



H I G H   S O L A R   G A I N   G L A S S

**CARDINAL**® CG 

ENGINEERING THE FUTURE OF COATED GLASS





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## Freezing cold outside,

When the weather turns frigid, Cardinal LoE-180™ glass is the perfect cold remedy. It provides excellent insulating capability, even better than our previous high solar gain glass, blocking heat loss to the outside and reflecting heat back into the room. What's more, it's the ideal glass for passive solar applications because it allows the winter sun's heat to pass into the home.

## Cardinal comfort inside.

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.

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.



When it's frigid here, it's cozy here.



#### Inside Glass and Outside Temperatures

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

	-20°F (-29°C)	+20°F (-7°C)
Single-pane, clear	0°F (-18°C)	31°F (-1°C)
Double-pane, clear	37°F (3°C)	51°F (11°C)
Ordinary low-e <sup>1</sup>	47°F (8°C)	58°F (14°C)
<b>LoE-180<sup>1</sup></b>	<b>50°F (10°C)</b>	<b>60°F (16°C)</b>

Note: 1. Low-e units are argon filled.

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 sun's heat and light.

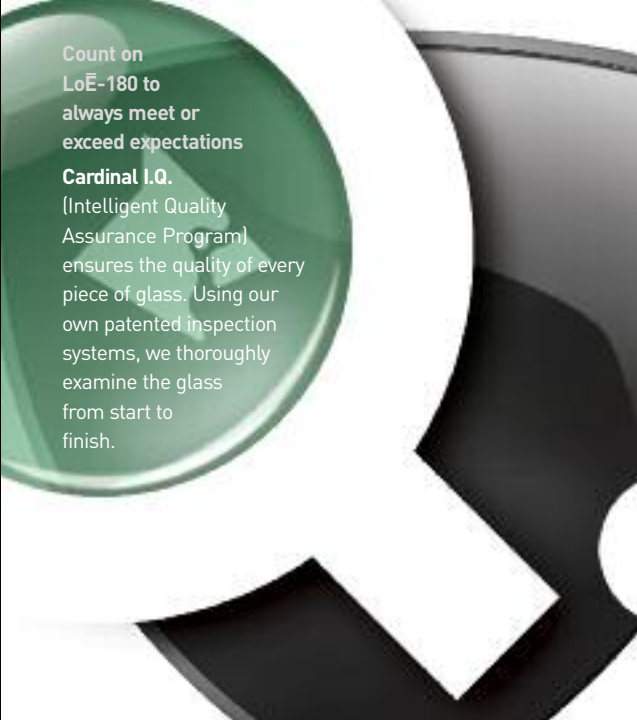
Cardinal LoE-180 delivers excellent cold weather performance – its insulation value (U-factor) is a low 0.26, and with a solar heat gain coefficient (SHGC) of 0.69, it lets the winter sun's heat pass into the home. It also blocks 71 percent of the sun's harmful UV rays. While blocking out the cold and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

### Visible Light Transmittance

Single-pane, clear	90%
Double-pane, clear	81%
Ordinary low-e <sup>1</sup>	76%
<b>LoE-180<sup>1</sup></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.



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.

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

## Heating and Cooling Energy Savings\*

(Percentage of dollars saved over ordinary glass)

NORTHERN 13-19%

WESTERN 15-20%

EASTERN 14-20%

\*Total energy costs (heating + cooling) comparing windows with clear double-pane glass versus LoE-180. Range in values considers different house types: Existing and New, 1 vs. 2-story.

### ENERGY STAR compliant in most of northern North America

In conjunction with an efficient window frame design, LoE-180 can comply in the Northern zone of U.S. ENERGY STAR. The combination of high solar gain and excellent insulating value allows LoE-180 to achieve one of the highest ER values for a double-pane glass in the Canadian window rating program. Many of these double-pane windows can then achieve Canadian ENERGY STAR compliance as far north as zone C.

### Glass Performance

PRODUCT	WINTER U-FACTOR (METRIC)	SOLAR HEAT GAIN COEFFICIENT	GLASS ER <sup>2</sup>	WINDOW ER IMPROVEMENT <sup>3</sup>
Double-pane, clear	0.48 (2.73)	0.76	24	---
Ordinary low-e <sup>1</sup>	0.31 (1.78)	0.71	42	---
<b>LoE-180<sup>1</sup></b>	<b>0.26 (1.48)</b>	<b>0.69</b>	<b>47</b>	<b>3-4</b>

Note: 1. Low-e units are argon filled. 2. Does NOT include frame. Use for glass comparisons only. 3. Assumes operable window at 25% frame area. The Canadian ER system does a heat energy balance in the winter (solar gain IN - heat loss OUT) but does not consider any effects on air-conditioning loads and/or the risk of overheating the space with TOO much solar gain.

Think of LoE-180 glass as invisible insulation. Although windows provide beautiful views and wonderful natural light, they can also account for up to 25% of the annual heating cost for a home. In the winter, LoE-180 helps homes stay warm and cozy by blocking heat loss to the cold weather outside while welcoming the sun's heat inside.



LoE-180 can be purchased in a variety of custom shapes and sizes. To learn more about it and other Cardinal glass products, ask your contractor or architect, or visit our web site at [www.cardinalcorp.com](http://www.cardinalcorp.com).

Note: All values calculated using Window 6.3.

(See <http://windows.lbl.gov/software/window/window.html> and <http://windowoptics.lbl.gov/data/igdb> for more information on glass optical data and the Window 6.3 program.) Emittance of ordinary low-e is 0.20.

**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 700 nanometers. This region includes all of the ultraviolet energy and most 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 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 for all climates in the country.

(See <http://www.energystar.gov/products/windows/> for more information on the Energy Star windows program.)

## GLASS PERFORMANCE

PRODUCT	VISIBLE LIGHT TRANSMITTANCE %	SOLAR HEAT GAIN COEFFICIENT	WINTER U-FACTOR (METRIC)	UV	FADING TRANSMISSION
Single-pane, clear	90%	0.86	1.04 (5.91)	0.71	0.84
Double-pane, clear	81%	0.76	0.48 (2.73)	0.56	0.74
Ordinary low-e <sup>1</sup>	76%	0.71	0.31 (1.78)	0.49	0.66
<b>LoE-180<sup>1</sup></b>	<b>80%</b>	<b>0.69</b>	<b>0.26 (1.48)</b>	<b>0.29</b>	<b>0.63</b>

Note: 1. Low-e units are argon filled.



**Mixed Sources**  
Product group from well-managed  
forests, controlled sources and  
recycled wood or fiber

Cert no. SW-COC-002633  
[www.fsc.org](http://www.fsc.org)  
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