



GLASS QUALITY STANDARDS

PRODUCT STANDARDS

Window Mart®'s product standards are based on the following ASTM documents. Complete versions of these documents are subject to copyright and may only be obtained directly from ASTM (www.astm.org).

ASTM C-1036 – Standard Specification for Flat Glass

ASTM C-1048 – Standard Specification for Heat Strengthened and Fully Tempered Flat Glass

ASTM C-1172 – Standard Specification for Laminated Architectural Flat Glass

ASTM C-1376 – Standard Specification for Pyrolytic and Vacuum Deposition Coatings on Flat Glass

INTRODUCTION

High-precision automated machinery allows Window Mart®'s glass suppliers to maintain a strong balance between artisanal quality and computer-controlled speed of production. It should be noted, however, that the fabrication processes used to create Window Mart®'s glass products often subject the glass to high temperatures, pressures, and sometimes a significant amount of handling between each process. While these processes are necessary to afford our glass products with additional strength, safety, or efficiency, they can be known to cause slight flaws in the surface of the glass that may be visible should the glass be overly scrutinized.

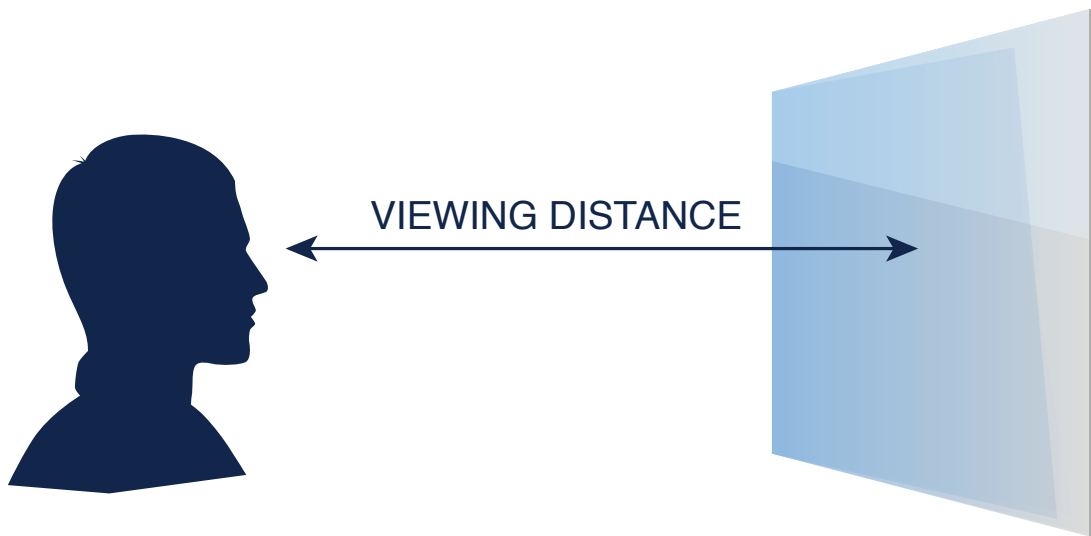
The above ASTM standards have been created to define official viewing conditions that determine the acceptable limits of these flaws, optically and aesthetically. These standards also address safety concerns, rejecting any such flaw that may cause the glass to break or fail.

All of Window Mart®'s glass quality and production standards are designed to meet or exceed those set forth by ASTM and in most cases are above the industry standard.

BLEMISHES IN MONOLITHIC FLAT GLASS

A blemish is an imperfection in the body or on the surface of the glass. Linear blemishes include scratches, rubs, and digs and may be straight or curved in nature. Point blemishes include crush (light pitting), knots (lumps), dirt, stones and gaseous inclusions (cat eye).

All visual blemish inspections shall be made with the naked eye viewing samples in the vertical position at a viewing angle of 90° to the specimen using daylight (without direct sunlight) or other uniform diffused background lighting that simulates daylight (minimum 1700 lux measured at the center of the glass).



LINEAR BLEMISH intensity shall be determined by detection distance. Detection distance is obtained viewing the specimen from a distance of 11ft (3.3m) and progressing sequentially in, noting the distance at which the blemish is detected. Use the table on the following page to categorize a blemish and determine its acceptability.

DETECTION DISTANCE	BLEMISH INTENSITY
132in (3.3m)	HEAVY
39in (1m)	MEDIUM
8in (.2m)	LIGHT
< 8in (.2m)	FAINT

Table 2: detection distance vs. blemish intensity

The following line blemishes are **NOT ALLOWED**:

- Multiple medium blemishes < 3 in that are within 24 in of each other
- Medium blemishes > 3 in
- Heavy blemishes

POINT BLEMISHES shall be viewed from a distance of **39in (1m)**. Point blemish size shall be determined by measuring the max length and max perpendicular width of the blemish and averaging the two dimensions.

