

# 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](http://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 distortion.



#### LOCATION

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



#### CLIMATE

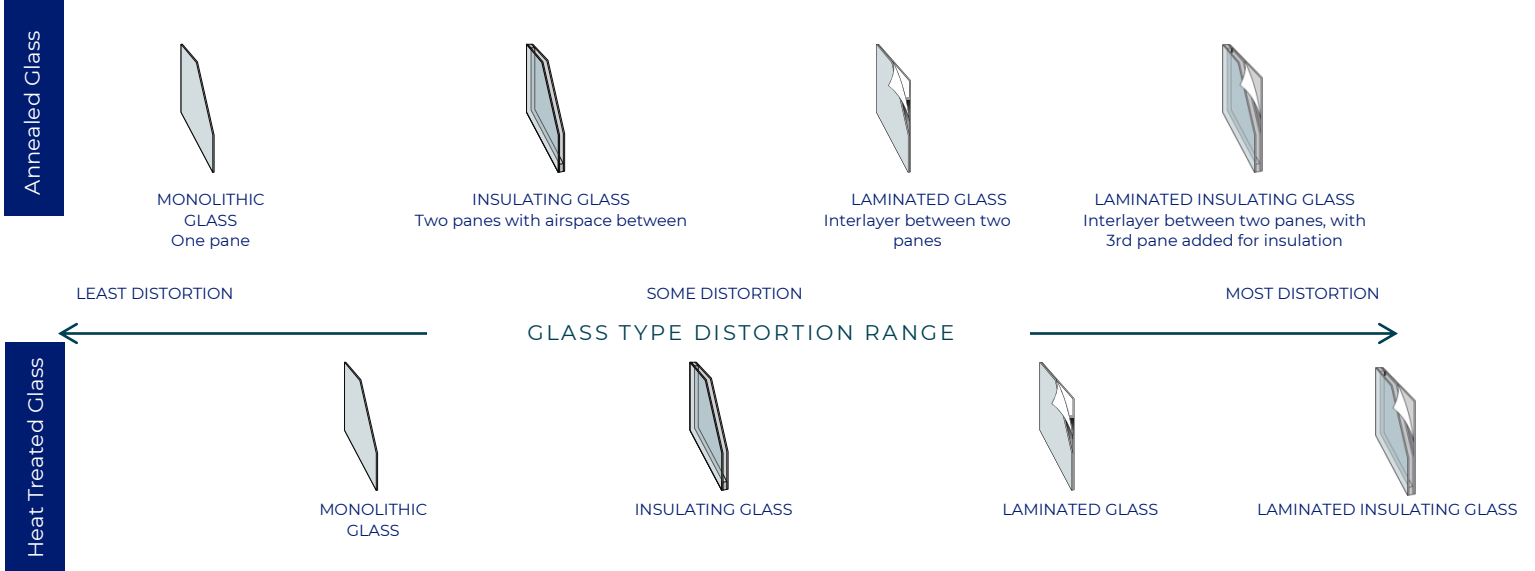
Constantly changing temperature fluctuations based on the time of day, season, and other environmental factors will also distort glass.

### GLOSSARY OF TERMS

Term	Definition
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 reheated to below melting point and cooled quickly; nearly two times stronger than annealed glass.
Insulated Glass Units	Window panes separated by an air- or 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 reheated 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.

# INTRODUCTION (continued)

## 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)

# BLEMISHES

## 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)



## BLEMISHES (continued)

### 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)		
	6 Square Feet or Less	6 - 25 Square Feet	Over 25 Square Feet	6 Square Feet or Less	6 - 25 Square Feet	Over 25 Square Feet
Linear	6 Feet Away		10 Feet Away	5 Seconds	10 Seconds	20 Seconds
Point	39 Inches Away		39 Inches Away	5 Seconds	10 Seconds	20 Seconds

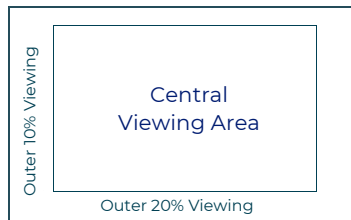
**How to Read:** If you are examining a potential linear blemish on a glass pane that is 25 sq. feet, you must stand 6 ft. away from the pane and view it for 10 seconds with uniform background.

