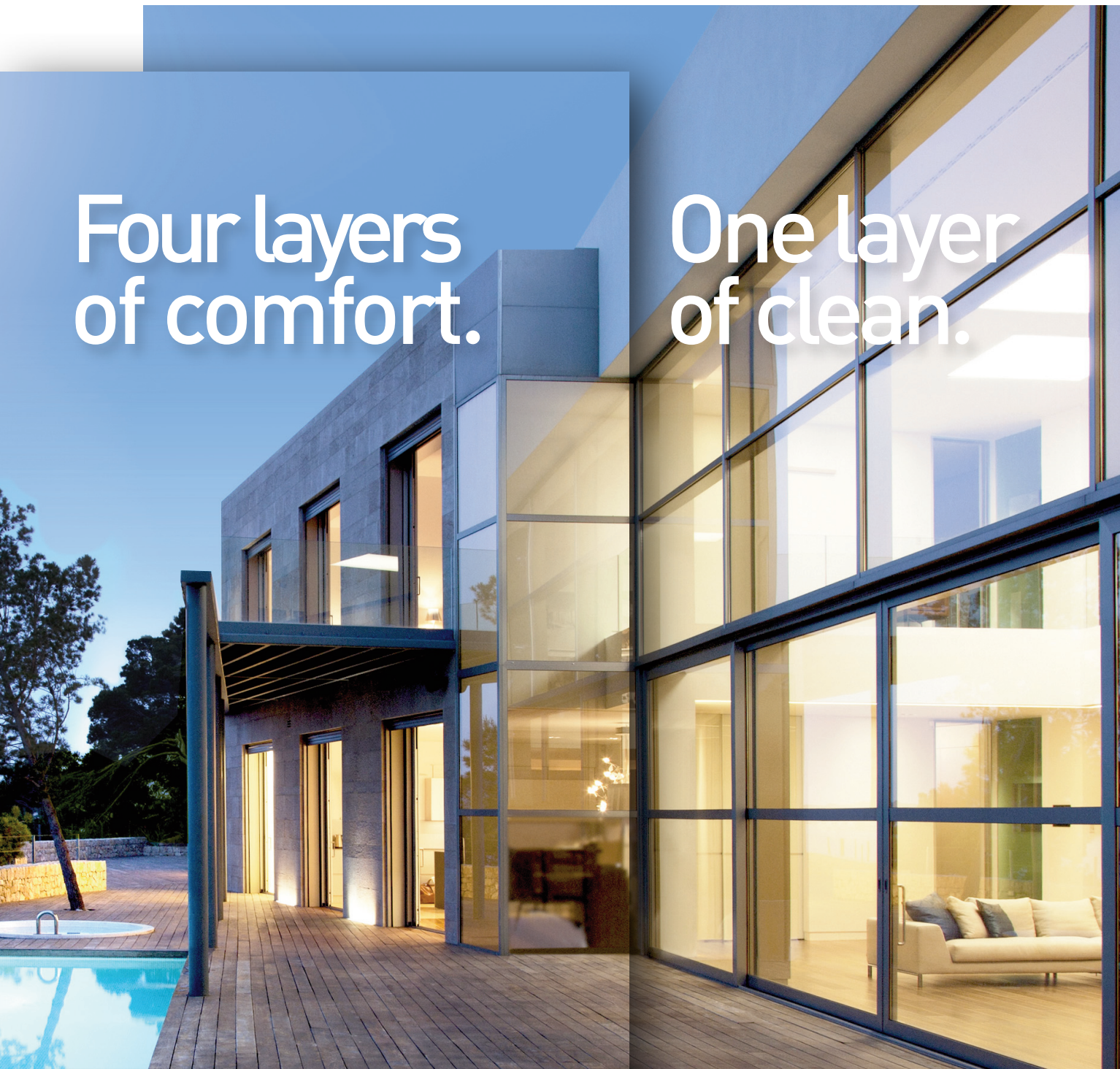


Four layers
of comfort.

One layer
of clean.



