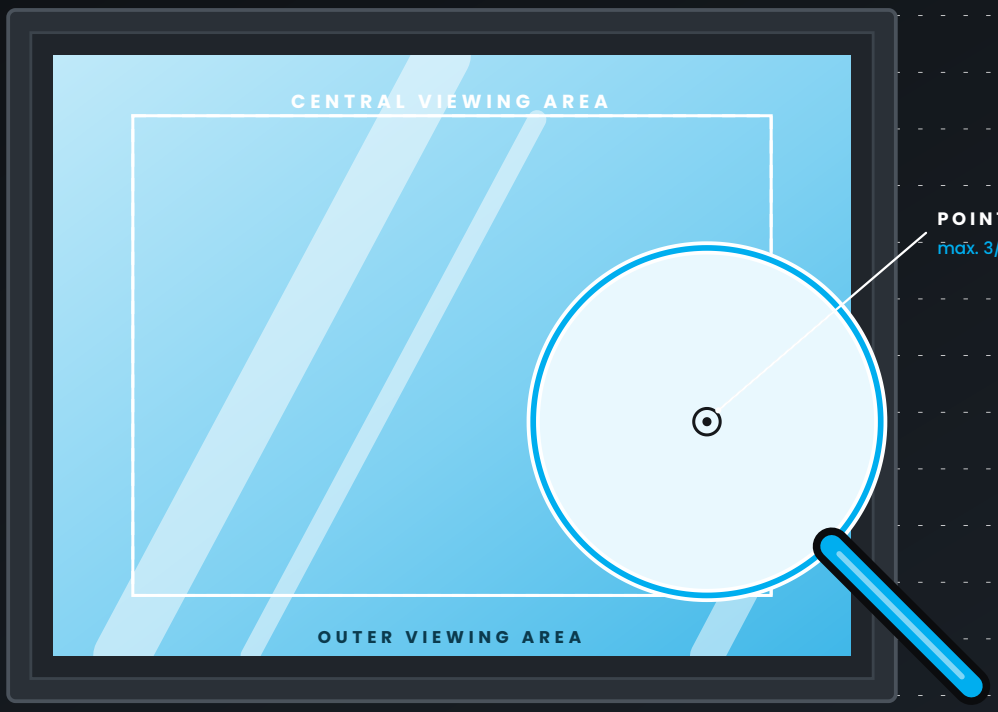
OPTVUE™




# GLASS GUIDE

BREAKAGE · DISTORTION · ALLOWABLE IMPERFECTIONS

WWW.OPTVUE.COM (760) 760-0110 OCEANSIDE, CALIFORNIA

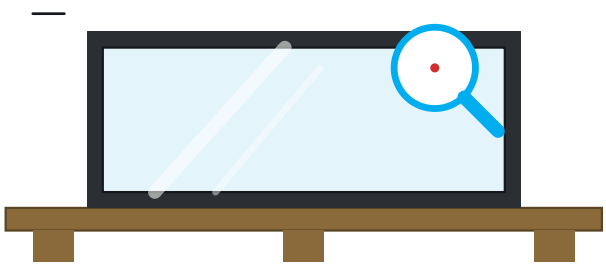
# ABOUT GLASS

## HOW TO READ THIS GUIDE

Glass is never perfect, and the larger the unit, the more imperfections may become visible. ASTM International (formerly the American Society for Testing and Materials) sets the industry standards for glass and classifies the type, size and test method used to decide whether an imperfection is within industry tolerances.

This Glass Guide summarizes the ASTM glass standards and the OPTVUE Limited Warranty to help dealers, installers and homeowners decide when a glass distortion or imperfection is outside accepted tolerances and qualifies for replacement.

## INSPECT AT DELIVERY



Inspect on the truck / at ground level, before installing

- Inspect every unit at ground level when it is delivered, **before** it is installed.
- Glass breakage or damage from manufacturing or shipping must be noted and reported to OPTVUE at delivery, before installation, to qualify for replacement.
- If you find a defect, **stop** – do not install the unit. Contact OPTVUE.
- Once a unit is installed, glass breakage and visible damage are not OPTVUE's responsibility.

