

Introduction: A Clear Look at Glass Distortion

A GUIDE FOR HOMEOWNERS

We take great pride in delivering high-quality products that are strong, energy efficient, and customizable for any home or business. To ensure exceptional performance, our glass undergoes extreme processes that can cause distortion like bubbles, discolorations, and scratches – occurrences that are experienced industry-wide. We adhere to the guidelines established by the American Society for Testing and Materials International (ASTM) on annealed glass, heat-strengthened glass, coated glass, laminated glass, and insulated glass units. Each pane is inspected thoroughly to meet our benchmarks for excellence and to meet/exceed industry standards.

This document includes general guidelines to help you determine if a glass-related concern is eligible for replacement. Please reference the ASTM standards at www.astm.org for a complete overview of industry policies.

WHAT CAUSES GLASS DISTORTION?



PROTECTION

Necessary processes that are used to create glass products, pressures, glazing, and heat treatments increase strength, safety, and/or efficiency. However, they can cause visible distortions.



LOCATION

Environmental factors like barometric pressure and elevation can affect your glass.



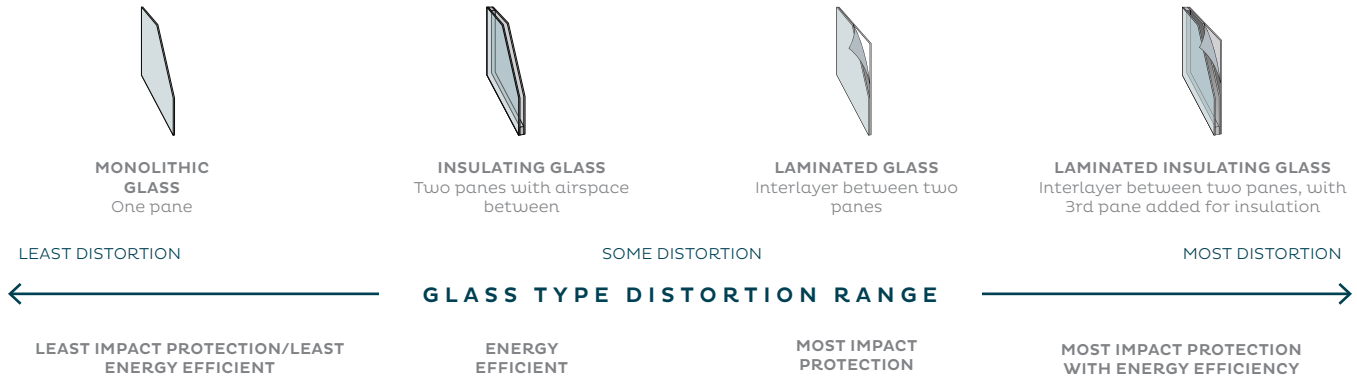
CLIMATE

Constantly changing temperature fluctuations based on the time of day, season, and other environmental factors will also distort glass.

GLOSSARY OF TERMS

- **American Society for Testing and Materials International (ASTM)**
An organization that develops and publishes technical standards for a wide range of materials and products.
- **Annealed Glass**
Raw glass that has not been heat-treated.
- **Heat-Strengthened Glass**
Glass that is re-heated to below melting point and cooled quickly; nearly two times stronger than annealed glass.
- **Insulated Glass Units**
Window panes separated by an air- or other gas-filled space to reduce heat transfer.
- **Laminated Glass**
Two or more pieces of glass bonded together with a strong, clear interlayer.
- **Low-E (Emissivity) Glass**
Glass with a transparent, metallic oxide coating applied onto or into a glass surface. The coating typically allows short-wave energy to pass through but reflects long-wave infrared energy, which improves the U-value.
- **Tempered Glass**
Glass that is re-heated to below melting point and cooled twice as fast as heat-strengthened glass; nearly four times stronger than annealed glass. When shattered, it breaks into small pieces.