Premium Performance Glass



Naturally Cleaner Glass

CARDINAL CG  ENGINEERING THE FUTURE OF COATED GLASS
A CARDINAL GLASS INDUSTRIES COMPANY



Quad LoE-452+™ Premium Glass: A Decade in the Making

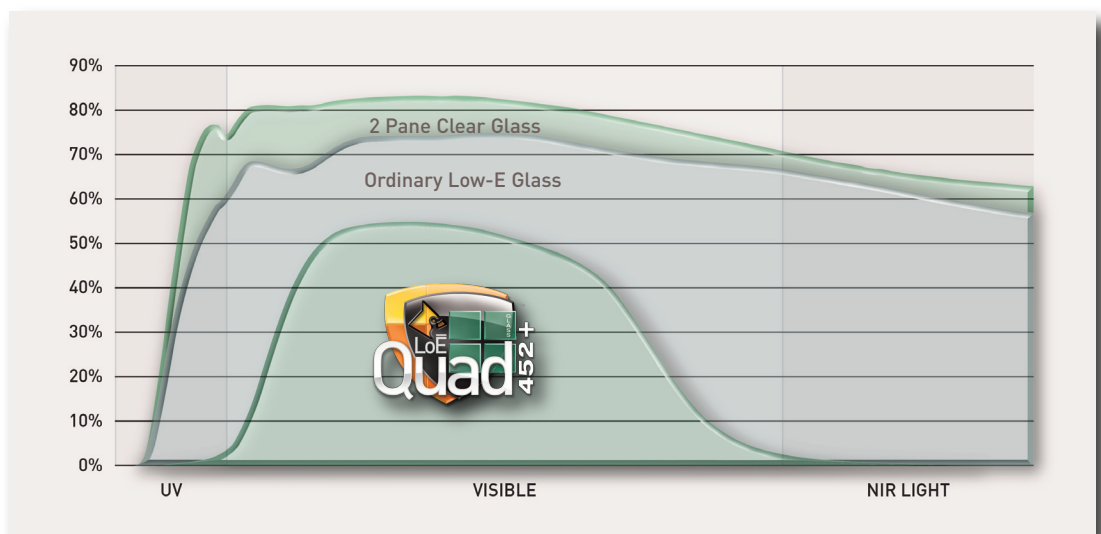
New Quad 452+ is a true, four-layer silver coating with exceptionally low emissivity, 99% UV protection, low exterior reflection and superior solar control. It also comes standard with Neat+™ — an exterior coating that stays cleaner longer and is easy on the environment.

Superior performance. Naturally cleaner glass. This is a breakthrough combination you won't find anywhere else.

A new standard in thermal performance.

Quad 452+ has an SHGC (solar heat gain coefficient) of 0.22, a visible transmittance of 52% and an excellent 2.30 light-to-solar-gain ratio. It also has a low exterior reflection (10%) and is neutral in transmission, in reflection, and on angle.

IG TYPE AND COATING	VISIBLE LIGHT			FADE TRANSMISSION		SOLAR	U-FACTOR	
	TRANSMITTANCE	EXTERNAL REFLECTANCE	INTERNAL REFLECTANCE	UV	ISO	HEAT GAIN COEFFICIENT	AIR FILL IP / SI	ARGON FILL IP / SI
Single-pane, clear	90%	8%	8%	71%	84%	0.86	1.04 / 5.91	—
Double-pane, clear	82%	15%	15%	58%	75%	0.78	0.48 / 2.73	—
Ordinary low-E	76%	17%	17%	50%	68%	0.72	0.34 / 1.93	0.30 / 1.70
Quad LoE 452+	52%	10%	15%	1%	33%	0.22	0.29 / 1.64	0.24 / 1.36





More comfort than ever.

In hot, sunny climates, Quad 452+ clearly outshines ordinary window glass. It is formulated specifically to manage solar heat gain while maintaining clear views, taking more of the burden off the AC unit to keep conditions comfortable inside. The low emissivity of Quad 452+ glass also means warmer rooms during winter.

Exceptional fade protection.

Quad 452+ blocks 99% of UV rays from reaching the interior, protecting furniture, carpets, artwork and other furnishings to a degree that is comparable to laminated glass.

Uncoated glass allows more UV light to reach the interior, which can damage furniture, carpets and artwork.

Simulation

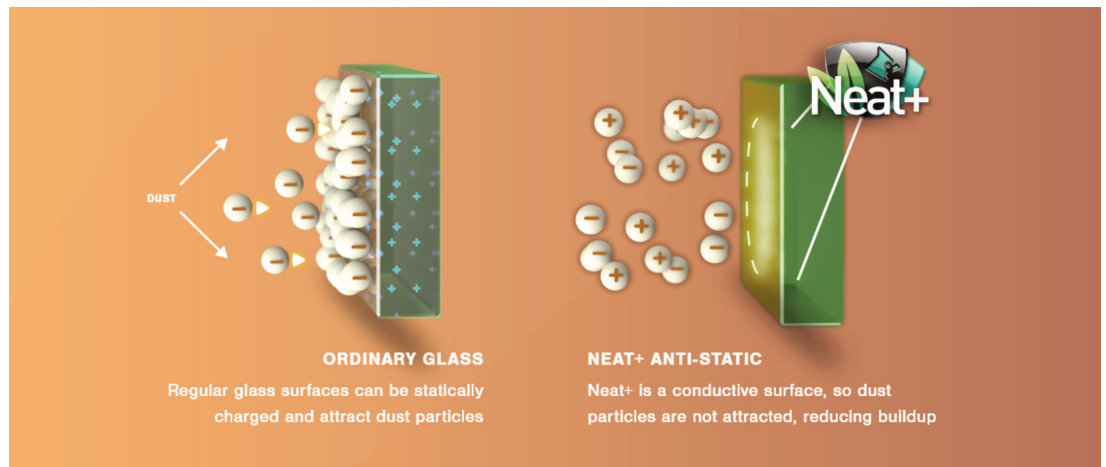


Neat+™ coating: standard on all Quad 452+ glass.