## GLASS WARRANTY SUMMARY

| | |
|---|---|
| **5 years** | OPTVUE glass warranty, starting on the delivery date. |
| **Over 50 sq ft** | No glass warranty on a single piece of glass over 50 sq ft unless the additional extended warranty is purchased. |
| **Not covered** | Breakage or damage not reported at delivery, and the natural conditions described in this guide (thermal bowing, roller waves, condensation, residue). |

This is a summary. The OPTVUE Limited Warranty sets the full terms: **www.optvue.com/warranty**

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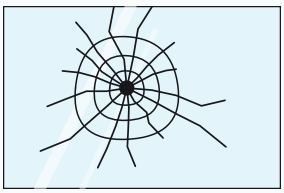
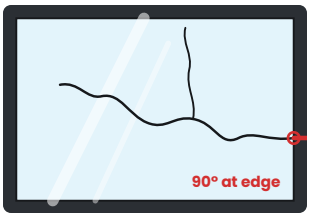
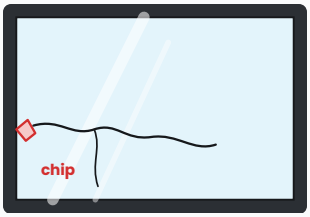
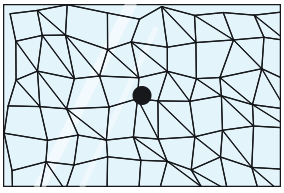
# GLASS BREAKAGE

## TYPES, CAUSES AND REPLACEMENT

Although glass breakage is uncommon, there are many different types and causes. Breakage that occurs during manufacturing or shipping is eligible for replacement when it is observed and reported to OPTVUE at delivery, before the unit is installed. Breakage that occurs after that may result from many factors outside OPTVUE's control, including later impact or improper storage, handling, installation, use or care. To understand these differences, first identify the type and cause of the break.

The chart below describes the types of glass breakage, their common causes, and whether they qualify for replacement when first observed or reported **after delivery**.

| TYPE OF BREAKAGE | DESCRIPTION | COMMON CAUSES | QUALIFIES FOR REPLACEMENT? |
|---|---|---|---|
|  **Impact breakage** | A circular puncture or horizontal crack at the point of impact, with cracks radiating outward. The size and severity depend on the size and speed of the object that struck the glass. | Objects striking the glass at high speed. | **No** |
|  **Stress cracks** | Cracks that start at the edge of the glass, usually at 90° to the edge, and wander across the pane. Unlike edge damage (below), stress cracks often appear in several units throughout a building and follow a pattern based on elevation, sun exposure and window coverings. | Stress from extreme temperature differences across the glass. | **No** |
|  **Edge damage** | Similar in appearance to a stress crack, but starts from a small chip in the glass edge (which may be hidden in the frame seal). | Damage to the glass edge during handling or installation, or improper cleaning. | **No** |
|  **Spontaneous breakage** | The entire pane cracks or shatters. | A rare condition usually caused by outside stress, pressure, or edge damage from improper storage or installation. | **No** |

**CARE & MAINTENANCE**
For cleaning, storage and care instructions that help prevent edge damage and breakage, visit **www.optvue.com/care**.