WHAT LEVEL OF GLASS DISTORTION SHOULD I EXPECT?



WHAT IS NOT CONSIDERED GLASS DISTORTION?

As glass configurations become more advanced, it is difficult to control certain outcomes. Therefore, the instances listed below are not considered distortions.

Name	Definition	Why It Occurs
Roller Waves	A pattern of ripples/waves across heat-treated glass	This occurs during the heating process, and patterns may vary on each pane
Coloration	Low-E coating may exhibit a hue or coloration especially under different lighting	This coloration is inherent to the coating process
Suction Cup Marks and Label Residue	Residue from label adhesive or marks from suction cups may appear on the glass surface	This occurs during the handling/packaging process and may be seen when condensation is present. However, these marks can be removed (view our Care and Maintenance Instructions).



HOW DO I INSPECT MY GLASS?

In order to determine if your glass is eligible for replacement, please inspect it with the industry-wide standards featured below. This ensures that every glass pane is measured consistently.

- Inspect glass with the naked eye in the vertical position
- View it at a 90-degree angle to the glass
- Make all inspections during the daytime (without direct sunlight)
- Stand at the distance specified by each defect type for the noted amount of time (see the documents on **Blemishes** and **Glass Breakage** for more details)

A Clear Look at Blemishes

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Since glass is derived primarily from sand, blemishes may appear in the finished product. There are two main types of blemishes: linear and point. This document will guide you through how to determine eligibility for replacement in 2 steps.

STEP 1: IDENTIFY THE BLEMISH TYPE



LINEAR BLEMISH

- **Scratch** – Damage in the form of a line
- **Rub** – Abrasion that produces a frosty appearance
- **Dig** – Deep, short scratch



POINT BLEMISH

- **Crush** – Lightly pitted condition with a dull gray appearance
- **Knot** – Lumps
- **Dirt/Mark/Contaminant** – Small particle of foreign material on the surface
- **Gaseous Inclusion** – Round or elongated bubble
- **Pinhole** – Small area in which the coating is entirely or partially absent
- **Corrosion** – Change in color or level of reflected or transmitted light over all or part of the surface



STEP 2: INSPECT GLASS PROPERLY

If you suspect that you have a linear or point blemish, please examine your glass with the industry-wide standards featured below. This ensures that every glass pane is measured consistently.

- Inspect glass with the naked eye in the vertical position
- View it at a 90-degree angle to the glass
- Make all inspections during the daytime (without direct sunlight)
- Stand at the **distance specified** by each blemish type below for the noted amount of time
- Understand what merits replacement based upon the location of the blemish (review the **central area and outer area** section below)



VIEWING DISTANCES AND TIMES FOR BLEMISHES

Where you stand and how long you review a potential blemish will help you determine if your glass pane is eligible for replacement. Use the charts below to identify the appropriate criteria.

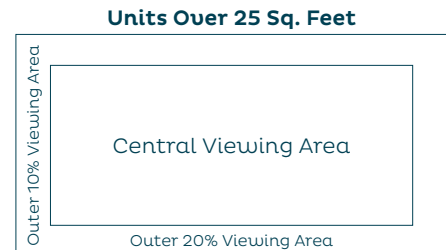
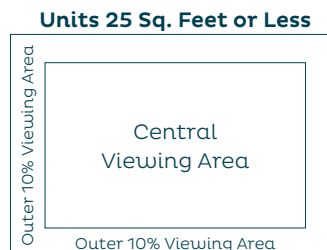
Blemish Type	Viewing Distance (Based on Size of Glass Pane)		Viewing Time (Based on Size of Glass Pane)	
	25 Square Feet or Less	Over 25 Square Feet	25 Square Feet or Less	Over 25 Square Feet
Linear	6 Feet Away	10 Feet Away	10 Seconds	20 Seconds
Point	39 Inches Away	39 Inches Away	10 Seconds	20 Seconds

How to Read: If you are examining a potential linear blemish on a glass pane that is 25 sq. feet or less, you must stand 6 ft. away from the pane and view it for 10 seconds.

