NGA Glass Conference™ 2022
Long Beach

1

Fabricating Committee: Tempering

Rick Wright
Oldcastle
BuildingEnvelope

2

ASTM C14 Update

- 2021 New ASTM Standards
  - C1908-21 Standard Test Method for Pummel Adhesion Testing of Two-ply Laminated Architectural Glass.
  - C1914-21 Standard Test Method for Bake and Boil Testing of Laminated Glass
- 2021 Revisions to Existing ASTM Standards
  - C1464-21 Standard Specification for Bent Glass
  - C1376-21a Standard Specification for Pyrolytic and Vacuum Deposition Coatings on Flat Glass

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ASTM C14 Update

- ASTM Standard Requiring Review for Ballot
  - C1349-2017 Standard Specification for Architectural Flat Glass Clad Polycarbonate
    - Urmilla Sowell, NGA, Chair of review task group
- ASTM Active Work Items
  - New Test Method for Center-Punch Fragmentation of Fully Tempered Glass
    - Urmilla Sowell, NGA, Chair of task group to resolve ballot negatives and comments
  - New Test Method for Glazing Materials Using a Binomial Choice Protocol for Transparent Fly-through Bird Collision Deterrence (New Title)
    - Kevin Ramus, KR Glass Consulting, and Stefan Knust, ENNEAD ARCHITECTS LLP, Co-Chairs of task group to resolve ballot negatives and comments

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GTPs Being Updated

- FB18-08 Methods of Measuring Optical Distortion in Heat-Treated Flat Architectural Glass
  - Reviewing ballot comments
- FB20-08 Iridescence Patterns in Heat-Treated Architectural Glass
  - Going to ballot in February

5

Ceramic Enamel Update – Tim McGee

- NGA E1300 update
  - The E06.52 sub-committee expects to release a revised E1300 for printing sometime after the end of June. It may include revisions related to the use of ceramic frits, but that depends on getting the proposed changes to ballot in the next few weeks.
- The ceramic frit related revision work is under work item WK65259.
  - Will address use of ceramic frits on monolithic glass and on lites as part of an IG unit.
  - Work is based on data collected by breaking many large, fritted and heat-strengthened glass panels.
  - Data analysis indicates that for many common aspect ratios the standard NFL charts still apply.
  - Data analysis also indicates that for less common aspect ratios (e.g. 4.0 or 5.0) some strength reduction occurs that is outside of the standard NFL charts used in E1300.

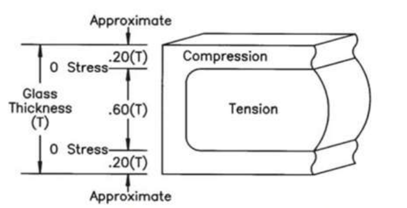
6

New and Upcoming – Bill Lingnell

- Evaluation of Post-Finishing for Heat-Treated Glass Edges
  - The test plan will determine if surface polishing and/or edge grinding following tempering reduces the glass strength.

7

Edge Grinding of Laminates Post-Tempering



Heat-Treated Glass Compression and Tension Zones

- ASTM C1048: fabrication techniques that alter the glass surface, thickness or edge shall be performed prior to heat treating to avoid a reduction in glass strength
- ASTM C1172: fabrication techniques should be performed prior to heat treatment
- NGA GTP *Heat-treated Laminated Glass Exposed Edges*
- NGA GIB *The Importance of Fabrication Prior to Heat-Treatment*

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Test Procedure for
Edge Grinding of Laminates Post-Tempering

Does post-tempering edge grinding actually reduce laminate strength?

- Evaluate strength resulting from "worst level" of edge grinding
- Outcome will be "go/no-go" decision

Test 1

What depth of post-tempering edge grinding preserves laminate strength?

- Evaluate strength resulting from three levels of edge grinding
- Determine the relationship between a given level of edge grinding and the resulting strength

Test 2

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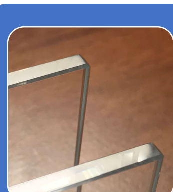
Test Procedure for
Edge Grinding of Laminates Post-Tempering- Test 1



Monolithic: 12 x 22 x ¼-inch

Monolithic: 12 x 30 x 3/8-inch

1. Annealed (baseline)
2. Tempered
3. Tempered + post-temper worst-level edge grinding

Laminated: 12 x 22 x ¼-inch

Laminated: 12 x 30 x 3/8-inch

1. Tempered
2. Tempered + post-temper worst-level edge grinding

Note: Prepare 25 specimen of each group for both thicknesses. Plan to test 20 of each.