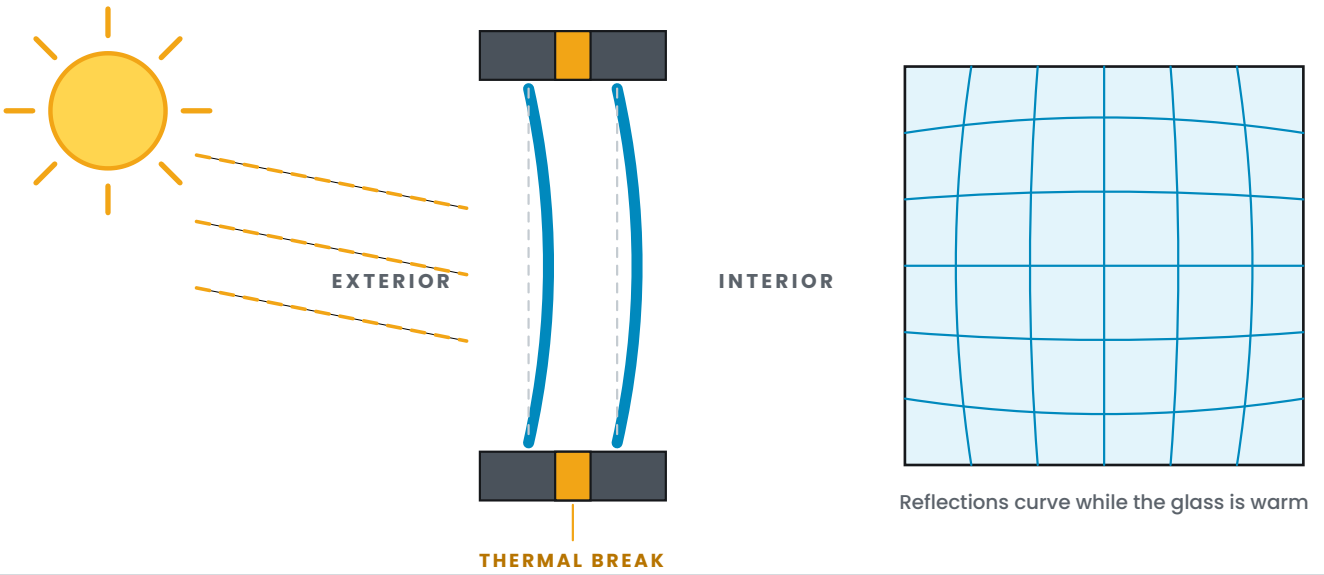
# GLASS DISTORTION

## WHY OBJECTS CAN LOOK UNEVEN THROUGH GLASS

Glass distortion can make objects seen through the glass look uneven or out of focus. Distortion has several causes. Most often it is the result of normal manufacturing processes that make the glass stronger and safer, including high heat and pressure. Glass can also be affected by conditions that cause or increase distortion, such as climate, large temperature differences, elevation and barometric pressure. How noticeable these effects are depends on the size and type of the glass, where it is in the building, and how far the viewer is standing from it.

## TYPES OF DISTORTION

### 1 Temporary bowing or warping

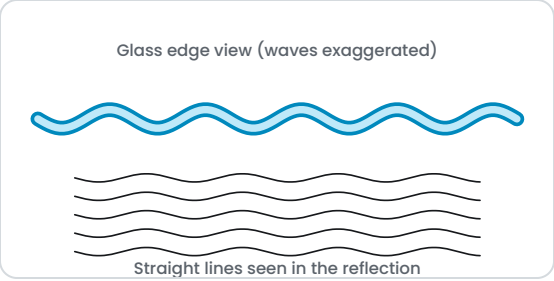



Temporary glass bowing or warping is often called thermal expansion. It is a natural effect that can occur when direct sunlight heats the glass, creating a large temperature difference between the interior and exterior of the unit. How visible it is depends on how long and how strongly the sun hits the glass, and on whether the frame has an insulating strip called a thermal break. The thermal break reduces bowing and warping because it separates inside and outside air and reduces the metal shrinkage and expansion that cause the effect.

Because thermal expansion is temporary, comes from the natural expansion and contraction of frame materials, and can be reduced by thermally broken products or less sun exposure, it does not qualify for glass replacement.

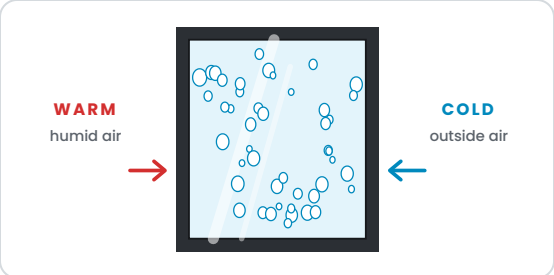
In rare cases the glass itself permanently bows or warps. Some bowing or warping is an expected result of glass production and can be more noticeable in thinner glass. ASTM C1048 sets the allowable bow tolerances for glass based on its size and thickness.

**PERMANENT BOW**
Check suspected permanent bow on a cool, overcast day or early morning. Bowing that disappears when the glass cools is thermal expansion, not a defect.




