GLASS ASSOCIATION OF NORTH AMERICA

Glass Informational Bulletin **GANA TD 02-0402 (Reapproved 2008)**

Heat-Treated Glass Surfaces Are Different

Industry Cleaning Procedures Must be Followed to Avoid Glass Damage

As the use of glass increased over recent years, issues of strength, safety and thermal performance became increasingly important design considerations. The availability of tinted and coated glasses had a dramatic impact on glass use in building projects. The vastly expanded aesthetic options, combined with the improved energy conserving and comfort capabilities of tinted and coated glasses allowed architects to use more glass, as well as larger sizes in their designs. A consequence of this trend was a corresponding increase in the use of tempered and heat-strengthened glass in order to meet both thermal and windload design requirements. The demand for tempered glass further increased with the passing of safety glazing legislation in 1977, which mandated its use in certain locations.

Currently, there are two types of heat-treated glass as defined in the American Society for Testing and Materials (ASTM) C 1048 - *Standard Specification for Heat-Treated Flat Glass – Kind HS, Kind FT Coated and Uncoated Glass*. The two types are heat-strengthened (Kind HS) and fully tempered (Kind FT). Both types of glass are produced using the same equipment. A majority of the heat-treated glass produced over the last 30 years has been fabricated in horizontal roller hearth furnaces. The preparation stage for the heat-treatment process requires annealed float glass to be cut to the required final size, the edges to be treated according to the specified finish (commonly seamed or polished) and the glass to be washed. The process then requires the glass to be transported on horizontal rollers through an oven and heated to approximately 1,150° F (621° C). Upon exiting the furnace, the glass is rapidly cooled (quenched) by blowing air uniformly onto both surfaces simultaneously. The cooling process leaves the surfaces of the glass in a state of compression and the central core in compensating tension.

The color, clarity, chemical composition and light transmission characteristics of glass remain essentially unchanged after heat-treating. Likewise, hardness, specific gravity, expansion coefficient, softening point, thermal conductivity, solar optical properties and stiffness remain unchanged by the heat-treating process. The only physical properties that change are improved flexural and tensile strength, and improved resistance to thermal stresses and thermal shock. Under uniform loading, heat-treated glass is stronger than annealed glass of the same size and thickness. The heat-treating process does change the break pattern of the glass, i.e. fully tempered glass disintegrates into relatively small pieces meeting the safety glazing requirements and thereby greatly reducing the likelihood of serious cutting or piercing injuries.

As mentioned, the heat-treating process typically involves the transport of very hot glass on rollers. As a result of this soft glass-to-roller contact, some glass surface changes will occur. Minute glass

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particles (fines) from the glass cutting and edging process, typical manufacturing plant air-borne debris or dust, refractory particles from the tempering oven roof, as well as external airborne dirt and grit carried into the plant by the large volumes of quench air used in the process, may adhere to one or both glass surfaces. Also, the physical contact of the soft glass surface with the rollers may result in a marking or dimpling of the glass surface. Current glass quality specifications contained in ASTM C 1036- *Standard Specification for Flat Glass*, establish the size and number of glass imperfections allowed based on specific visual inspection criteria. The glass surface conditions listed above are not usually visible to the eye under normal visual circumstances. These surface conditions do not threaten the visual nor structural integrity of the product, and are not reason for rejection of glass under the ASTM consensus standards.

However, despite being invisible, such surface conditions can be detectable to the touch. This difference in "feel", between annealed and heat-treated glass, can lead to issues during cleaning of the glass, as glass cleaning workers attempt to remove microscopic particles. With the best of intentions, they may attempt to scrape particles that can be felt, but not seen, and very often end up scratching and chipping the glass surface.

Additionally, once the glass is delivered to the construction site, construction materials and debris may be deposited on the glass. Paint, stucco, concrete, adhesives, and other materials may be splattered on the glass and left there for long periods of time. These materials and the methods for removing them may also damage the glass surface.

It is important to note that the recommended cleaning procedures for heat-treated glass are the same as for annealed glass. The use of scrapers, abrasives, and harsh chemical cleaning agents is not recommended for any glass product because they can cause irreparable damage. With the best of intentions, window cleaners, and other tradesmen, may attempt to remove construction dirt and debris from the glass surface by scraping the surface. This can lead to glass damage, such as scratching and chipping if any microscopic particles have adhered to the surface and are dislodged and transported across the glass in the scraping process.

Acceptable cleaning procedures are available from glass manufacturers and fabricators. In addition, the Glass Association of North America has published a Glass Information Bulletin entitled, *Proper Procedures for Cleaning Architectural Glass Products,* which includes industry recommended cleaning procedures, as well as a list of Do's and Do Not's.

Heat-treated glass products are critical components of today's high-performance coated, insulating, laminated, spandrel, safety glazing, bullet-resistant, blast-resistant, and hurricane-resistant fenestration products. Millions upon millions of square feet of heat-treated glass have been installed and have provided trouble free performance for almost 50 years. Continued use of acceptable cleaning practices, combined with good judgment, will prevent glass damage and enable the glass to maintain its original attractive appearance for years to come.

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