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Test Procedure for Edge Grinding of Laminates Post-Tempering- Test 2

Monolithic: 12 x 22 x ¼-inch

Monolithic: 12 x 30 x 3/8-inch

1. Annealed (baseline)
2. Tempered
3. Tempered + post-temper minimum depth edge grinding
4. Tempered + post-temper moderate depth edge grinding
5. Tempered + post-temper worst-level depth edge grinding

Laminated: 12 x 22 x ¼-inch

Laminated: 12 x 30 x 3/8-inch

1. Tempered
2. Tempered + post-temper edge grinding (depth determined by monolithic results
3. Tempered + post-temper edge grinding (depth greater than group 2 specimen)

Note: Prepare 25 specimen of each group for both thicknesses. Plan to test 20 of each.

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Test Procedure for Edge Grinding of Laminates Post-Tempering- Results

Non-destructive optical technique

- Determine level of residual compression locked into each specimen
- Combine data with calculated mechanical stress to determine net tensile stress at failure

Destructive mechanical test to failure

- Collect load time history to correct measured failure strength data to standard load durations of 3-sec, 60-sec, and 1 hour

Calculation of stress

- Translate applied loads to stress in laminated glass beams using geometrically nonlinear finite element analyses
- Determine magnitude of edge strength degradation

Result: Clear and defensible position on the acceptability of post-tempering edge treatment on laminated glass

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Published GTPs

Glass Technical Paper — FB13-07 (2018)

The Importance of Fabrication Prior to Heat-Treatment

Glass applications frequently require a variety of glass edge and/or surface fabrication. Some common fabrication processes include: edge seaming, grinding, polishing, hole-drilling, notch-cutting, surface-grooving, sand-blasting, and etching. The Glass Association of North America (GANA) does not recommend glass fabrication after heat-treatment because it may weaken the glass and/or cause it to break. This recommendation is confirmed in Section 7 of ASTM C 1048, Standard Specification for Heat-Treated Flat Glass-Kind HS, Kind FT Coated and Uncoated Glass, which states, "All fabrication, such as cutting to overall dimensions, edgework, drilled holes, notching, grinding, sandblasting, and etching, shall be performed before heat-strengthening or tempering and shall be as specified."

The Heat-Treating Process

In order to provide greater resistance to thermal and mechanical stresses, and to achieve required break patterns for safety glazing applications, annealed float glass and patterned glass can be strengthened through a thermal process known as heat-treating. The most commonly used process for heat-treating architectural products calls for glass to be cut to the desired size and shape, and edges prepared to the specified condition. The glass is washed and then transported through a tempering furnace where it is uniformly heated to approximately 1150 °F (621 °C). Upon exiting the furnace, the glass is rapidly cooled (quenched) by blowing air onto all surfaces simultaneously.

The cooling process places the surfaces of the heat-treated glass into a state of high compression and the central core in tension. As shown in Figure 1, each surface compression zone is approximately 20% of the glass thickness and the middle 60 % of the glass thickness is the tension zone.

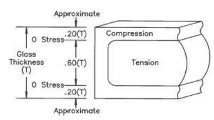

Figure 1
Heat-Treated Glass Compression and Tension Zones

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Glass Technical Paper — FB45-14 (2019)

Recommended Applications for Heat-Treated Glass

The glass industry has been heat treating architectural glass to increase its strength since about 1930. The process of heat- treating glass involves uniformly heating glass close to its softening temperature and then rapidly, and uniformly, cooling it. This process results in the development of surface compressive stresses, thus increasing the strength of the glass. Heat-treated glass is used in many of today's architectural glazing applications where increased strength to resist glass breakage is desired. Vision and spandrel areas of buildings as well as building entrances, glass railings and balustrades, and other applications where public safety is a priority, are common examples.

Types of Heat-Treated Glass

There are two types of heat-treated glass: heat-strengthened glass and fully tempered glass. Both are produced in a similar fashion by heating and cooling the glass. It is the rate of cooling that determines whether the final product is heat-strengthened or fully tempered. It is a generally accepted rule of thumb that glass that has been heat-strengthened has approximately twice the breakage strength of annealed glass of the same thickness and that fully tempered glass has approximately four times the breakage strength of annealed glass.