## 2 Roller waves

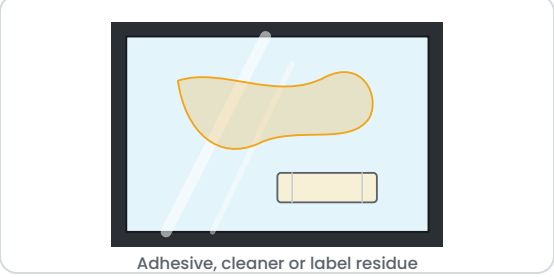
A roller wave is a common optical distortion caused by the glass sagging slightly while it is heated and rapidly cooled during manufacturing. This process makes the glass stronger and safer, but it also leaves compression and tension in the glass that can show as slight ripples or waves on the surface. Roller waves are usually most noticeable in thin, large glass, because smaller and thicker glass stays flatter while it is heated and cooled. Because roller waves come from a necessary part of glass manufacturing, they do not qualify the glass for replacement.




## 3 Condensation

Water collecting on the interior or exterior glass surface can cause temporary distortion. It is a natural, temporary condition caused by a large temperature difference between the air inside and outside the building. Warm air holds more water vapor than cool air; when warm air is cooled, it releases that moisture as water droplets. In cold climates, condensation forms when warm inside air touches glass cooled by the outside air, and droplets or frost can appear. The same thing can happen inside when the indoor air is very humid and touches cold surfaces such as glass or stone countertops.

Because condensation is a temporary result of climate conditions, interior or exterior condensation does not qualify the glass for replacement. There are steps that reduce condensation – see **www.optvue.com/care**.




## 4 Surface residue

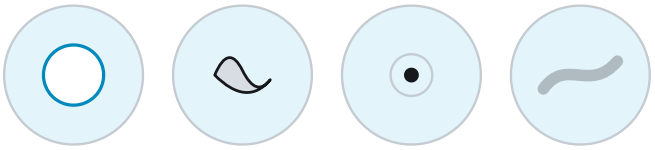
Distortion can also come from substances on the glass, such as adhesives, cleaning products, or materials used during shipping, storage or installation. Glass distorted by surface residue does not qualify for replacement, because residue can normally be removed. See **www.optvue.com/care**.

# ALLOWABLE GLASS IMPERFECTIONS

ASTM C1036

Glass may contain minor imperfections such as rub marks, abrasions, knots, bubbles or pinholes (together called “point blemishes”), scratches (“linear blemishes”) or chips. These are natural features of glass and, except in the cases described below, do not qualify the glass for replacement.

## POINT BLEMISHES

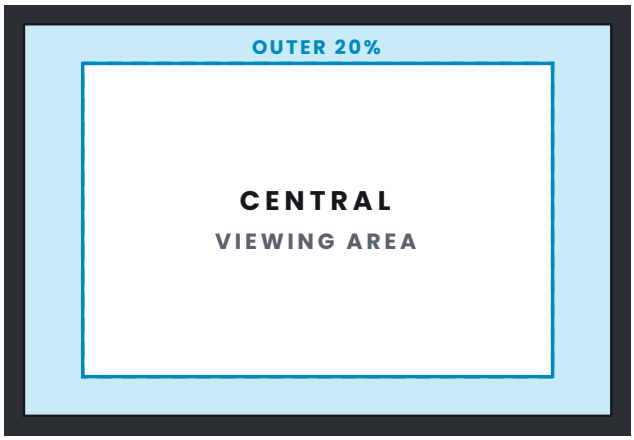


**Bubble** **Knot** **Pinhole** **Rub mark**

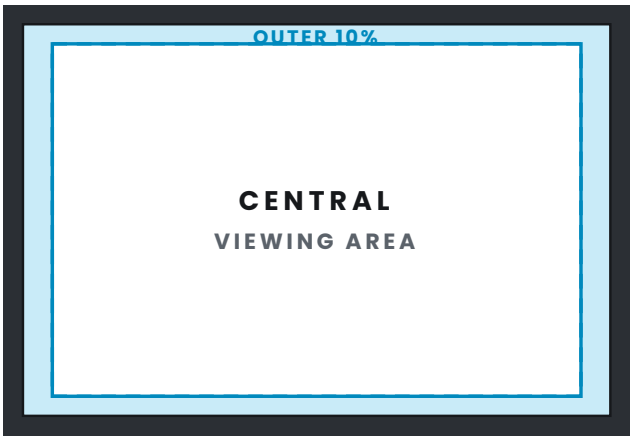
To qualify for replacement, a point blemish must (1) be larger than the allowable tolerance, based on the size of the glass, the size of the blemish and where it is; **and** (2) be visible when inspected using the ASTM C1036 method on the next page.

