Efficient Windows

"Go! Green!"

Outline

- Energy efficient windows
- Zones
- The four inefficient deal breakers
- ‘Old’ windows
- Comparing U-factors and R-values
- Costs effectiveness
- Weather-Stripping
- Conclusion

Energy Efficient Windows

- Materials
  - Low-E coating
  - Solar control coating
  - Low conductance gas fill
  - Warm edged spacers
  - Improved weather stripping
- Design
  - Number of panes
  - Casement
  - Awning
  - Frames

Zones

- Assigned by the IECC (International Energy Conservation Code)
- Maine has two Zones
  - Zone 6 and Zone 7
- Zone 7 is assigned to the Aroostook county
- Determines ‘proper’ U-factors

Zone 7 Chart Requirements

Zone	Window/ Door U-Factor	Skylight U-Factor	Window/ Door/ Skylight SHGC
7	0.35	0.60	No Requirement

Four Inefficiencies:

- Conduction
- Air leakage
- Convection
- Radiant heat transfer

Conduction:

- Transfer of heat through windows is caused by difference in temperature
- Use less conductive materials to cut back on heat loss
- Examples:
  - Low-conductance gas fill, argon and krypton
  - Thermal resistive spacers
  - Thermal resistive window frames

Air Leakage:

- Responsible for most heat losses
- Use better insulated, and sealed materials
- Examples:
  - High quality hinged windows like casements
  - Improve frame conditions
  - Seal air gaps
  - Improved weather stripping


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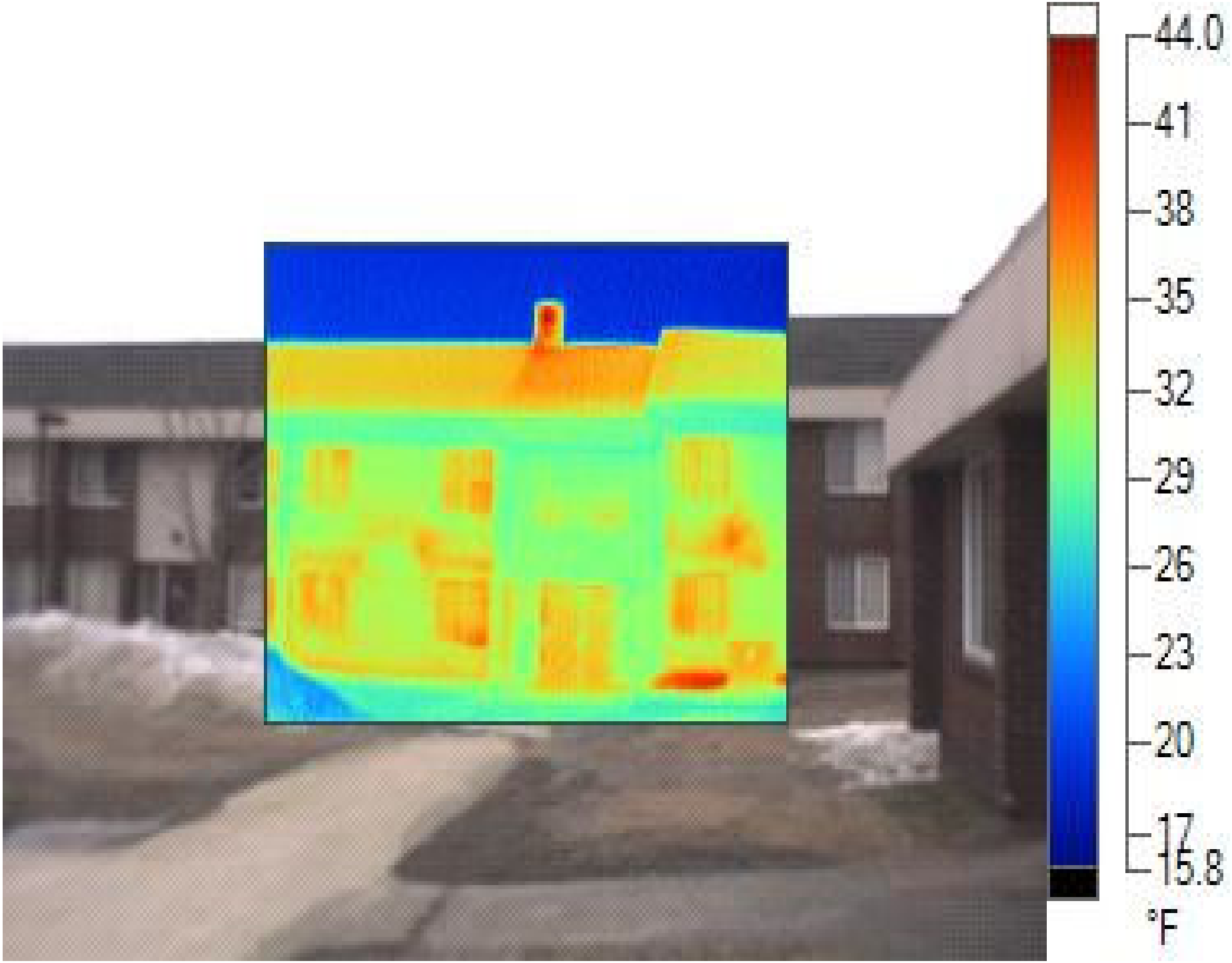
Convection:

- Makes rooms colder by cooling hot air that comes in contact with the window's surface
- Causes frost to accumulate on windows
- To stop heat loss raise glass temperatures to slow convection with low conductive materials
- Examples:
  - warm-edged spacers
  - glazing
  - low-conductance gas

Radiant Heat Transfer:

- Movement of hot air to cold air
- To improve use Low-E coating
  - Low-E coatings give off less long wave heat energy, keeping warm air inside
  - Low-E coatings combined with double glaze has the same efficiency as a triple-glazed clear window


44.0
41
38
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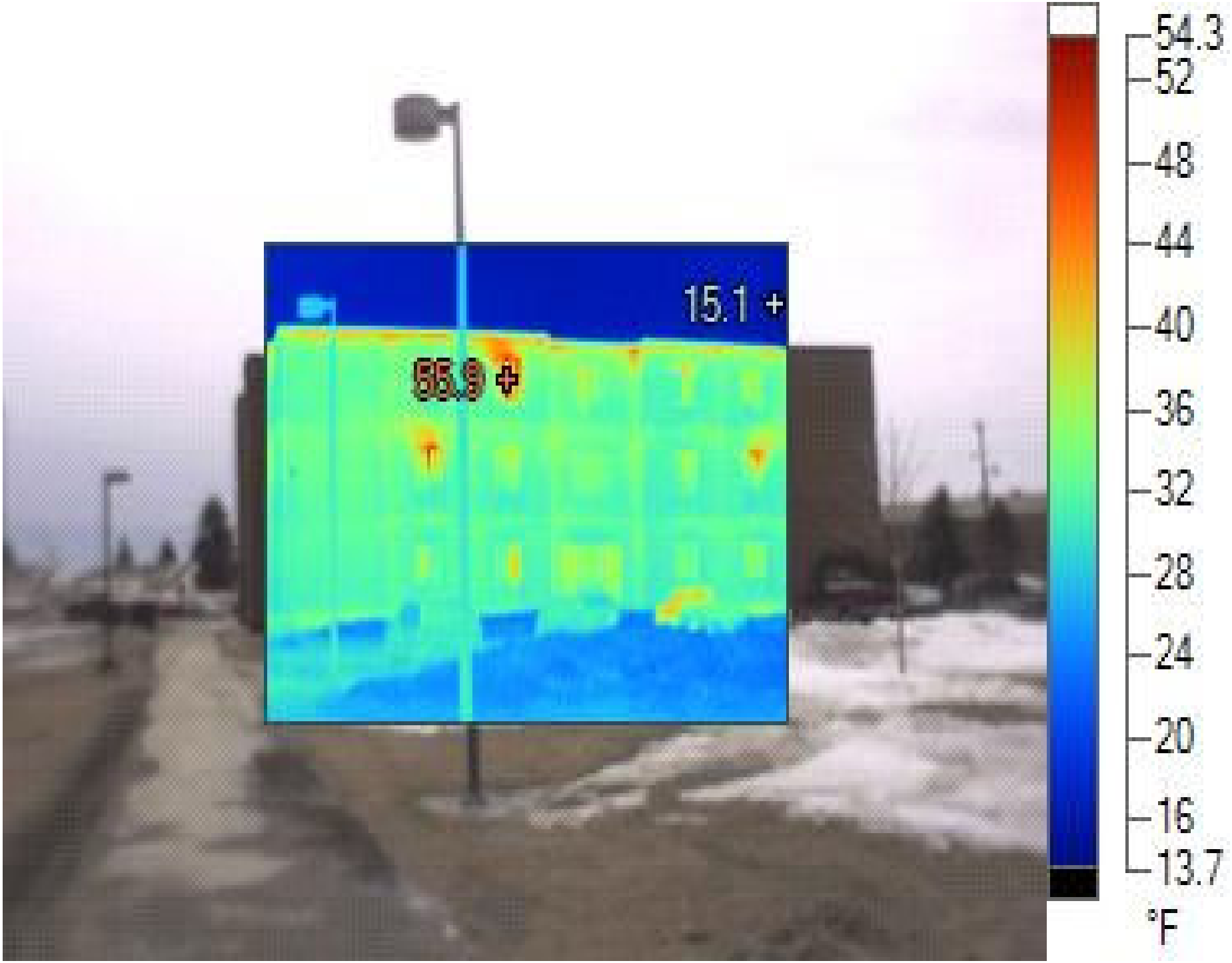
15.1 +
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‘Old’ Windows

