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## Quality Guidelines & Inspection Criteria

Flat glass inspection criteria conforms to the following ASTM documented specifications:

**ASTM C 1036** Standard Specification for Flat Glass Quality level Q3

**ASTM C 1048** Standard Specification for Heat-Treated Flat Glass

**ASTM C 1376** Standard Specification for Pyrolytic and Vacuum Deposition Coatings on Flat Glass.

### Terminology:

#### Chips:

- a) **Adhesive Chips** – a small piece of glass adhered to the surface – typical to tempered glass.
- b) **Flake Chips** – shallow chips at the edge of the glass, much like a shell chip but smaller.
- c) **Shell Chips** – a smooth, shell like chip at the edge of the glass. Circular indentation in the glass edge as a result of breakage of a small fragment out of otherwise regular surface.

**Coating Debris:** - irregular areas of missing coating creating voids in the surface.

**Coating Scratch:** - partial, or complete, removal of the coating along a thin straight or curved line.

**Corrosion:** change in the colour or level of reflected or transmitted light over all or part of the glass surface as a result of degradation of the coating. May appear as spots with irregular edges.

**Crazing/Arching:** - a random conglomeration of fine lines or micro cracks in the coating, may be similar in appearance to a lightning bolt.

**Crush:** - lightly pitted condition with a dull gray appearance.

**Dig:** - deep, short scratch.

**Dirt:** - small particle of foreign matter embedded in the surface of flat glass.

**Gaseous inclusion:** - round or elongated bubble in the glass.

**Knot:** - inhomogeneity in the form of a vitreous lump.

**Lineal Blemish:** - scratches, rubs, digs, and other similar imperfections.

**Point Blemish:** - crush, knots, dirt, seeds, stones, bubbles, gaseous inclusions, and other similar imperfections.

**Rub:** - abrasion of a glass surface producing a frosted appearance.

**Scratch:** - damage on a glass surface in the form of a line caused by the movement of an object across and in contact with the glass surface.

**Seed/Stone:** - a crystalline inclusion within the body of the glass.

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### Point Blemish

Knots, Dirt, Stones, Crush, Gaseous Inclusions and Other Similar Blemishes

Inspection: - see attached Fig. 2 Viewing conditions for Blemish Detection

- Visual inspection should be done with the naked eye.
- The inspector shall place the glass in a vertical position.
- Inspector shall view through the glass at an angle of 90°
- Lighting should be daylight level (without direct sunlight) or other uniform diffused background lighting that simulates daylight.
- View at the distance specified by the defect type.

Place samples at a distance of 1m (39") from the viewer. If a blemish is detected, refer the evaluation criteria below.

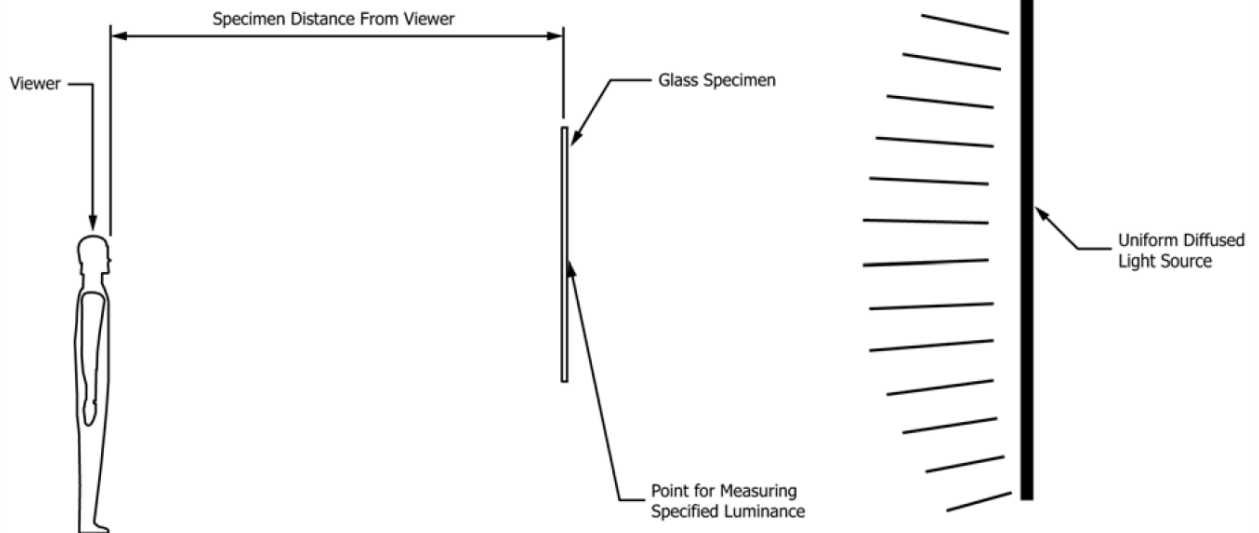


Figure 1 – Viewing Distance for Blemish Detection.