### ASTM allowable tolerances

| GLASS SIZE | LOCATION OF IMPERFECTION | SIZE OF IMPERFECTION |
|---|---|---|
| **25 sq ft or less** | Central viewing area | Must not exceed 3/32" |
| | Outer 20% viewing area | Must not exceed 1/8" |
| **Over 25 sq ft** | Central viewing area | Must not exceed 1/16" |
| | Outer 10% viewing area | Must not exceed 3/32" |

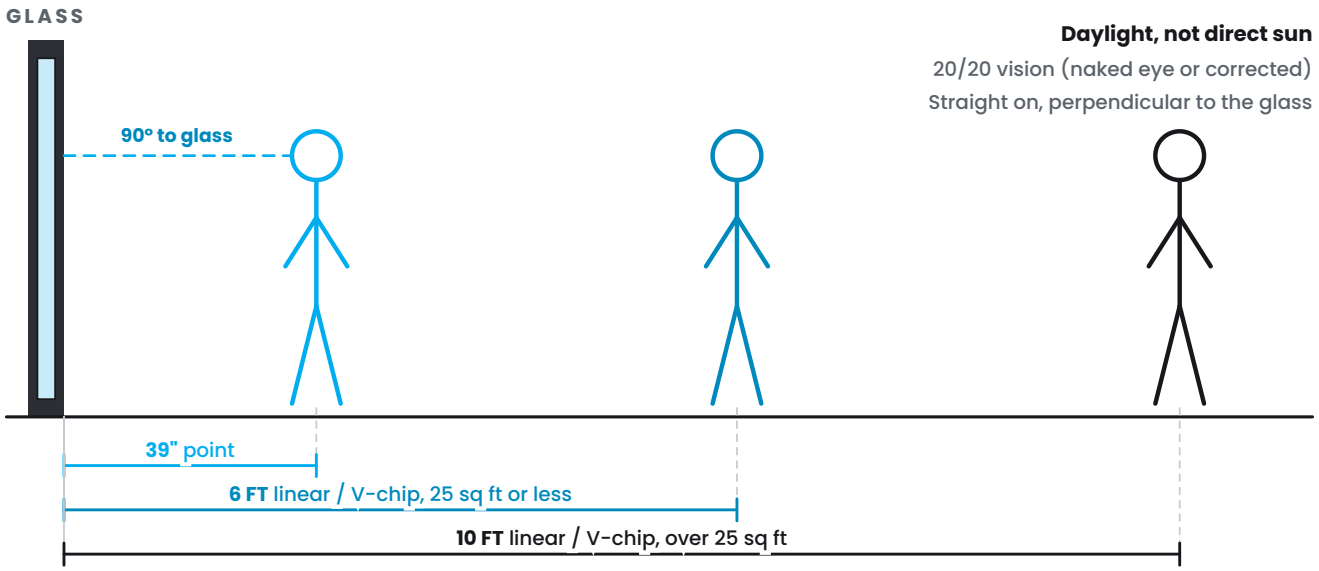



**Glass 25 sq ft or less**




**Glass over 25 sq ft**

## HOW GLASS IS INSPECTED (ASTM C1036)

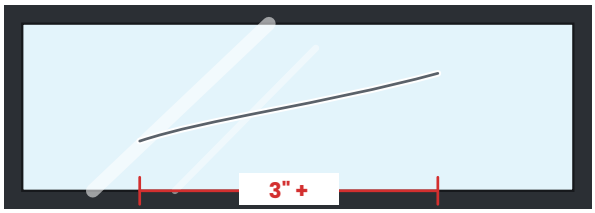



**Point blemishes must also be visible:**

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

Glass is eligible for replacement only if the point blemish is larger than the tolerances on the previous page (based on size and location) **and** is visible when inspected this way.

