Ceramic Coatings on Glass

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1.0. Ceramic Coatings on Glass

Ceramic Coated Glass from Emirates Glass encompasses a customized design printed on to the glass using a sophisticated screen printing process followed by heat treatment.

A wide array of optical and thermal performance values is possible to achieve using this technology. Emirates Glass also offers our customers with a unique option of having a ceramic coating followed by sputter coating on the same glass surface thereby enhancing the glass performance.

Some of the key benefits include:

- Control of energy and light transmission
- Increased privacy
- Variety of colors to choose from
- No color fading over time

***Note: This technical bulletin excludes digital ceramic printing process. For more information on digital printing, please contact our Technical department.**

2.0. Visual Effects in Ceramic Coated Glass

- ***Applications:***

  It is important to note that ceramic coated glass is usually intended to be used as spandrel glass. Although the ceramic coating alters the incident light (and energy) transmission depending on the frit design, it is not completely opaque. As a result, irregularities including but not limited to pinholes, light-dark shadowing within panes, streaks, lines etc. are to be expected when the glasses are installed as vision panels and are inspected from close quarters in transmitted light.

- ***Moiré Effect :***

  This is an optical phenomenon that usually appears in the form of circular, wavy or rippled pattern. It is not a glass defect but a visual effect resulting from multiple reflections of the ceramic frit design from different surfaces of the glass (and coatings). This effect is further exacerbated in the following cases:

  a. If a light colored ceramic coating is used on surface 2, the visibility of the shadow of this coating reflected from surface 3 is much more darker and visible when viewed from outside in comparison to a darker shade of ceramic coating. The misalignment of the ceramic coating and its darker shadow eventually leads to a Moire effect.

  b. Double and triple insulated glass units will increase the visibility of multiple reflections in comparison with monolithic panes as the reflection of coated surface gets reflected from multiple glass panes.

  Moiré effect is well known within the architectural glass industry and this phenomenon is in fact used by some architects to develop a visual dynamic effect in glass as the observer's viewing angle changes.

- ***Color Variation:***
  Certain variations in color are to be expected from the body tint of the glass type as well as the variations in coating thickness especially when the glass is inspected in transmitted light. Additionally, the ceramic frit design may also cause the glass to appear lighter or darker. For example, if the dot design is too small, a small variation in the dot diameter or spacing may result in the overall appearance of the glass being lighter or darker when the glass is inspected in reflected light from 5 meters and beyond.

- ***Glass Distortion:***
  Distortion from tempering (Overall Bow, local bow, edge dip and roller waves) in toughened and heat strengthened ceramic coated glass panels can have an effect when the glasses are inspected in reflection. Although Emirates Glass' tempered glass fully complies with ASTM C1048 and EN12150/EN1863, this effect cannot be completely eliminated for tempered glass.

- ***Printing Effects:***
  Some minor imperfections like pinholes, color variation, print misses, lines and streaks are to be expected due to the inherent nature of the screen printing process and products used. The visual inspection criterion as laid out in this document shall apply for all ceramic coated glass supplies from Emirates Glass.

- ***Pattern:***
  Ceramic coated glasses are heat treated to temperatures exceeding 650 degrees C. During the heat treatment process, the medium in which the ceramic powder and the colorants are suspended is 'blown away' and this affects the definition of the pattern edges. In cases where the design involves tiny, sharp shapes, this could be a cause for concern and Emirates Glass strongly recommends the inspection of full size mockups prior to placing the order. For screen dimensions greater than 1200mm, a joint may be required. Such joints will be visible in the finished product.

3.0. Design Tolerances

- Minimum dot size/diameter shall be 2mm.
- Minimum distance between adjacent lines/dots shall be 2mm.
- Minimum distance between lines and minimum width of lines shall be 3mm.

4.0. Glass Inspection

The glass should be inspected in reflected light at a minimum distance of 3 meters from the glass surface.