- They are inefficient
  - Single pane
  - No gases to provide a barrier
  - Wood frames that were not maintained have created air leaks
  - Not properly selected for climate

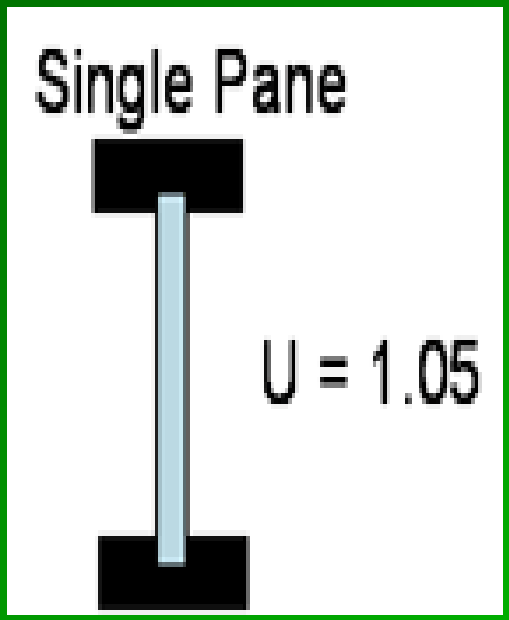
U-factor:

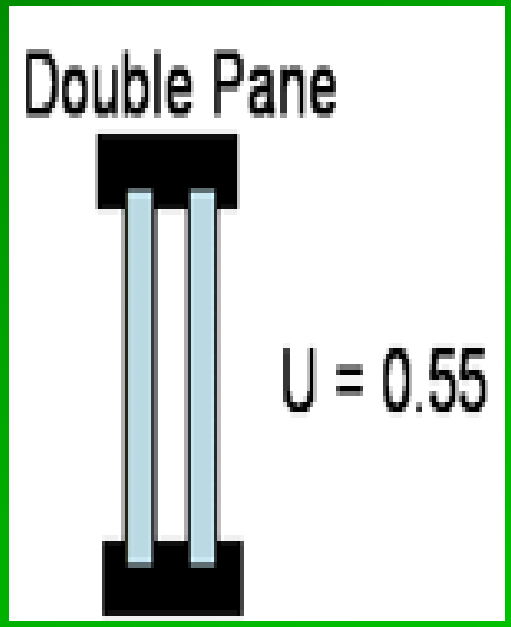
- The rate of heat loss
- The lower the U-factor the grater the resistance to heat flow and better insulating value
- It’s recommended that the U-factor be as low as 0.35 for northern climates

