

# Strain Pattern Characteristics

Heat-treated glass (heat-strengthened or tempered) can have an optical phenomenon that is called iridescence, strain pattern, or quench pattern. Under certain lighting conditions, this phenomenon can appear as faint spots, blotches, or lines. (See Fig FG01-1) It is the direct result of the heat treatment process and is not considered to be a glass defect.

The process for heat-treating glass involves heating the glass to its softening point in a furnace and then quickly cooling or quenching the glass as it exits the furnace. It is this quenching that imparts the added strength and breakage characteristics required in heat-treated glass. Unfortunately, the quenching also imparts a strain pattern. While it may vary from one lite of glass to the next, it is part of the process and cannot be eliminated.

Quenching the glass is achieved in the process using several arrays of air nozzles to uniformly disperse cool air across the glass. Ideally, the nozzles would cool the glass with perfect uniformity. In practice, there are slight differences in the rate of cooling across the glass, which results in slight differences in strain.

These differences in strain show up optically when viewed under polarized light. Since direct sunlight has a component that is polarized, it can cause the pattern to become visible. Wearing polarized sunglasses will increase the effect.

The color and shape of the strain pattern will vary depending on the design of the cooling nozzles. Sometimes no color is observed (dark and light) and sometimes the pattern is iridescent.

The intensity of the strain pattern is influenced by the viewing angle, lighting conditions and by the perception of the viewer. It may be accentuated if two lites of heat-treated glass are used in an IG unit.

The governing standard on heat-treated glasses is ASTM C1048, *Heat Treated Flat Glass – Kind HS, Kind FT Coated and Uncoated Glass*. In this standard, strain pattern is recognized as a common occurrence. Section 7.5 of the standard clearly states that strain pattern “is a characteristic of these kinds of glass [heat-treated] and should not be mistaken as discoloration or non-uniform tint or color.”



Fig. FG01-1: Strain Pattern

In addition, the Glass Association of North America (GANA) has published the Glass Information Bulletin *GANA TD-05-0108 Quench Patterns in Heat Treated Architectural Glass*. This is available at [www.glasswebsite.com/](http://www.glasswebsite.com/)

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