Featuring 25% higher photocatalytic activity than original Neat®, Neat+ repels 40% more dust and dirt than uncoated glass.



Neat+ incorporates titanium dioxide that reacts with the sun's UV rays to also break down greenhouse gases such as methane to further clean the window. This saves homeowners time while requiring less water and chemicals, helping to reduce environmental impact. With sufficient UV radiation, water will sheet away, improving drying time.





Keeping it neutral.

In addition to its performance advantages, the fourth layer of silver in Quad 452+ glass enhances the grey to aid in a neutral appearance. This provides architects and designers with greater flexibility to specify the glass for a broader palette of building façade colors. Here are approximate exterior color representations:



Quad 452+ glass



Grey glass



Add LoE-i89® to trap the heat indoors during cold weather.

For climates that get cold in winter as well as hot in the summer, insulating glass units (IGUs) with Quad 452+ glass can be specified with the optional LoE-i89 coating. Indium tin oxide is sputtered onto the interior side of the glass panel to reflect escaping heat back into the room, lowering U-Factor.

Combined with exceptional solar control and naturally cleaner glass, these three coatings in a dual-pane IGU deliver everything you want in a window.

Quad LoE-452+ with Neat+ — superior performance meets naturally cleaner glass.

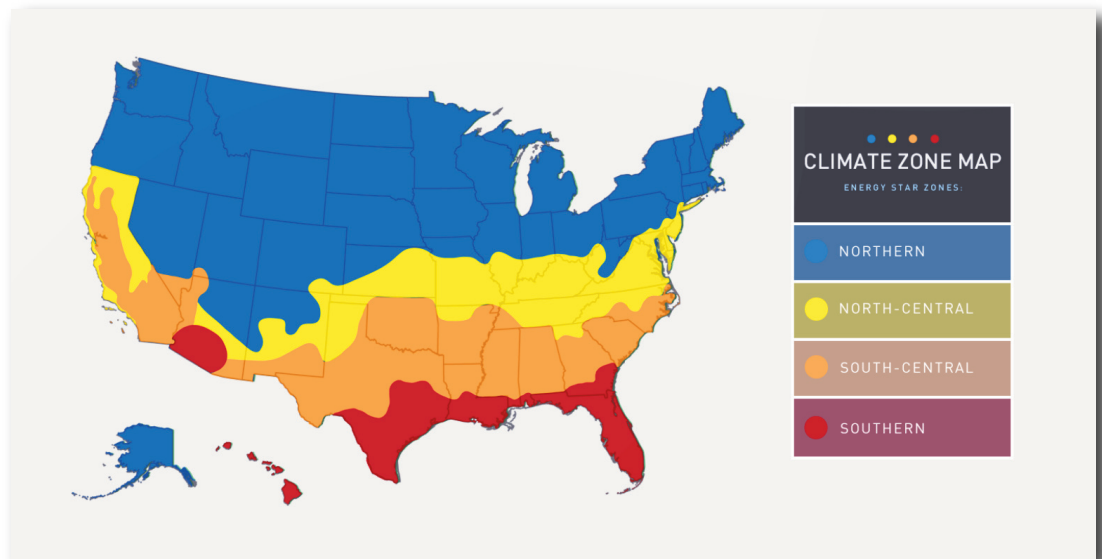
With its four layers of silver and natural cleaning qualities, new Quad 452+ redefines energy efficiency, low maintenance and neutral appearance for LoE coatings.

To learn more about Quad 452+ premium glass and other Cardinal products, ask your window manufacturer, contractor or architect.



ENERGY STAR®, everywhere.

The goal of the ENERGY STAR Windows program is to be better than code. LoE³-366® and Quad 452+ are two low-E products that qualify everywhere: superior insulating value in the north, and clear solar control for everywhere else in the country.



Inside glass and outside temperatures.

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

IG TYPE AND COATING	OUTSIDE TEMP °F (°C)	
	VERY COLD OUTSIDE -20°F (-30°C)	COLD OUTSIDE 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)
Quad LoE 452+ (air fill)	49°F (9°C)	59°F (14°C)
Quad LoE 452+ (argon fill)	52°F (11°C)	61°F (16°C)