### **Quality Criteria**

To determine point blemish size, measure length and perpendicular width of blemish and calculate the average of the two dimensions. Only the point blemish is to be measured and not any distortion that may be present.



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**Allowable Point Blemish**

- Blemish Size <1.2mm (0.05”) allowed without restriction.
- Blemish Size >.1.2mm (0.05”) <2.0mm (0.08”) allowed with a minimum separation of 600mm (24”)
- Blemish Size <2.5 (0.08”) not allowed.

Note: values are for 6.0 mm (1/4”) and less. For glass thicker than 6.0 mm (1/4”) and less than or equal to 12.0 mm (1/2”), they may contain proportionally larger blemishes for the same minimum separation distances. (for example, as 12 mm Q3 sample with a blemish size of >3.0 < 4.0 mm, the allowable minimum separation would be 600 mm.)

**Linear Blemish**

Scratches, Rubs, Digs and other Similar Blemishes

**Inspection:** To determine scratch intensity, place samples approximately 160” (4 m) from the viewer. The viewer shall move towards the specimen until a blemish is detected (if any). The distance from the viewer to the glass surface when the blemish is first detectable is defined as the detection distance. Blemish intensity is determined by comparing the detection distance to the blemish intensity charge below.

Detection Distance	Blemish Intensity
Over 3.3 m (132”)	Heavy
3.3 to 1.01 m (132 to 40”)	Medium
1 to 0.2 m (39 to 8”)	Light
Less than 0.2 m (8”)	Faint

**Allowable Linear Blemish, (viewing distance starting at 160”)**

- Faint or light scratch, ≥ 75mm (3”) allowed.
- Medium scratch ≤ 75mm (3”) allowed with a minimum separation of 600mm (24”)
- Medium or heavy scratch >75mm (3”) are not allowed

All listed criteria are based on ASTM C 1036-06, Quality Level Q3.



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**Coated Glass**

**Inspection: Viewing conditions for Coated Vision Glass**

- A) The glass shall be inspected, in transmission, at a distance of 10 ft (3.0 m) 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 below criteria applies.
- B) No more than two (2) readily apparent blemishes are allowed in a 3” (75mm) diameter circle, and no more than five readily apparent blemishes are allowed in a 12” (300 mm) diameter circle.
- C) The central area is considered to form a square or rectangle defined by the centre 80 % of the length and 80% of the width dimensions centered on a lite of glass. The remaining area is considered the outer area.

BLEMISH	CENTRAL AREA, in. (mm)	OUTER AREA, in. (mm)
Pinhole	1/16" (1.6) max	3/32 (2.4) max
Spot	1/16" (1.6) max	3/32 (2.4) max
Coating Scratch	2" (50) max	3" (75) max
Mark/contaminant	2" (50) max	3" (75) max
Coating Rub	none allowed	length plus width not to exceed 3/4" (19)
Corrosion/Crazing	none allowed	none allowed

**Inspection: Viewing conditions for Coated Overhead Glass (Kind CO)**

- a) The glass shall be inspected, in transmission, at a distance of 15 ft (4.6 m) 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 above criteria applies.
- b) No more than two readily apparent blemishes are allowed in a 3” (75 mm) diameter circle, and no more than 5 readily apparent blemishes are allowed in a 12” (300mm) diameter circle.
- c) The central area is considered to form a square or rectangle defined by the centre 80% of the length and 80% of the width dimensions centered on a lite of glass. The remaining area is considered the outer area.



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<b>BLEMISH</b>	<b>CENTRAL AREA, in. (mm)</b>	<b>OUTER AREA, in. (mm)</b>
Pinhole	3/32 (2.4) max	1/8 (3.2) max
Spot	3/32 (2.4) max	1/8 (3.2) max
Coating Scratch	3" (75) max	4" (100) max
Mark/contaminant	3" (75) max	4" (100) max
Coating Rub	length plus width not to exceed 3/4" (19)	length plus width not to exceed 3/4" (19)
Corrosion/Crazing	none allowed	none allowed