The North American industry standard specification for heat-treated glass is ASTM C1048 *Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass.*

- Heat-strengthened glass is defined as having a surface compression of 3,500 to 7,500 psi (24 to 52 MPa); no requirement for edge compression is specified.
- Fully tempered glass is defined as having a minimum surface compression of 10,000 psi (69 MPa), an edge compression of not less than 9,700 psi (67 MPa), or meeting the American National Standards Institute (ANSI) Standard Z97.1 - *Safety Performance Specifications and Methods of Test for Safety Glazing Materials Used in Building*[i] or the Consumer Product Safety Commission (CPSC) Standard 16 CFR 1201 - Safety Standard for Architectural Glazing Materials[ii] Category II

Because of the high internal stresses in both glass types, all fabrication including cutting, hole-drilling, notching, or edge treatment must be performed prior to the glass being heat-treated.

Reasons for Heat- Treating

The reasons for heat-treating glass are two-fold: increase the glass strength to resist externally applied loads and, for fully tempered glass, also to meet safety glazing requirements defined by applicable codes or federal standards. External loads include wind and snow loads as well as thermal stresses induced by the sun's radiant energy. In many instances, combinations of these loads must be considered by the design professional during the design process.

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Published GTPs

Glass Technical Paper — FB52-17

Guidelines for the Production of Heat-Treated Architectural Flat Glass

Since the 1930s, the glass industry has been producing heat treated architectural glass. The process of heat-treating glass involves uniformly heating glass close to its softening temperature and then rapidly, and uniformly, cooling it. Heat-treated glass is used in many of today's architectural glazing applications where in- creased strength to resist glass breakage is desired. This Paper gives guidelines to producing heat-treated glass. Guidelines should be regarded as a general starting point, but for more detail consult your vendors and equipment manufacturers.

Personal Protection Equipment (PPE)

Do:

- Stress to employees each day the importance of the proper use of safety equipment at every stage of the glass fabrication process
- Have available and wear such personal protection equipment, including:
  - Hardhat
  - Safety glasses
  - Cut-resistant clothing material such as shirt/jacket and chaps
  - Steel-toe boots with metatarsal guards
  - Minimum Level 4 cut-resistant gloves and glove liners (when handling raw edges)
  - Ear plugs
  - Face shield
- Reference ASTM E2875 Standard Guide for Personal Protective Equipment for the Handling of Flat Glass
- Report any problems performing routine tasks as a result of the PPE
- Always check those working in your area to ensure they are wearing the proper PPE
- Always check your PPE to ensure it is in good condition, no holes, tears ormissing components

Don't:

- Don't assume others are wearing the proper PPE for your work area
- Don't take short cuts when it comes to PPE – ensure it's always worn and in good working condition
- Don't modify PPE from its original design

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Glass Technical Paper — FB01-00 (2020)

Proper Procedures for Cleaning Architectural Glass Products

Architectural glass products play a major role in the comfort of the living and working environment of today's homes and commercial office spaces by providing natural daylight, views of the surroundings, thermal comfort and design aesthetics. Glass usage and condition often affect our selection of where we live, work, shop, play and seek education. This document describes procedures that generally apply to most architectural glass products. Certain glass types may require different procedures and care. Glass can be clear or tinted and have pyrolytic or sputtered Low-E or reflective coatings, some of which may be on the exposed surface of the glass. Glass products can be monolithic (single lites), laminated glass or insulating glass units. (See Glass Technical Paper FB15-07 Describing Architectural Glass Constructions). Glass can be of various strengths, i.e., annealed, heat-strengthened or fully tempered. There are also other decorative and functional glass types including spandrel, silk- screened, patterned, acid etched, and sandblasted. Architectural glass products should be properly cleaned and protected throughout the construction process using a program of regularly scheduled maintenance designed to maintain visual clarity and prevent glass surface damage. Since glass products can be permanently damaged if infrequently or improperly cleaned, glass producers and fabricators recommend strict compliance with the following procedures for cleaning glass surfaces.