### LOCATION OF BLEMISHES (CENTRAL AREA AND OUTER AREA)

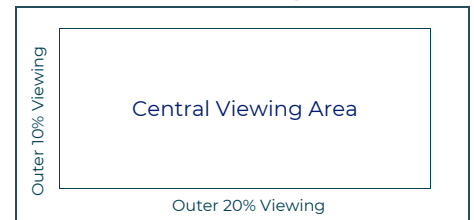
Blemishes are eligible for replacement based upon their location on the glass pane. Before you examine your glass, it is important to understand the two viewing areas for each pane/unit: central area and outer area. The central area is considered the section in the middle of the glass, and the outer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

Units 25 Sq. Feet or Less



Units Over 25 Sq. Feet



### 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	3/32 inch or less	1/16 inch or less	Any pane with a point blemish larger than 3/32 inch is <b>eligible</b> for replacement.	Any pane with a point blemish larger than 1/16 inch is <b>eligible</b> for replacement.
25 – 75 Square Feet	3/16 inch or less	1/8 inch or less	Any pane with a point blemish larger than 3/16 inch is <b>eligible</b> for replacement.	Any pane with a point blemish larger than 1/8 inch is <b>eligible</b> for replacement.
Over 75 Square Feet	1/4 inch or less	1/4 inch or less	Any pane with a point blemish larger than 1/4 inch is <b>eligible</b> 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 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 <b>eligible</b> 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 <b>eligible</b> for replacement.
Glass Size	+/- 1/16"	Any occurrence that exceeds this tolerance is <b>eligible</b> for replacement.
Glass Squareness*	1/8" or less	Any occurrence larger than 1/8" is <b>eligible</b> for replacement.
Glass Offset (misalignment of 2 or more lites of glass)	1/8" or less	Any occurrence larger than 1/8" is <b>eligible</b> for replacement.
Edge Deletion	3/8" to 7/16"	Any occurrence that exceeds this tolerance is <b>eligible</b> 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 1/8" - 1/4" and less than half the thickness	Chip width over 1/4" and less than half the thickness
Shell Chip	Any occurrence is <b>not eligible</b> for replacement.	If more than one chip per edge is visible, your glass is <b>eligible</b> for replacement.	Any occurrence is <b>eligible</b> for replacement.

# A Clear Look at Glass Breakage

A GUIDE FOR DEALERS



## 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.

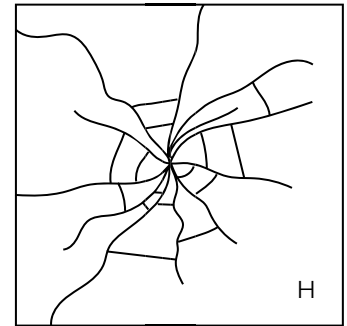
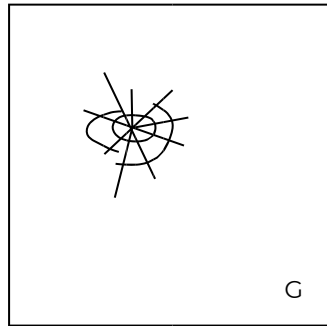
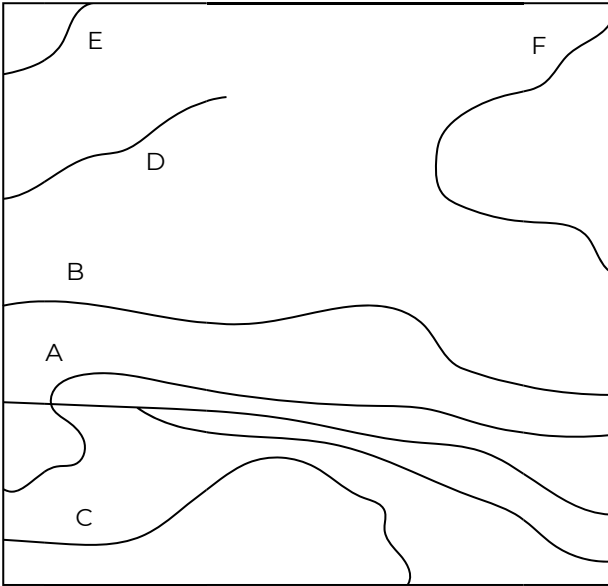


### IMPACT BREAK

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

# GLASS BREAKAGE (continued)

## STEP 2: DETERMINE IF YOUR GLASS IS ELIGIBLE FOR REPLACEMENT



Class Breakage Type	Specific Breakage Type (Refer to the Drawing Above for Examples)	Replacement Eligibility
Thermal Breaks	A – High-Stress Thermal Break	This break is <b>not eligible</b> for replacement.
	B – Low-Stress Thermal Break	This break is <b>not eligible</b> for replacement.
Bending Breaks	C – Low-Stress Bending Break	This break is <b>eligible</b> 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 <b>eligible</b> 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 <b>eligible</b> 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 <b>eligible</b> 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 <b>eligible</b> 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 <b>eligible</b> 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.

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