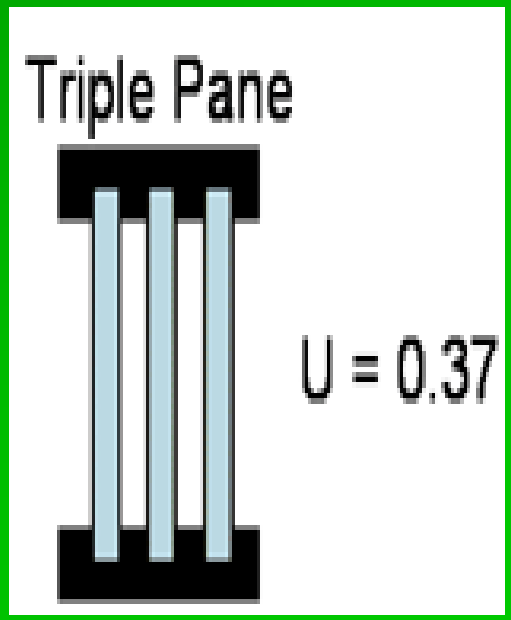
U-factor: (continued)

- Single pane windows have a U-factor of 1.0
  - The same windows used on campus
- Examples of a good U-factor:
  - Double pane windows
  - Triple pane windows

Example of U-factors:







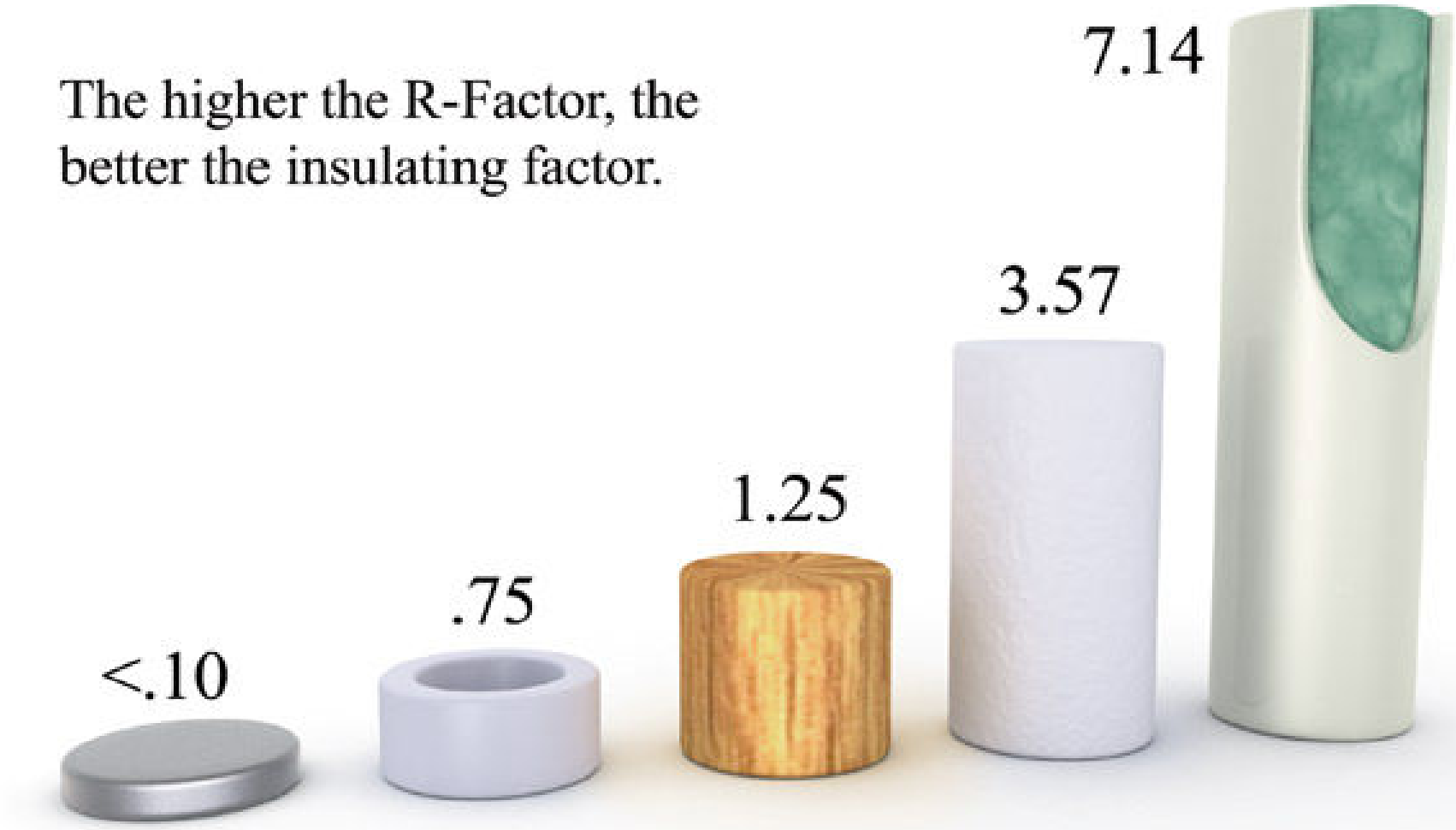
R-value:

- Insulated value of window

- The R-value is the inverse of the U-factor
  - R = (1/U)
- The higher the R-value the better insulated the window is
- The materials that are used determine the R-values and U-factors

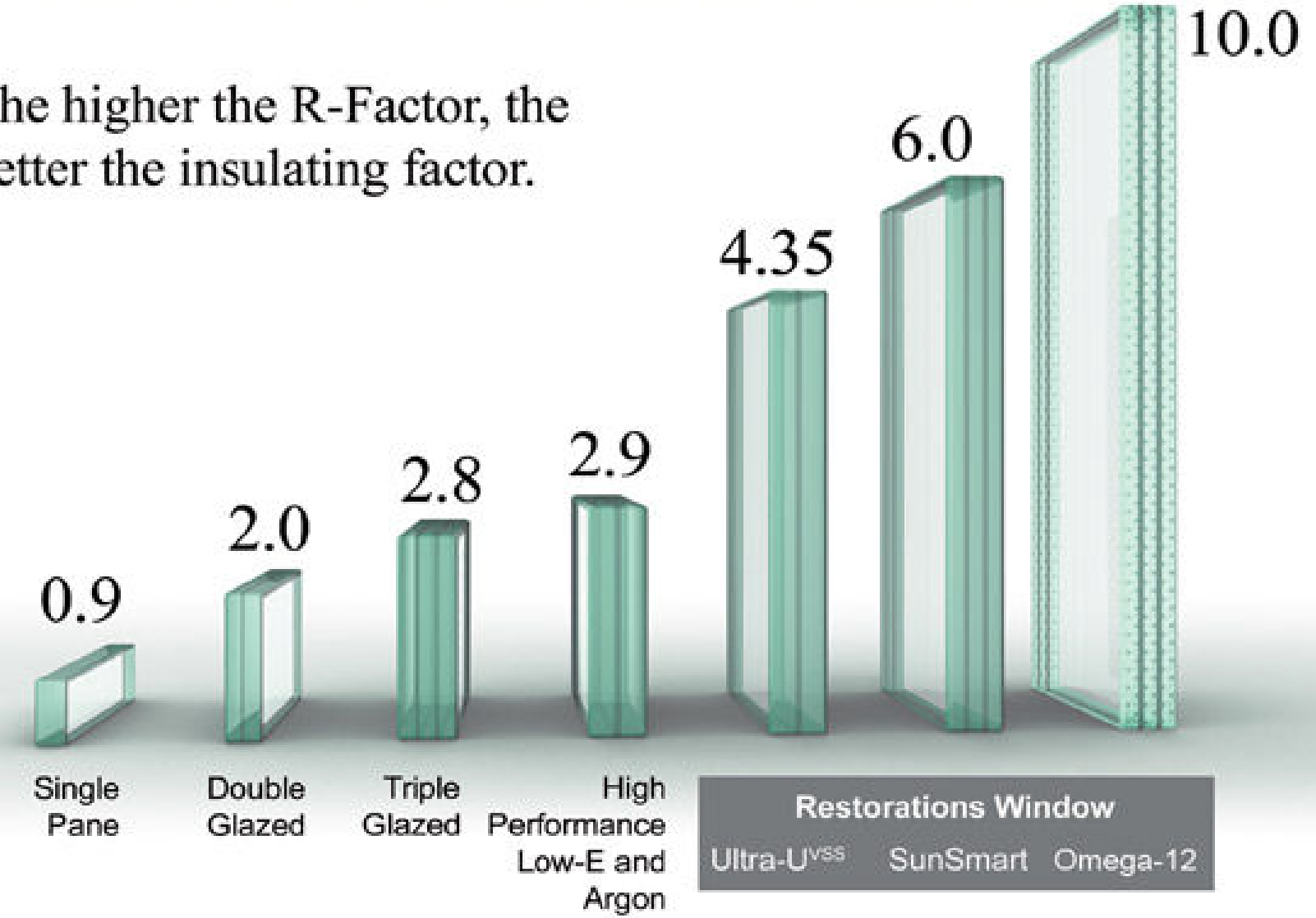
R-Factor - Frame Materials *(per lineal inch)*

