
GLASS GUIDE

Glass Breakage, Distortions &
Allowable Imperfections





ABOUT GLASS

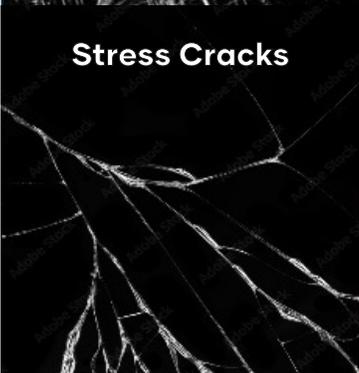
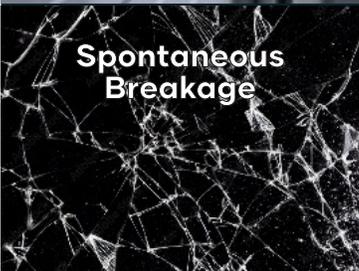
Glass is never perfect and the larger the unit, the more imperfections may become visible. The American Society for Testing and Materials International (ASTM) provides the industry standards for glass and categorizes the type, size, and testing method to determine whether imperfections are within industry tolerances. This Glass Guide is intended to provide a summary of ASTM glass standards and Awake's Limited Warranty in order to help dealers and consumers determine when glass distortions or imperfections are outside of accepted tolerances and qualify for replacement.



GLASS BREAKAGE

Although glass breakage is uncommon, there are many different types and causes. All types of glass breakage that occur during the manufacturing and shipping process are eligible for replacement if observed and reported to Awake within 48 hours of delivery. Glass breakage that occurs thereafter may result from a variety of factors outside of Awake's control, including subsequent impact or improper storage, handling, installation, use, or care. To understand these distinctions, it is important to first identify the different types and causes of glass breakage.

The below chart is intended to describe the various types of glass breaks, common causes, and whether they are eligible for replacement if first observed or reported after 48 hours from delivery.

TYPE OF BREAKAGE	DESCRIPTION	COMMON CAUSES	QUALIFIES FOR REPLACEMENT?
 <p>Impact Breakage</p>	<p>Produces a circular puncture or horizontal crack at the point of impact with cracks emanating outward. The size and severity of the puncture is dependent on the size and velocity of the object that struck the glass.</p>	<p>Objects impacting the glass at high velocity.</p>	<p>No</p>
 <p>Stress Cracks</p>	<p>Cracks that emanate from the edge of the glass and meander in various patterns across the pane. Unlike edge damage (described below) stress cracks typically appear in several units throughout the building, and follow a pattern depending on elevation, sun exposure, and window/door coverings.</p>	<p>Cracks are created to relieve stresses caused by extreme thermal changes. For more information, see Awake's Extreme Weather Guide.</p>	<p>No</p>
 <p>Edge Damage</p>	<p>Similar in appearance to stress cracks but emanates from a small chip (which can sometimes be buried in the frame seal).</p>	<p>Can be caused by damage to the glass edge during handling or installation or improper cleaning. For more information, see Awake's Care and Maintenance Guide.</p>	<p>No</p>
 <p>Spontaneous Breakage</p>	<p>Cracks or shatters across the entire glass pane.</p>	<p>Rare condition that is typically caused by external stress, pressure or edge damage due to improper storage or installation. For more information, see Awake's Care and Maintenance Guide.</p>	<p>No</p>



GLASS DISTORTION

Glass distortions can cause objects to appear irregular and out of focus when observed through the glass. Distortions can be caused by a variety of factors and conditions. Most commonly, distortions occur as a result of normal manufacturing processes to improve strength and safety, including the application of high heat and pressure. In addition, glass may be subjected to environmental conditions that can cause or exacerbate distortions, such as climate, extreme weather differentials, elevation and barometric pressure. How pronounced these conditions are may vary depending on the size and type of the glass, location of the glass within the building, and the distance the viewer is standing from the surface.

Types of Distortion

1. Temporary Bowing Or Warping

Temporary glass bowing or warping is often referred to as thermal expansion. This naturally occurring phenomenon can occur when direct sunlight hits a glass surface, causing a significant difference in temperature between the interior and exterior of the product. The extent to which bowing or warping may be visible depends on the duration and intensity of sun exposure and whether the door frame includes an additional insulating strip, referred to as the “thermal break”. The insulating strip reduces appearance of bowing or warping because it creates a barrier between inside and outside air and reduces the corresponding metal shrinkage and expansion that causes the warping effect.

Since thermal expansion is a temporary natural condition that occurs from natural expansion and retraction of frame materials and can be mitigated by thermally broken products or reducing sun exposure, it does not qualify for glass replacement.

However, there are rare circumstances where the glass itself permanently bows or warps. Some warping or bowing is an expected result of the glass production process and can be more pronounced the thinner the glass. ASTM C1048, describes the acceptable bowing tolerances for glass depending on its size and thickness.

2. **Roller Waves**

A roller wave is a common optical distortion that results from the glass sagging slightly during the heating and rapid cooling process of glass manufacturing. Although this process is required to improve the strength and safety of the glass, it creates a compression and tension in the glass thickness that can result in a slight inconsistency (often described as ripples or waves) in the appearance of the surface of the glass. Roller wave distortions are typically most prominent in thinner and large glass sizes, as smaller and thicker glass is able to remain flatter during the heating and cooling processes. Since roller waves are created by a necessary aspect of glass manufacturing, their appearance does not qualify the glass for replacement.