**Linear blemishes (scratches)**




Linear blemishes do not normally qualify unless they are longer than 3", heavy in intensity, in the center of the glass, and visible:

1. with 20/20 vision (naked eye or corrected);
2. while facing the glass straight on, perpendicular to the glass surface;
3. in daylight, but not direct sunlight; and
4. within 10 seconds from 6 feet away (glass 25 sq ft or less); or
5. within 20 seconds from 10 feet away (glass over 25 sq ft).

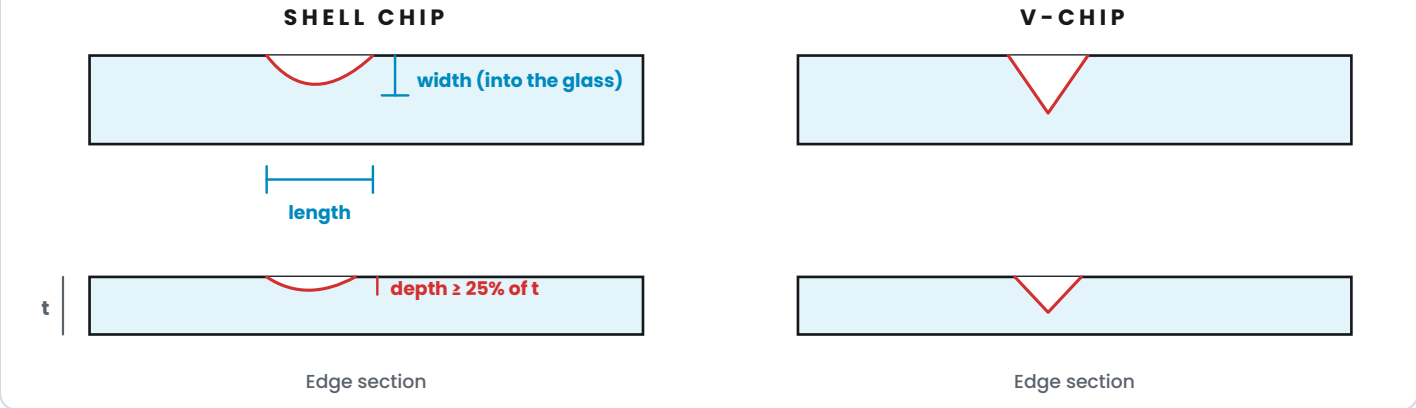
**REPORTING A GLASS CONCERN**

Email **info@optvue.com** with your order or reference number, the window location, and photos of the glass taken straight on (perpendicular) from the inspection distance shown above, in daylight.

# CHIPS

## SHELL CHIPS AND V-CHIPS

Several types of chips can occur in glass. Whether a chip qualifies for replacement depends on its type, size and location.




| TYPE OF CHIP | DESCRIPTION |
|---|---|
| **Shell chip** | A curved, shell-shaped scoop in the glass edge, where a small piece has broken out of an otherwise smooth surface. |
| **V-chip** | A V-shaped notch in the edge of the glass. |

**Shell chips do not qualify for replacement unless:**

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

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

1. with 20/20 vision (naked eye or corrected);
2. while facing the glass straight on, perpendicular to the glass surface;
3. in daylight, but not direct sunlight; and
4. within 10 seconds from 6 feet away (glass 25 sq ft or less); or
5. within 20 seconds from 10 feet away (glass over 25 sq ft).

## SAFETY GUIDELINES & WARNINGS

**WARNING**
Broken, cracked or shattered glass can cause serious injury or death. It should only be handled or removed by an experienced construction professional using the right protective equipment (including gloves, face shields and eye protection) and safe lifting and moving methods. For more information, see **www.optvue.com/care**.

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GET IN TOUCH

# GLASS GUIDE

## QUESTIONS ABOUT YOUR GLASS?

Have your order or reference number ready and, if possible, photos of the glass taken straight on and from the distance described in this guide. Report any glass breakage or damage at delivery, before installation.

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