

# LoE-180 Glass

When the weather turns frigid, Cardinal LoE-180™ glass is the perfect cold remedy. It keeps homes warmer and more comfortable by blocking heat loss to the outside and letting the sun's heat stream in. With a glass U-Factor of just 0.26 and an SHGC of 0.69, LoE – 180 is the ideal product for passive solar applications. It extends a warm welcome home while achieving the highest ER values.

Regardless of where your home is located, choosing windows that provide you with the highest level of comfort and energy savings year-round is extremely important. And choosing the right glass for your windows is the most important factor in the decision. Go beyond ordinary low-e glass – choose Cardinal LoE-180, the ideal choice for passive solar designs.

## When it's freezing cold outside, it's cozy inside.

During cold weather, the insulating effect of your windows has a direct impact on how your rooms feel. Typically, 75% of the exposed surface of a window is glass, and the temperature of the room side of the glass directly affects the air temperature in the room. The better insulated the window glass, the warmer your room will be.

The table below compares the room-side center of glass temperatures of different glass types against two different winter conditions.

### INSIDE GLASS AND OUTSIDE TEMPERATURES

PRODUCT	OUTSIDE TEMP -20°F (-30°C)	OUTSIDE TEMP +20°F (-10°C)
Single-pane, clear	0°F (-19°C)	31°F (-3°C)
Double-pane, clear	37°F (2°C)	51°F (9°C)
Ordinary low-e (air fill)	46°F (7°C)	57°F (13°C)
<b>LoE – 180 (air fill)</b>	<b>48°F (9°C)</b>	<b>58°F (14°C)</b>
<b>LoE – 180 (argon fill)</b>	<b>51°F (10°C)</b>	<b>60°F (15°C)</b>

The superior insulating capability of Cardinal LoE-180 is a key factor in the construction of comfortable windows for cold climates. The dramatic comfort improvement from windows with warm glass surfaces also means the relative humidity of the indoor air can be controlled and maintained properly. Proper humidity levels (not too much, not too little) will improve comfort and promote a healthier living environment.

## Blocks out the cold, lets in the light.

Cardinal LoE-180 delivers outstanding cold weather performance – its insulation value is excellent with a low 0.26 U-Factor. And with an SHGC of 0.69, it lets the winter sun’s heat pass into the home. It also blocks 71 percent of the sun’s harmful UV rays. While blocking out the cold and UV rays, it lets the daylight stream in – more light than ordinary low-e glass.

### VISIBLE LIGHT TRANSMITTANCE

PRODUCT	VISIBLE LIGHT TRANSMITTANCE
Single-pane, clear	90%
Double-pane, clear	82%
Ordinary low-e	76%
<b>LoE-180</b>	<b>80%</b>

## Our unique coating is the key.

Cardinal employs a state-of-the-art sputter coating process that is unmatched by any other glass manufacturer. The glass is coated with a microscopically thin, optically transparent layer of silver sandwiched between layers of anti-reflective metal oxide coatings. A protective coating is applied to assure durability and long life. The coating is virtually invisible to the eye – it’s just like looking through clear glass.



When it's frigid outside, you only feel the warmth inside.

## Save energy with glass so smart, it can control your comfort.

Although windows provide beautiful views and wonderful natural light, they can also account for up to 50% of the heating and cooling energy consumed in a home. In the winter, Cardinal LoE – 180 helps your home stay warm and cozy by blocking heat loss to the cold weather outside. Summer solar gain is about 10% less than ordinary double pane clear glass and the low U-Factor blocks heat gain from the hot weather outside. In short, it can save energy year around.



\* Thermostat settings are the largest variable in establishing the heating and cooling energy savings potential with window replacements. If you tolerate the discomfort from your current windows and don't change thermostat settings with the weather, consider the savings suggested from the "Fixed Thermostat" column. If on the other hand you frequently adjust the thermostat, add space heaters to compensate for cold rooms, or close drapes/blinds to block the sun consider the additional savings suggested in the "Equal Comfort" column.