The following point blemishes are **NOT ALLOWED**:

- Multiple blemishes $\geq 0.05\text{in} < 0.06\text{in}$ within 24in* of each other
- Multiple blemishes $\geq 0.06\text{in} < 0.08\text{in}$ within 24in* of each other
- Blemishes $\geq 0.08\text{in}$

*Separation distances are specified for $\leq 1/4$ " thick glass. Thicker glass may contain proportionally larger blemishes for the same 24in separation distance. Blemishes in size ranges that are allowed without separation distance criteria shall not be compared with those that have separation criteria. See applicable ASTM standard for pattern glass products.

REFLECTIVE OR LOW-E COATED GLASS

COATING BLEMISHES:

The glass shall be inspected, in transmission (see figure 1), at a distance of 11ft (3.3m) at a viewing angle of 90° to the specimen against a bright uniform background. If a blemish is readily apparent under these viewing conditions, the following criteria are **NOT ALLOWED**:

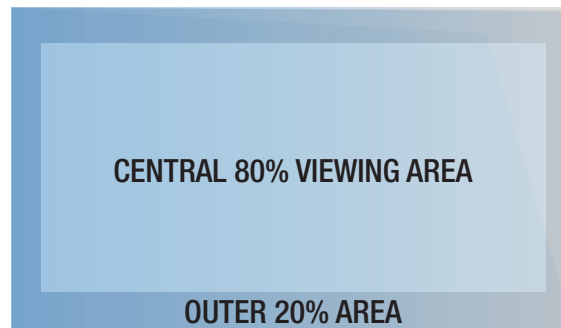


Figure 2: viewing area

- Pinholes > 1/16” in diameter in the central 80% of the viewing area
- Pinholes > 3/32” in diameter in the outer 20% of the glass area
- More than 2 readily apparent blemishes w/in a 3” diameter circle
- More than 5 readily apparent blemishes w/in a 12” diameter circle
- Scratches > 2” in the central 80% viewing area
- Scratches > 3” in the outer 20% viewing area
- Concentrated scratches or abraded areas

COATING UNIFORMITY AND COLOR VARIATION:

Visual observations of color differences on the exterior of a building are subjective and vary from person to person. Perceived color variation can be the result of lighting conditions (both internal and external), distance and angle of observation, and the surrounding area.

Window Mart®’s glass products conform to industry color standards. Variations in color and uniformity from one unit to another may occur and are not cause for rejection. Disparities in coloring could be the result of slight variations in the float glass substrate or normal production variations.

DISTORTION IN INSULATED UNITS:

Sealed insulating glass units, regardless of the glass type, exhibit distortion. Air or other gas, sealed in the gap between the lites of glass, expands or contracts with temperature and barometric changes, creating a pressure differential between the sealed gap and the atmosphere. The glass reacts to the pressure differential by being deflected inward or outward.

When inspecting for color uniformity and distortion, glass should be viewed as installed from the exterior at a distance of 11ft (3.3m) at a viewing angle of 90° to the installation with standard day lighting in front of the glass (see figure 3).

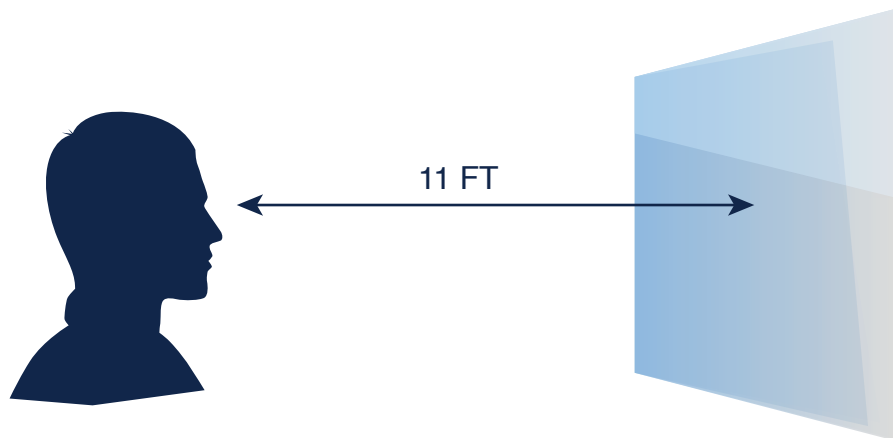


Figure 3: viewing color uniformity and distortion