LOCATIONS OF BLEMISHES (CENTRAL AREA AND OUTER AREA)

Blemishes are eligible for replacement based upon their location on the glass pane. Before you examine your glass, it is important to understand the two viewing areas for each pane/unit: central area and outer area. The central area is considered the section in the middle of the glass, and the outer area represents the remaining portion along the perimeter of the glass.

Based upon the standards to the right, please refer to the charts below to determine eligibility for replacement.



Linear Blemish

Viewing Area	Blemish Intensity	Replacement Eligibility
Outer	Light and Heavy	Any occurrence is not eligible for replacement.
Central	Light	Any occurrence is not eligible for replacement.
	Heavy	Any occurrence is eligible for replacement.

How to Read: If a light or heavy linear blemish occurs in the outer area of the pane, your glass will not be eligible for replacement.

Point Blemish

Size of Glass Pane	Blemish Intensity		Replacement Eligibility	
	Outer Area	Central Area	Outer Area	Central Area
25 Square Feet or Less	$\frac{3}{32}$ inch or less	$\frac{1}{16}$ inch or less	Any pane with a point blemish larger than $\frac{3}{32}$ inch is eligible for replacement.	Any pane with a point blemish larger than $\frac{1}{16}$ inch is eligible for replacement.
Over 25 Square Feet	$\frac{1}{8}$ inch or less	$\frac{3}{32}$ inch or less	Any pane with a point blemish larger than $\frac{1}{8}$ inch is eligible for replacement.	Any pane with a point blemish larger than $\frac{3}{32}$ inch is eligible for replacement.

How to Read: If you are examining a point blemish in the outer area on a pane that is 25 square feet or less, it will be eligible for replacement if the blemish is larger than $\frac{3}{32}$ inch.

A Clear Look at Replacement Glass

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Our team continually strives to deliver exceptional products to our customers. Although our thorough glass inspections minimize potential defects, there may be situations where your glass warrants replacement.

This document will help you identify whether your glass is considered acceptable or eligible for replacement in 2 steps. Please refer to the glass policies for **Blemishes** and **Glass Breakage** to learn more about determining eligibility for these distortion types.

STEP 1: INSPECT GLASS PROPERLY

In order to determine if your glass is eligible for replacement, please inspect it with the industry-wide standards from the American Society for Testing and Materials International (ASTM) featured below. This ensures that every glass pane is measured consistently.

- Inspect glass with the naked eye in the vertical position
- View it at a 90-degree angle to the glass
- Make all inspections during the daytime (without direct sunlight)

STEP 2: IDENTIFY THE POTENTIAL BLEMISH/CHIP

Blemish Type	Measurable Feature	Replacement Eligibility
Short Interlayer	1/8" maximum depth	Any occurrence that exceeds 1/8" is eligible for replacement. If there are multiple occurrences, they must be separated by 12" in order to be eligible.
Excess Interlayer	1/16" or less	Any occurrence larger than 1/16" is eligible for replacement.
Glass Size	+/- 1/16"	Any occurrence that exceeds this tolerance is eligible for replacement.
Glass Squareness*	1/8" or less	Any occurrence larger than 1/8" is eligible for replacement.
Glass Offset (misalignment of 2 or more lites of glass)	1/8" or less	Any occurrence larger than 1/8" is eligible for replacement.
Edge Deletion	3/8" to 7/16"	Any occurrence that exceeds this tolerance is eligible for replacement.

*Measure each lite diagonal, corner to corner.

Chip Type	Chip width 1/8" or less and less than half the thickness	Chip width 5/32" – 1/4" and less than half the thickness	Chip width over 1/4" and less than half the thickness
Shell Chip /Flake Chip	Any occurrence is not eligible for replacement.	If more than one chip per edge is visible, your glass is eligible for replacement.	Any occurrence is eligible for replacement.

