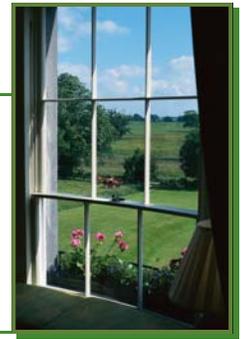




EXAMINING GLASS IMPERFECTIONS



Strict requirements are followed in order to maintain that our glass is free of blemishes and imperfections. The requirements that Quaker uses in house are actual tighter than U.S. Federal Government specifications.

Nonetheless, even the finest quality glass can contain minor imperfections and even though these imperfections may be bothersome, they may not impair the view or reduce the serviceability of the glass.

When inspecting windows where visual imperfections have been reported, it is important to remember that glass in windows & doors is intended to be *looked through...not at*.

The following quality standards are offered as suggested guidelines for the evaluation of clear and coated glass products, based on glass industry standards.

Where to Begin

First, identify the type of glass you're viewing. The three most common are Clear, Low-E/Tinted or Spandrel. The type of glass you have will determine the testing inspection process and the available tolerances.

Next, conduct a standard viewing test. Focus on the area of most importance which is the central viewing area. This is defined as 80% of the glass length and 80% of the glass width centered on a lite of glass. The remaining area is considered the outer area.

View as follows:

FOR CLEAR GLASS:

- 1) The glass must be viewed from the **INSIDE** of the home, looking **OUTSIDE**.
- 2) Look from a distance of ten (10) feet.
- 3) The viewing angle should be 90° against a bright, uniform background.

FOR LOW-E & TINTED GLASS:

- 1) The glass must be viewed from the **OUTSIDE** of the structure, looking **INTO** the home.
- 2) View from a distance of ten (10) feet.
- 3) Make sure you're viewing it in ideal lighting for this type of glass. Weather conditions must be sunny, not cloudy. But there should be no direct sun on the glass.

FOR SPANDREL GLASS:

- 1) The glass must be viewed from the **INSIDE** of the home, looking **OUTSIDE**.
- 2) Observe from a distance of fifteen (15) feet.
- 3) The viewing angle should be 90° against a dark, uniform background.

Label the Imperfections

After conducting your viewing test, place the imperfection into one of two categories: ACCEPTABLE or REJECT.

Instances that are considered ACCEPTABLE:

- Scratches 50 mm or less (approx. 2") within the central viewing area. For spandrel glass, scratches up to 75 mm (approx. 3") are acceptable.
- Slightly different hues, colors or reflectivity on tinted/coated glass
- Pinholes up to 1.5 mm (approx. 1/16")
- A cluster of pinholes (2 or more pinholes in a 3" diameter) outside of the central viewing area.

Instances that are considered REJECT:

- Scratches more than 50 mm (approx. 2") within the central viewing area. For spandrel glass, scratches more than 75 mm (approx. 3").
- Visibly pronounced difference in hues, colors or reflectivity on tinted/coated glass
- Pinholes larger than 3 mm (approx. 1/8")
- A cluster of pinholes (2 or more pinholes in a 3" diameter) found amid the central viewing area.

Understand that while the imperfection may be visible at distances less than the viewing distances listed, the window or door should be labeled "REJECT" only if the imperfection

- a) can be observed from more than distance listed,
- b) and it can be observed at all hours of the day.

Special Notes

Imperfection rules must take into consideration the size of the unit. Larger windows and doors (30 sq. ft. and above) obviously have larger glass plates, thus there is a greater probability of imperfections on the glass surface. These additional prospects also occur with geometrically shaped windows and doors because of the intricacies involved in making them.

Scratches and pinholes should always be reviewed looking through the glass.

Colors, hues, tints and spandrel glass should always be viewed in the reflection. Due to the reflectivity of some glass coatings, distortion may be more distinct with heat-treated, tempered and laminated glass.

Heat strengthened and tempered glass may contain surface waves caused by contact with the ceramic rollers inside the furnace. This distortion is most visible when viewing reflected images from a distance. Roller distortion is inherent in the heat treating process and is not considered a defect. Another common characteristic of heat treated glass is strain pattern or iridescence. This strain pattern is most visible under certain lighting conditions and when viewed at an acute angle. Strain pattern is inherent in the heat treating process and is not considered a defect.

According to www.ASTM.org, heat strengthened and tempered glass is permitted to contain a slight amount of bowing and warping based on the size of the unit. ASTM C 1048 allows the following tolerances.

		United Inch of the Finished Lite				
		20" to 35"	35" to 47"	47" to 59"	59" to 71"	71" to 83"
Glass Thickness	1/8" & 3/16"	.16	.20	.28	.35	.47
	1/4"	.12	.16	.20	.28	.35
		83" to 94"	94" to 106"	106" to 118"	118" to 130"	130" to 146"
Glass Thickness	1/8" & 3/16"	.55	.67	.75	n/a	n/a
	1/4"	.47	.55	.67	.75	.83

If There is an Imperfection

Report any imperfection by using Quaker's Service Request form available from your manufacturer's representative or Quaker's Service Department.

You can request a Service Request form by sending an email to service@quakerwindows.com or calling 573-744-5211.

Credits:

Guardian Sunguard Glass - Technical Guidelines; www.ASTM.org; ASTM Int'l - Designation C1048-04; US Glass Magazine - "Tempered Glass Is Always Perfect...Except When It Isn't"