3. **Condensation**

Condensation or water accumulation on the exterior or interior glass surface can cause temporary glass distortion. However, this condition is a temporary natural occurrence resulting from significant differences in temperature between air inside and outside the building. Specifically, warm air can hold more water vapor than cool air. When warm air is cooled, it loses its ability to hold moisture and releases such moisture in the form of water particles. For example, in cold weather climates, condensation can occur when warm inside air comes into contact with cold glass surfaces (cooled by outside air). As the warm air cools, it loses its ability to hold moisture. The excess moisture condenses and water droplets or ice can be visible on the glass exterior. Based on this same process, water particles or ice can form on glass interiors if inside air is extremely humid. As humid air, which holds a lot of water vapor, comes into contact with cold surfaces (such as glass or stone countertops), it loses its ability to hold the moisture and droplets or frost form.

Since condensation is a temporary condition resulting from climatic conditions, the appearance of interior or exterior condensation does not qualify the glass for replacement. Furthermore, there are steps that can be taken to reduce the appearance of condensation. For more information, see Awake's Care and Maintenance Guide, available at www.awakewdc.com.

4. **Surface Residue**

Distortions may also result from substances placed on the glass, such as adhesives, cleaning products, or other tools used during shipping, storage, or installation. Glass distorted by surface residue does not qualify for replacement because residue can ordinarily be removed. For more information, see Awake's Care and Maintenance Guide.



ALLOWABLE GLASS IMPERFECTIONS

Glass may also contain minor imperfections or flaws, such as rub marks, abrasions, knots, bubbles, or pinholes (collectively, "Point Blemishes"), scratches (referred to as "Linear Blemishes") or chips. Such imperfections are inherent features of the glass material and except in the extreme circumstances described below, do not qualify the glass for replacement.

Point Blemishes



In order to qualify for replacement, the Point Blemish must: (1) exceed allowable tolerances (based on the size of the glass, size of the imperfection, and location of the imperfection); and (2) be visible when inspected in accordance with ASTM C1036 testing protocol.

Specifically, the below chart describes the allowable imperfection tolerances:

ASTM Allowable Tolerances

Glass Size	Location of Imperfection	Size of Imperfection
≤ 25 square feet	Central viewing area	Shall not exceed 3/32"
	Outer 20% viewing area	Shall not exceed 1/8"
≥ 25 square feet	Central viewing area	Shall not exceed 1/16"
	Outer 10% viewing area	Shall not exceed 3/32"

In accordance with the ASTM testing protocol, Point Blemishes must also be visible:

1. With 20/20 vision (naked eye or corrected);
2. while facing the glass straight on and positioned perpendicular to the glass surface;
3. during daylight, but not direct sunlight; and
4. from a distance of 39" away.

Glass may only be eligible for replacement if the Point Blemish exceeds the above tolerances (based on size and location) and is visible when inspected in accordance with the above ASTM testing protocol.

Linear Blemishes



Linear blemishes do not ordinarily qualify for replacement unless they exceed 3" in length, are heavy in intensity, are located in the center of the glass, and visible:

1. When inspected with 20/20 vision (naked eye or corrected);
2. While facing the glass straight on and positioned perpendicular to the glass surface;
3. During daylight, but not direct sunlight; and
4. Within 10 seconds of inspection from 6 feet away (if the glass is \leq 25 square feet); or
5. Within 20 seconds of inspection from 10 feet away (if the glass is \geq 25 square feet)

Chips



There are several different types of chips that may occur in glass and whether they are eligible for replacement depends on their type, size and location.

TYPE OF CHIP	DESCRIPTION
Shell Chip	Shell chips have a circular indentation in the glass edge as a result of breakage of a small fragment out of an otherwise regular surface.
V-Chip	V-chips are v-shaped imperfections in the edge of the glass.

Shell Chips do not qualify for replacement unless:

1. The depth is $\geq 25\%$ of glass thickness;
2. The width is $\geq 25\%$ of glass thickness or $1/16"$, whichever is greater; and
3. The length is ≥ 2 times the chip width.

V-chips may qualify for replacement if they are visible:

1. When inspected with 20/20 vision (naked eye or corrected);
2. While facing the glass straight on and positioned perpendicular to the glass surface;
3. During daylight, but not direct sunlight; and
4. Within 10 seconds of inspection from 6 feet away (if the glass is ≤ 25 square feet);
or
5. Within 20 seconds of inspection from 10 feet away (if the glass is ≥ 25 square feet).



SAFETY GUIDELINES & WARNINGS



Broken, cracked or shattered glass can cause significant injury or death and should only be handled or removed by an experienced construction professional utilizing appropriate protective equipment (including, but not limited to, gloves, shields, and eye protection) and safe moving techniques). For more information and warnings, see Awake's Care and Maintenance Guide.



GET IN TOUCH

**435 E GERMANN RD SUITE 104
GILBERT, AZ 85297**

www.awakewdc.com
(833) 292-5393