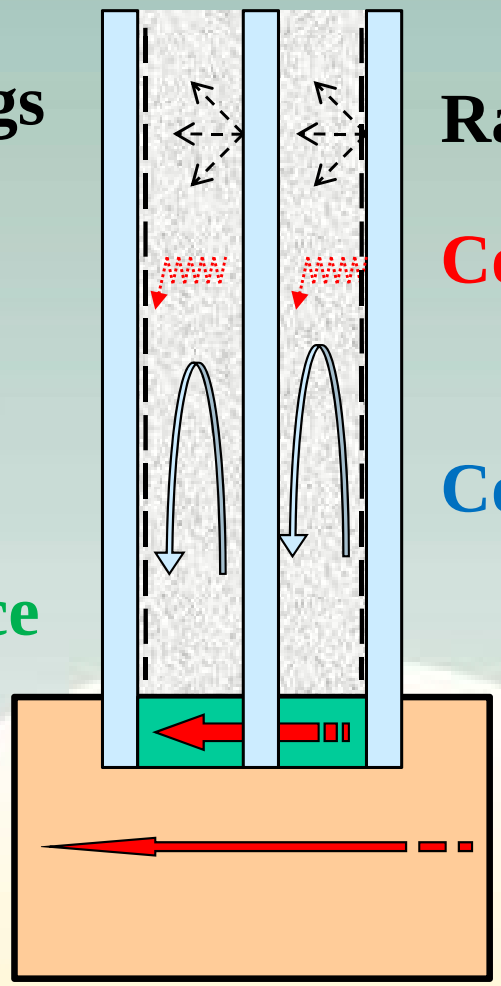
# Heat transfer pathways – single pane window



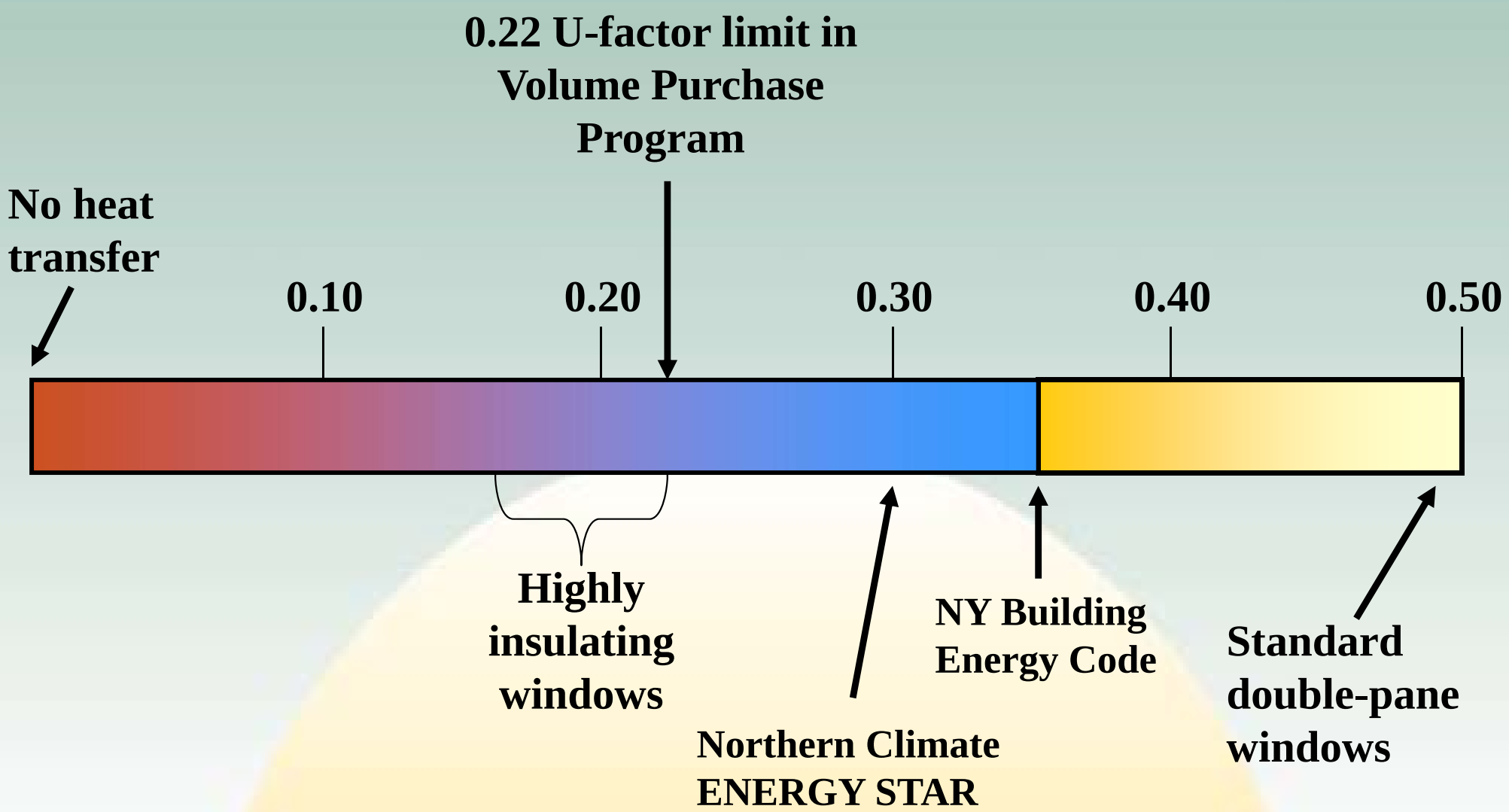
# Heat transfer pathways – double pane window



