Technical Bulletin

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WINDOW AND DOOR INSULATED GLASS CHARACTERISTICS

At MI Windows and Doors, we strive to bring the highest-quality products to our customers. We follow industry guidelines on glass that are set by ASTM (American Society for Testing and Materials), IGMA (Insulated Glass Manufacturer's Alliance) and AAMA (American Architectural Manufacturer's Association.) There are characteristics of glass that arise during the manufacture of the flat glass and in the process of making insulated glass units. These may appear as small blemishes or marks. The purpose of this document is to outline MI's criteria to determine if a product exhibiting these characteristics is acceptable or whether it merits consideration for replacement. MI Windows has developed specifications that are, in many cases, more demanding than those set by ASTM for our industry.

Window insulated glass quality is governed by:
ASTM C1036: *Standard Specification for Flat Glass,* ***ASTM C1048:*** *Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass,* ***ASTM C1172:*** *Standard Specification for Laminated Architectural Flat Glass,* ***ASTM C1376:*** *Standard Specification for Pyrolytic and Vacuum Deposition Coatings on Flat Glass,* ***ASTM E2190****: Standard Specification for Insulating Glass Unit Performance and Evaluation,* ***IGMA TM-3100****: Voluntary Guidelines for the Identification of Visual Obstructions in the Airspace of Insulating Glass Units*

INSPECTION CRITERIA

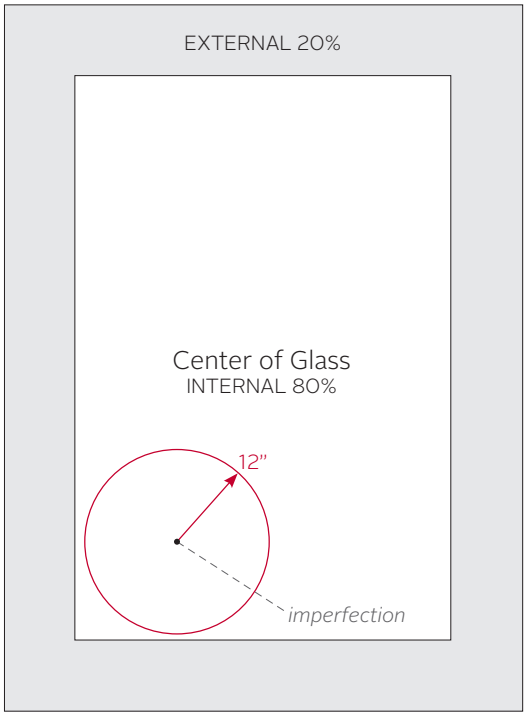
GLASS & GLASS COATINGS	
Scratches	Are allowed up to ½" in the center area and ¾" within 6" of the perimeter. Only one is allowed in each area of the glass, and they must be separated by at least 12". For glass measuring 48" x 48" and larger, a scratch up to 1" is allowed in center area and up to 2" is allowed within 6" of the perimeter.
Digs	A dig is a deep, short scratch. Only one is allowed with a maximum length of ¾" within 6 inches of the perimeter.
Corrosion/Rubs	A rub is a shallow abrasion that is cloudy. None are allowed. No corrosion (deterioration of the surface of the glass) is allowed.
Fisheye & Dirt/Stones	May not exceed 1/16" in diameter. Two are allowed if they are within 6" of the perimeter and they are separated by at least 24".
Edge quality	Should be perpendicular to the face of the glass and smooth in appearance, with nothing more than light shark teeth or serration hackles.
Distortion	Distortion is defined as localized deviation in flatness that can take on the appearance of ripples across the glass or pockets of indentations. Distortion is allowed and is typically found in tempered glass. It is not measurable in the field.
Bow	1/16" per lineal foot is allowed for all tempered glass.
Glass thickness	Follows ASTM C 1048 standards.
INSULATED GLASS UNIT (IGU)	
Lint, hair, debris	No more than one hair, hair-like fiber, or piece of debris which is not to exceed 1/16" in length on the internal 80%, and not exceed 3/32" on the external 20%.
Fingerprints and smudges	May not exceed ¼" in diameter. Two are allowed if they're within 1" of the perimeter.
Water spots	One is allowed up to 1/16" in diameter within 6" of the perimeter.
Chips, dirt, scratches, scuffs	None are allowed on the side facing the interior. One is allowed on the exterior side as long as it does not exceed 1/16" in diameter. No scratch with metal exposed is allowed on the interior. Scratch up to ¼" allowed on the exterior. Scratch up to ½" without metal exposed is allowed on the interior and exterior.
Spacer visibility	The spacer shall maintain straight vertical and horizontal lines, with no more than 1/16" exposure on either side of a corner once the unit is installed in a sash or frame.
GRIDS	
Split seams	May not exceed 1/32" in width and may not extend past 1" from either end.
Alignment	May be 1/16" off in vertical or horizontal alignment, but not both. If 2 units in the same window have misalignment in the opposite direction, total misalignment shall not exceed ⅛".
Intersections	Shall be flush-fit, with the appearance of nothing more than a black "hair-like" line not to exceed 1/32".
Clip attachment	The clip-insert shall not be exposed more than 1/16" from the end of the grid bar.
Grid orientation	The horizontal flat grid bar shall be continuous when viewing from the interior.
LAMINATED GLASS	
Bubbles	No more than one bubble, which is not to exceed 3/32" in length on the internal 80%, and not exceed ⅛" on the external 20%.
Lint, hair, debris	No more than one hair, hair-like fiber, or piece of debris which is not to exceed 1/16" in length on the internal 80%, and not exceed 3/32" on the external 20%.
Blow-in	One blow-in (recessed interlayer at the edge) is allowed up to ¼" in diameter within the external 20%.