5.0. Dimensional Tolerances

Figure 1

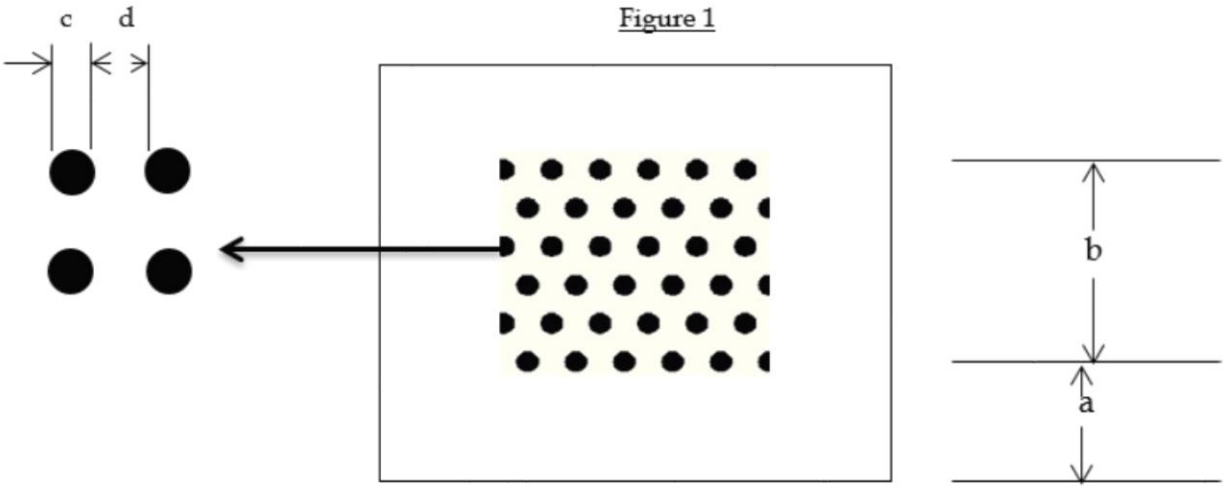
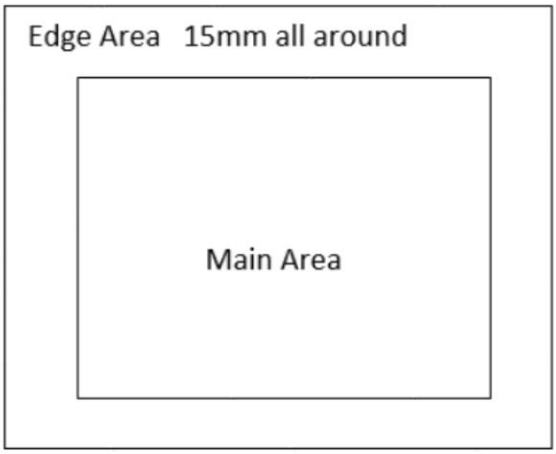


Figure 2



Defect tolerances	Main Zone	Edge Zone
Water Stains	Not permitted	Permitted
Haziness/Shadowing	Not permitted	Permitted
Tolerance of dimension 'a' (Figure 1)	Print size less than 1 mtr. = ±1mm Print size less than 2 mtrs. = ±3mm Print size more than 2 mtrs = ±5mm	N/A
Tolerance of dimension 'b' (Figure 1)	Print area less than 1 mtr. = ±1mm Print area less than 2 mtrs. = ±3mm Print area less than 3 mtrs. = ±4mm Print area more than 3 mtrs. = ±5mm	N/A
Tolerance of dimension 'c' and 'd' (Figure 1)	≤ 20mm = ±1mm >100mm = ±2mm	N/A
Color variation	Delta E ≤ 3 (Calculated in accordance with ASTM D2244)	N/A

6.0. Other Requirements

- In order to maintain consistency of design, a minimum order quantity of 20 pieces per size would be required. Smaller quantities may be produced at increased costs. The screens shall be retained for a period of 6 months from completion of project.

- If the quantity exceeds 100 panes for any given size, additional screens would be required due to excessive wear. This will incur additional costs.

7.0. Mockups

- Making a screen requires that an order is placed. Printing in non-standard colors is not always possible without an order being placed. This may affect mockup appearances against production appearances where an order has not been placed and the customer requires an advanced mockup.

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