Routine Cleaning & Maintenance

For routine maintenance, interior and exterior glass surfaces should be thoroughly cleaned as dirt and residue appear. Cleaning frequencies should be tailored to the individual characteristics inherent to the site conditions, as well as the severity of local environmental factors and atmospheric pollutants that vary from region to region. Before proceeding with cleaning, determine whether the glass is clear, tinted or reflective. Surface damage is more noticeable on reflective glass as compared with the other glass products. If the reflective surface is exposed, either on the exterior or interior surface, special care must be taken when cleaning, as damage to the reflective glass surface may result in coating removal and a visible change in light transmittance which is very noticeable. A simple test to determine the location of the reflective coating is to touch the point of a pencil to the glass surface. If the reflection of the pencil point meets the real pencil, the coating is exposed on that side. If there is a gap between the pencil point and the reflections, the coating is not exposed on that side of the glass. Cleaning tinted and reflective glass surfaces in direct sunlight should be avoided, as the surface temperature may be too hot for optimum cleaning. Exterior cleaning should begin at the top of the building and continue to the lower levels to reduce the risk of leaving residue and cleaning solution on glass that has already been cleaned. Cleaning procedures should also include checking that the wind is not blowing the cleaning solution and residue onto already cleaned glass.

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Glass Technical Paper **FB02-02 (2018)**

Heat-Treated Glass Surfaces Are Different

Industry Cleaning Procedures to be followed to Avoid Glass Damage

Heat-treated glass (fully tempered and heat-strengthened) has been in use for many decades. The demand for fully tempered glass increased greatly with the passing of safety glazing legislation in 1977. Heat-treated glass usage has increased in recent years for a variety of reasons including, but not limited to, changes to the building codes requiring safety glazing in more applications, the need to meet higher thermal stress loads due to the use of more high-performance glasses and coatings with increased heat absorbing and/or reflecting properties, the use of larger glass sizes and increased design loads.

Currently, there are two types of heat-treated glass as defined in the ASTM International standard C1048 *Standard Specification for Heat-Strengthened and Fully Tempered Flat 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 40 plus years has been fabricated in horizontal roller hearth furnaces. The preparation stage for the heat-treatment process requires annealed 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 1150ºF (621ºC). 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 un- changed 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 that is produced with sufficient center tension will break into relatively small pieces designed to meet the industry safety glazing standards, 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 particles (fines) from the glass cutting, edging and washing processes, 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

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International Window Cleaning

Glass Technical Paper **FB03-03 (2018)**

Construction Site Protection and Maintenance of Architectural Glass

Steps Must Be Taken to Avoid Permanent Damage to Glass

Architectural glass products used in windows, doors and skylights for today's residential and commercial building projects are more sophisticated than those used in earlier fenestration applications. Performance requirements call for glass to be coated and used in an insulating glass unit in order to be more energy efficient; and often heat-treated and laminated to provide greater strength, safety, and security. As a result of increased performance capabilities, more high-performance glass is being used in both residential and commercial construction. The higher valued products and their greater susceptibility to damage have increased the importance of proper site storage, handling, installation and protection throughout the construction process.

During glass manufacturing, fabrication and installation, products are carefully handled to prevent surface and edge damage. Materials are packaged to provide protection during shipment and delivery. Once finished materials are placed on a construction site, they become exposed to a variety of conditions and influences that can adversely affect product aesthetics and functionality. Irreparable glass damage can occur from improper storage and handling, exposure to chemicals and leaching agents, prolonged exposure to moisture, mechanical attack and breakage, damage related to adjacent construction activities and improper cleaning methods.

Site Delivery and Storage

Windows, doors and skylights for residential construction typically arrive on construction sites preglazed, while commercial construction applications often require glass be delivered to the site and glazed at a later date.

In both types of construction, it is vital that materials be properly stored for the duration of the construction process. The complex nature of construction projects and site management requires well-planned and executed material delivery and storage. The following is a list of recommended practices that glazing subcontractors should observe for site delivery and storage of fenestration materials:

- Consult glass and glazing system suppliers for specific recommendations on the site storage, handling, installation, and protection of their materials before any work is started.
- Coordinate glass deliveries, to the extent practical, to minimize on-site storage durations.
- Work with the general contractor or builder to select on-site under-roof storage locations that avoid direct rain and water runoff, work areas of other trades, and areas of high traffic and to minimize material movement and handling.

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Glass Technical Paper **FB56-18**

Heat Soaking Testing of Tempered Glass for Architectural Glass Applications

Introduction

Fully tempered (FT) glass used in architectural applications may break spontaneously for a variety of reasons, including, but not limited to, unperceivable imperfections or inclusions in the glass substrate. Most inclusions are stable, but some inclusions, most notably nickel sulfide, may cause a spontaneous break if it is located in the tension region. The purpose of a heat soak test is to reduce the risk of a spontaneous break by influencing the inclusion to break the glass during the test. It is important to remember a heat soak test may reduce the risk, but will not eliminate the potential of a spontaneous break due to an inclusion.