# Highly Insulating Windows



# Whole Window U-factor Range

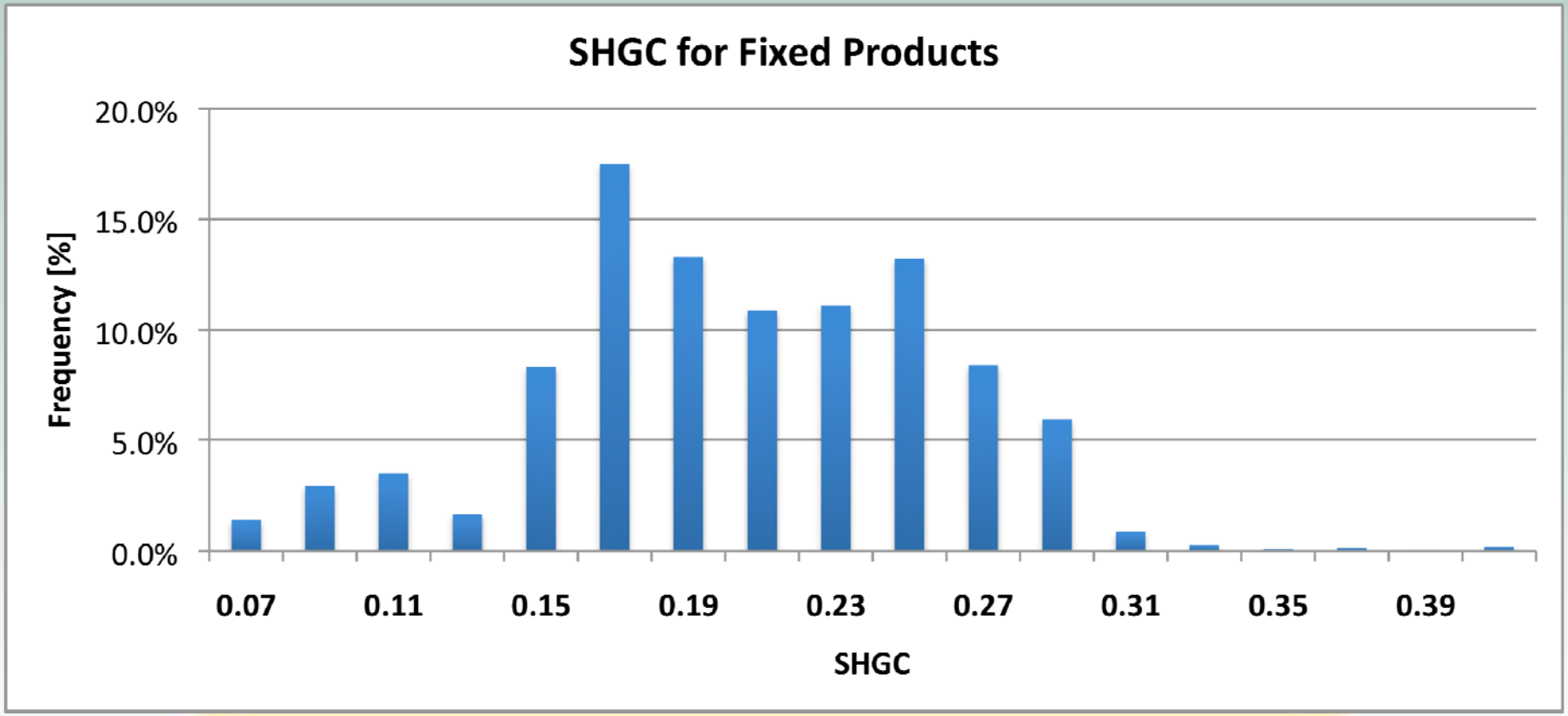


# Solar Heat Gains

- The right Solar Heat Gain Coefficient (SHGC) depends strongly on climate and house design:
  - Solar heat gain through windows helps offset heating loads (east and south facing windows)
  - Can increase cooling load (above all with west facing windows)

# Solar Heat Gain Window Properties

- Range of products available for Volume Purchase Program triple glazed windows (SHGC=0.15 – 0.30)



# Energy Cost Savings Estimates

Typical 1,850 $ft^2$ detached home (Albany, NY)

**Estimated savings from window replacement**
(excluding air leakage reduction savings)

- Double-pane windows without low-E: $240/year
- U-factor 0.35 (=code requirement): $320/year
- U-factor 0.22: $400/year

Energy cost savings estimator for download at:
www.windowsvolumepurchase.org

Estimates based on regression equations by Lawrence Berkeley National Laboratory derived from energy use simulations for representative single- and double-story homes in various U.S. locations.