A Clear Look at Glass Breakage

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Blemishes caused by windblown elements or cleaning can reduce the strength of the glass or, in some cases, produce breakage. This document illustrates the 3 types of breakage and how to determine eligibility for replacement in 2 steps.

STEP 1: IDENTIFY THE GLASS BREAKAGE TYPE



THERMAL BREAK

Occurs when the temperature varies in different parts of the glass and the strength of the temperature strain is greater than the strength of the glass.



BENDING/CORNER BREAK

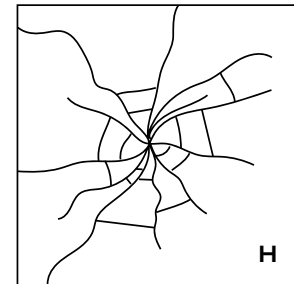
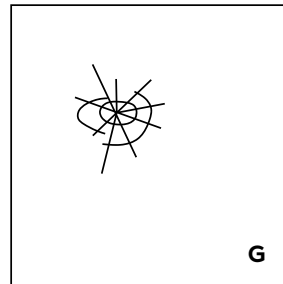
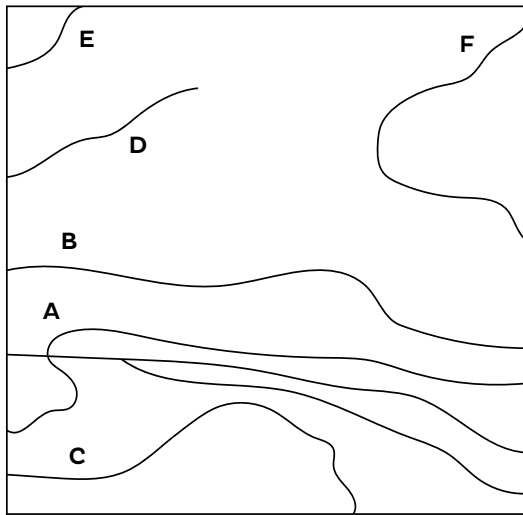
Occurs when torsional (twisting under torque) forces are applied during transport, handling, or installation. Force has been applied at or near the break or along a parallel edge. Breaks may occur at any location along the edge of the glass.



IMPACT BREAK

Occurs when the pane is impacted with enough force to cause a shatter. A typical example pattern is a "spider web" effect.

STEP 2: DETERMINE IF YOUR GLASS IS ELIGIBLE FOR REPLACEMENT



Glass Breakage Type	Specific Breakage Type (Refer to the Drawing Above for Examples)	Replacement Eligibility
Thermal Breaks	A – High-Stress Thermal Break	This break is not eligible for replacement.
	B – Low-Stress Thermal Break	This break is not eligible for replacement.
Bending Breaks	C – Low-Stress Bending Break	This break is eligible for replacement if noted upon delivery to the authorized dealer. For breaks that occur after delivery, a warranty claim with a photo must be submitted for consideration.
	D – Low-Stress Bending Break	This break is eligible for replacement if noted upon delivery to the authorized dealer. For breaks that occur after delivery, a warranty claim with a photo must be submitted for consideration.
Corner Breaks	E – Low-Stress Corner Break – could be due to burr or spacer	This break is eligible for replacement if noted upon delivery to the authorized dealer. For breaks that occur after delivery, a warranty claim with a photo must be submitted for consideration.
	F – Low-Stress Corner Break – low-stress bending	This break is eligible for replacement if noted upon delivery to the authorized dealer. For breaks that occur after delivery, a warranty claim with a photo must be submitted for consideration.
Impact Breaks	G – Small Object Impact Break	This break is eligible for replacement if noted upon delivery to the authorized dealer. For breaks that occur after delivery, a warranty claim with a photo must be submitted for consideration.
	H – Large Object Impact Break	This break is eligible for replacement if noted upon delivery to the authorized dealer. For breaks that occur after delivery, a warranty claim with a photo must be submitted for consideration.