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Mirror Specifications

• Purpose & Scope

This specification defines the quality and performance criteria for a thin film; front surface mirror coated product on glass substrates for use with large optical display systems such as projection televisions.

• Applicable Documents

The following documents form a part of this specification to the extent specified herein:

OCIL Spec 6600007 Clear Float Glass Thickness from 1.9 mm to 10.0 mm

MIL Spec:

From the "Environmental Test Procedures Manual 9020003"

8510001B Constant Humidity Test

8510002E Scotch Tape Adhesion Test

8510003C Salt Spray Tests, MIL-STD-810C, MIL-C-675A

8510011A Cheesecloth Rub Durability (Coating Hardness)

• Equipment, Materials, and Supplies

Poly-film America PF 11RC Protective Tape, Pink

• Responsibilities

None.

• Definitions

Front Surface Mirror

Clear glass substrate vacuum coated on one surface, designed as the front side, with a thin film high reflecting mirror coating.

Clear Aperture

All surface area of the mirror except for a one-inch border around the entire perimeter of the stock sheet.

Un-terminated Fracture

The description of a type of chip or fracture along the edge of the glass which does not have a distinct stopping location for its intrusion inward from the edge. This is usually distinguished by fine dark lines intruding into the part from the defect area.

Stock Sheets

Stock sheets are defined as specific size of substrate used to fabricate into smaller, usable parts.

Usable Area

Usable area is defined as the area of the stock sheet that meets the customer's requirements.

Edge Finish

Large stock sheets 74" x 130" (1880 x 3302 mm) and 74" x 65" (1880 x 1651 mm) are provided with a standard factory sharp edge. Edge chips with thermal fractures are allowed accept for those which are un-terminated and may increase in size or mechanical stress.

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Stains

Stains on the front surface mirror coating are not allowed if they do not meet the minimum spectral specification requirements set forth in this document.

Haze

A defect made up of hundreds or thousands of microscopic pinholes, this defect looks whitish in color. Haze is acceptable as long as it does not interfere with the spectral requirements set forth in this document.

Lightning Arcs, Arcing

Lightning arcs are a destructive defect seen by transmission. The defect looks like lightning when viewed under light.

Arcing defects are white or purple in color. This defect affects spectral quality and is only allowed if the size of the defect does not exceed the 100/120 criteria.

Safety Seam

A lightly sanded seam applied to the edge of the smaller stock sheets just enough to take off the sharp factory edge. Note—Edge seam offered only on stock sheets, 37" x 65" and 37" x 43.3".

• Product Specifications

Optical Performance

Spectral reflectance performance of the front surface mirror coating at a 45° angle shall meet the following minimum values in the visible spectrum as follows:

WAVELENGTH	MINIMUM % R
400 nm	91.5%
450 nm	94.0%
500 nm	94.0%
550 nm	93.5%
600 nm	91.5%
650 nm	89.0%
700 nm	85.0%

• Environmental Durability Characteristics

Adhesion

The coating shall show no damage after 3M Scotch Brand No. 600 tape (or equivalent) is pressed firmly against the front surface mirror coating surface and removed quickly by a snap of the wrist.

Adhesion Resistance

The coating shall show no damage after a 500-rub test with a cheesecloth pad approximately $\frac{3}{8}$ " diameter by $\frac{1}{2}$ " thick. The bearing force shall be one pound +/- 1/4 pound.

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Mirror Specifications

Humidity Resistance

The coating shall show no deterioration after exposure to 24-hour humidity test of 49° C @ 95% relative humidity.

Corrosion Resistance (Salt Fog)

The coating shall show no deterioration after exposure to a 24 hour salt fog test (5% NaCl by weight) at 35° C.

• Surface Quality Characteristics

Cosmetic Appearance Criteri

Stock Sheets:

Using a grid system, stock sheets will be inspected to a 90% usable surface area, minus a one inch border.

Linear (scratch) defects for stock sheets:

LINEAR DEFECTS 100/120	QUANTITY ALLOWED	MAXIMUM ACCUMULATED LENGTH
> 0.004" wide	None allowed	N/A
0.002" to 0.004"	3 per sq. ft.	6.0" per sq ft.
< 0.002"	Disregard	N/A

Circular (dig / pinhole) defects stock sheets:

CIRCULAR DEFECTS 100/120	QUANTITY ALLOWED	MINIMUM DISTANCE BETWEEN DEFECTS
> 0.047" Diameter	None Allowed	N/A
.020" to .047" Diameter	5 per sq. ft	2.0"
.010" to .019" Diameter	10 per sq. ft.	1.0"
< 0.010" Diameter	Disregard	N/A

Grid System. Circular and Linear (dig / . Pinhole—scratch) defects for stock sheets. Quantity of allowable defect grids represent a 90% usable area for that size sheet.