# Low-E storm windows

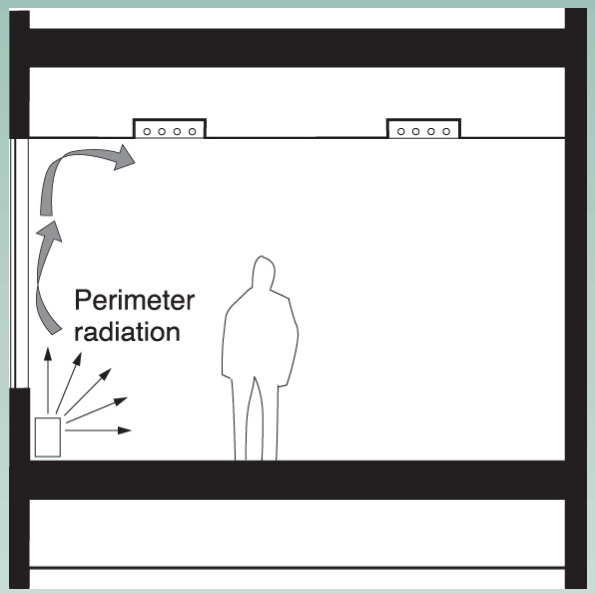
- Pyrolytic low-E coating - does not degrade in non-sealed cavity
- Identical installation cost to conventional storm windows

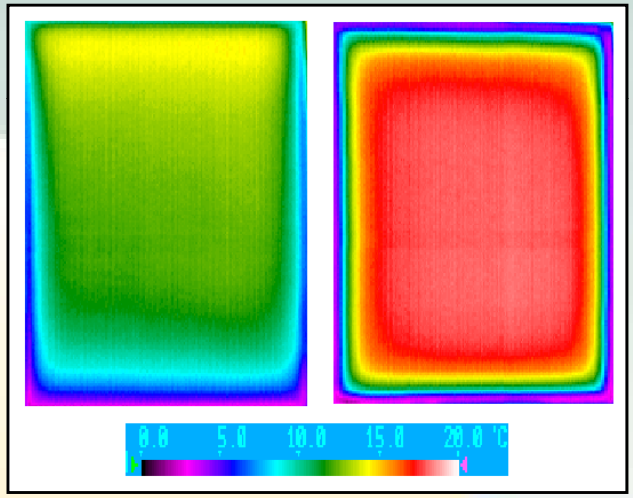
**Chicago field evaluation:**

- Simple payback for low-E storm windows: 4-5 years
- Whole house heating energy savings over a winter season:
  - Conventional storm windows 8-18%
  - Low-e storm windows 19-27%

# Comfort Benefits of Well-Insulating Windows

- Areas near windows are often places of great temperature variation and discomfort
- Conventional practice to avoid discomfort is to provide perimeter heating near windows
- Perimeter heat may not be necessary with highly insulating windows




**Thermograms comparing a conventional dual-pane with a highly insulating window**

# Thank You!

## *Questions?*

Let us know by email

***Efficient Windows Collaborative* resources:**

www.efficientwindows.org

***Efficient Windows Collaborative***

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