The higher the R-Factor, the better the insulating factor.



R-Factor - Center of Glass

The higher the R-Factor, the better the insulating factor.



Cost Effectiveness

- In a home the payback can take up to 2 to 3 years
- Replacing already existing windows in the school can take up to 12.6

Costs For New Windows

- New windows for Andrews would be around $1,000 a piece
- New windows for the other apartments would be around $800 a piece
- *The extra costs are labor, prices depend upon manufacturer and may vary*

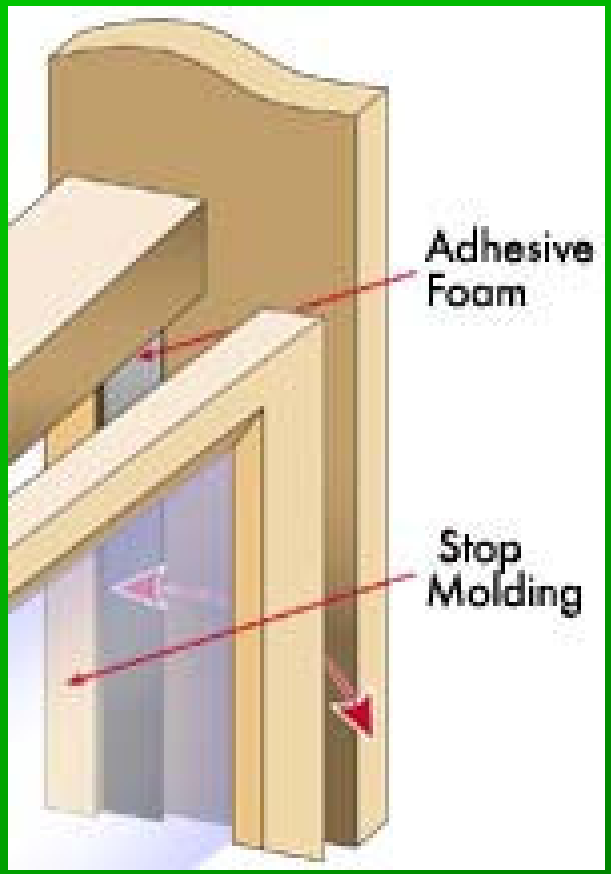
Efficient Windows

- The total annual savings in Fuel Oil #2 would be around 5,890 gallons
- Priced at $2.83/gal
- The total annual savings in costs would be around $16,667!

Weather-Stripping

- Can improve the overall efficiency of the window
- Is an alternative to replacing the whole window, but still helps conserve energy
- Cheaper than replacing windows but the materials used can break and wear down over time

Weather-Stripping



- Self adhesive weather-stripping can cost around $10.49 per window.
- Acrylic latex caulk plus silicon can cost around $3.00 a bottle

Conclusion

- Replace inefficient windows
- Benefits
  - Save money by saving fuel
  - Give back to the students by providing a warm and comfortable environment
  - Doing our part in conserving energy and going green