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STOCK SHEET SIZE ALLOWABLE DEFECT	GRID SIZE	QUANTITY OF GRIDS
37" x 43.3" (939.8 mm x 1100 mm)	5" x 6" (127 mm x 152.4 mm)	4
37" x 65" (939.8 mm x 1651 mm)	5" x 6" (127 mm x 152.4 mm)	10
74" x 65" (939.8 mm x 1651 mm)	12" x 12" (304.8 mm x 304.8 mm)	3
74" x 130" (1880 mm x 3302 mm)	12" x 12" (304.8 mm x 304.8 mm)	6

EDGE CHIPS	QUANTITY ALLOWED
Length > 0.200"	None allowed
Length ≤ 0.200"	Disregard
Width > 0.100"	None allowed
Width ≤ 0.100"	Disregard
Depth > .040"	None allowed

Table A below shows a 100/120 spec for the stock sheet grid system. This table is used for stock sheets smaller than 74" x 65" (1880 mm x 1651 mm).

TABLE A	
DEFECT CATAGORY	ACCEPTANCE CRITERIA QUANTITY OF DEFECTS PER 5" X 6" GRID
Pinholes	1 pinhole > 0.047" diameter rejects the grid 5 pinholes < 0.047" > 0.010" diameter NOTE: ignore any < 0.010" diameter
Scratches	1 scratch > 0.0024" wide, rejects the grid NOTE: ignore any < .0024" wide
Clusters	Any cluster within a grid > 10% of the grid, (3 sq. inch) rejects the grid
Lightning Arc	Any visible within a grid > 10% of the grid, (3 sq. inch) rejects the grid
Stains/Haze	Any visible within a grid > 10% of the grid, (3 sq inch) rejects the grid

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Table B below shows a 100/120 spec for the stock sheet grid system. This table is used for stock sheets larger than 37" x 65" (939.8 mm x 1651 mm).

TABLE B	
DEFECT CATAGORY	ACCEPTANCE CRITERIA QUANTITY OF DEFECTS PER 12" X 12" GRID
Pinholes	2 pinholes > 0.047" diameter rejects the grid
	10 pinholes < 0.047" > 0.010" diameter
	NOTE: ignore any < 0.010" diameter
Scratches	2 scratches > 0.0024" wide, rejects the grid
	NOTE: ignore any < .0024" wide
Clusters	Any cluster within a grid > 20% of the grid, (3 sq. inch) rejects the grid
Lightning Arcs	Any visible within a grid > 20% of the grid, (3 sq. inch) rejects the grid
Stains/Haze	Any visible within a grid > 20% of the grid, (3 sq inch) rejects the grid

• Physical Characteristics

Length, width and thickness

Standard dimensions for front surface mirror stock sheets are:

WIDTH	LENGTH	TOLERANCE
37.00" (939.8 mm)	43.33" (1100.6 mm)	+/- .060" (1.52 mm)
37.00" (939.8 mm)	65.00" (1651 mm)	+/- .060" (1.52 mm)
74.00" (1880 mm)	65.00" (1651 mm)	+/- .060" (1.52 mm)
74.00" (1880 mm)	130.00" (3302 mm)	+/- .060" (1.52 mm)

NOMINAL THICKNESS	NORMAL TOLERANCE RANGE
3 mm	2.92 - 3.10 mm (0.115—0.122")
4 mm	3.78 - 3.99 mm (0.149—0.157")
5 mm	4.80 - 5.00 mm (0.189 - 0.199")
6 mm	5.79 - 6.20 mm (0.228—0.244")

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Flatness

Flatness of the glass substrate, on which the mirror coating is deposited, is standard commercial grade soda lime float glass. Substrate for applications where flatness is more critical will be quoted upon request.

THICKNESS	STANDARD FLATNESS
3 mm	12/12/2"
4 mm	12/12/2"
5 mm	12/12/2"
6 mm	12/12/2"

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