### Modeling Conditions

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Heat/Cool portion of your energy bill: DOE estimates that in 2005 the average house spent \$2,003 on utilities and that 43% of this total (\$886) is for heating and cooling energy. (<http://buildingsdatabook.eren.doe.gov/TableView.aspx?table=2.3.10>).

Savings values are average of multiple locations within climate zone.

"Average" house as described in the Buildings Data Book at <http://buildingsdatabook.eren.doe.gov/TableView.aspx?table=2.2.7> The model house is described as a mid-1970's single-story dwelling with natural gas furnace, central air-conditioning, adequate insulation, and double-pane windows.

Window orientation set as uniformly distributed on all sides to represent a neighborhood average and the total window area set to 15% of the floor area.

Interior shading devices are presumed to be closed 50% of the time throughout the year.

"Fixed Thermostat" conditions are 70°F for heating and 75°F for cooling.

"Equal Comfort" thermostat settings determined using window thermal comfort research from the University of California at Berkeley ([http://www.cbe.berkeley.edu/research/pdf\\_files/SR\\_NFRC2006\\_FinalReport.pdf](http://www.cbe.berkeley.edu/research/pdf_files/SR_NFRC2006_FinalReport.pdf)). The existing double-pane windows used heat/cool thermostat setpoints of 72°F/74°F to match the comfort of LoE – 180 glass at 70°F/74°F.

House heat/cool energy simulations used the Resfen program from Lawrence Berkeley National Lab (<http://windows.lbl.gov/software/resfen/resfen.html>).

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## Glass Performance

PRODUCT	VISIBLE LIGHT TRANSMITTANCE	SOLAR HEAT GAIN COEFFICIENT	WINTER U-FACTOR (AIR / ARGON )	UV	FADING TRANSMISSION
Single-pane, clear	90%	0.86	1.04 / –	0.71	0.84
Double-pane, clear	82%	0.78	0.48 / –	0.58	0.75
Ordinary low-e	76%	0.72	0.34 / 0.30	0.50	0.68
<b>LoE – 180</b>	<b>79%</b>	<b>0.69</b>	<b>0.31 / 0.26</b>	<b>0.29</b>	<b>0.63</b>

### Definitions

**Note:** All values calculated using Window 6.3. (See <http://windows.lbl.gov/software/default.htm> and [http://windows.lbl.gov/materials/optical\\_data/default.htm](http://windows.lbl.gov/materials/optical_data/default.htm) for more information on glass optical data and the Windows 6.3 program.) Emissance of ordinary (pyrolytic) low-E is 0.16.

**Solar Heat Gain Coefficient – (SHGC)** – The amount of solar radiation that enters a building as heat. The lower the number, the better the glazing is at preventing solar gain.

**Fading Transmission** – The portion of energy transmitted in a spectral region from 300 to 600 nanometers. This region includes all of the ultraviolet energy and part of the visible spectrum, and will give the best representation of relative fading rates. The lower the number, the better the glass is for reducing fading potential of carpets and interior furnishings.

**U-Factor** – This represents the heat flow rate through a window expressed in BTU/hr-ft<sup>2</sup>-°F, using winter night weather conditions of 0°F outside and 70°F inside. The smaller the number, the better the window system is at reducing heat loss.

Cardinal actively supports and participates in the National Fenestration Rating Council (NFRC). Windows with **LoE – 180** that are rated and certified by the NFRC can comply with Energy Star™ requirements in all regions of the country. Northern zone will likely require the addition of LoE-i89 on the 4th surface to comply with U-Factor requirements. (See <https://www.energystar.gov/products/certified-products/detail/residential-windows-doors-and-skylights> for more information on the Energy Star windows program.)

## Count on LoE – 180 to always meet or exceed expectations.

**Cardinal I.Q.** (Intelligent Quality Assurance Program) ensures the quality of every piece of glass. Using our own patented inspection systems, we thoroughly examine the glass from start to finish.

LoE-180 can be purchased in hurricane-resistant laminated glass, as well as in a variety of shapes and sizes.