Refer to page 2 for inspection method details

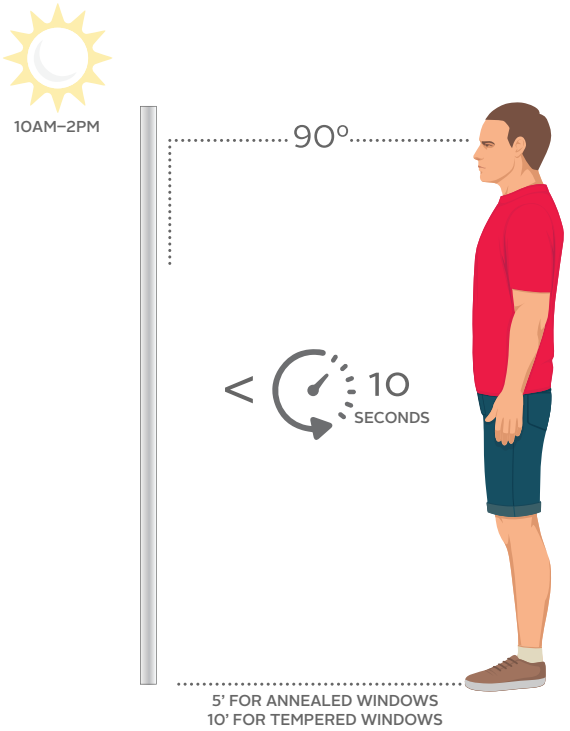
BOW AND ROLLER WAVE TEST: Reject product if roller wave or bow are beyond tolerance below.
Roller Wave: .130 mm or .0050 in

BOW/WARPAGE TOLERANCES			
	GLASS THICKNESS		
GLASS LENGTH	**1/8" - 5/32"**	**3/16" - 1/4"**	**3/8" - 3/4"**
0 - 18"	1/16"	1/16"	1/16"
18" - 36"	1/8"	1/8"	1/16"
36" - 48"	1/8"	1/8"	1/8"
48" - 60"	3/16"	3/16"	1/8"
60-" - 72"	1/4"	3/16"	1/8"
72" - 84"	5/16"	1/4"	1/8"
84" - 96"	3/8"	3/8"	1/8"
96" - 108"	1/2"	7/16"	3/16"
108" - 120"	*	1/2"	3/16"
120" - 132:	*	1/2"	3/16"
132" - 144"	*	9/16"	1/4"

*NOTE: Flatness won't be guaranteed on oversized lites.



Refer to page 1 for rules regarding shaded perimeter area



Reference illustration of proper examination

Inspection Methods

- Begin the inspection by cleaning the glass using an MI-approved cleaning product.
  Visit www.miwindows.com/docs/default-source/maintenance for recommended cleaning information.
- Always perform inspection in natural light—but not direct light.
- Stand five feet away if examining annealed or coated glass and ten feet away for laminated or tempered glass.
  Look for stamp in one of the four corners of your glass to determine if it is laminated or tempered
- Stand 90 degrees square to the plane of the glass.
- Examine the surface for no more than 10 seconds.
- If there are any readily apparent defects, try to clean the surface again to ensure that they cannot be removed.

For more information on industry standards, please visit www.aamanet.org/pages/glass-inspection-for-the-homeowner.