Glass Type

Heat soak testing may be done on any fully tempered architectural glass including, but not limited to, clear, tinted, low-iron, patterned and low-E coated glass. Reference ASTM C1036 and C1376 for more information on glass types and properties.

The Effect of Heat Soak Testing on the Temper of Glass

There is currently no North American standard for heat soak testing. Some companies in North America perform heat soak testing in accordance with EN 14179-1 Heat soaked thermally toughened soda lime silicate safety glass. This standard has specific instructions for the heat soak testing. When the heat soak test is performed as specified, there should be very little to no effect on the surface compression of the tempered glass.

Statistical Heat Soak vs. 100% Heat Soak

There have been two basic approaches taken with the heat soak testing. The first is to heat soak each lite required for the project. A second approach is a statistical approach. Statistical heat soak testing involves the selection of a statistically significant number of glass panels to be tested, as opposed to 100% of the glass. It is important to recognize that there is no consensus on the statistical procedures used with this approach. EN 14179-1 requires all lites to be heat soaked.

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Glass Technical Paper **FB57-18**

One Optical Number Does Not Fit All

For the purpose of this Glass Technical Paper, *the optical number defined is millidiopters, the unit of measure representing optical distortion.*

The glass industry has been challenged for many years with creating an optical measurement standard for glass products and windows. Measuring glass distortion, i.e., deviation from flatness, is not a new topic. However, with tighter energy efficiency demands, more variations in glass sizes, code changes and new glazing systems have resulted in more heat-treated glass, double (and even triple) insulating glass units, and multi-ply laminates in use than ever before. All of these products may increase the amount of distortion seen on buildings.

Distortion in glass is not a color or sharpness issue, but an aberration that renders straight lines in an object or image to appear curved. Distortions in glass have become more noticeable due to the visibility brought on by glass tints, coatings, and applications. Image distortion is simply fact and one that glass fabricators try to keep to a minimum.

The distortion prevalent in heat-treated glass is often seen as a sequence of concave and convex variations from a flat surface creating an optical lens power which can be expressed in diopters or millidiopters. A diopter is a unit of measurement describing the optical power of a lens or curved mirror (1D = 1,000 mdpt). The length of the lens radius defines the lens power of the curved glass and, therefore, the optical distortion in the resultant glass.

Distortion in glass is often perceived when the observed object or image fails to agree with the expected or true shape of the object. The shape of this distorted image is more apparent when viewing the image reflected from the surface of the glass rather than viewing the transmitted image through the glass. The appearance of a reflected image, the viewing angle, the distance of the viewer from the glass, the distance of the viewed objects to the glass, how the image moves, and the shape of the image are critical in quantifying the perceived visible distortion. Also, it is important to understand that human perception of distortion varies among individuals.

Where the reflected image contains trees or clouds in the sky, it is more difficult to discern the degree of distortion in the glass compared to straight lines or 90-degree angles where distortions will be very easily perceived. The reflection of a building far away will have greater distortion than a building that is near. Distortion associated with lehr rolls as the glass ribbon is cooled may also appear in annealed float glass. Distortion may not be evident if the viewer is right up against the glass, whereas it can be obvious if he is a great distance from the glass. A very small deviation in surface flatness causes a large deviation over long distances. As the viewing angle (line of sight) increases from 90 degrees (perpendicular to the glass) towards 0 degrees (parallel to the glass) any visible distortion will be changed. Distortion in glass can be caused by variations in thickness, flatness and parallelism (i.e. heat-treated laminated units or insulating units). Under certain viewing conditions, some distortion will inevitably be seen.

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Glass Technical Paper FB59-18

Heat-Treated Laminated Glass Exposed Edges

Introduction/Background

The architectural glass industry has seen a growing interest in minimally-supported glass applications, including facades, skylights, interior partitions and glass balustrades. Whether the glass is glazed top and bottom, point-supported or cantilevered, the trend is for less metal around the edges of the glass. Laminated glass is being used for its ability to provide post-breakage glass retention.

With the shift to laminated glass due to code changes (see International Building Code section), and the trend toward minimal supports resulting in exposed glass edges, questions around laminated glass edge quality and fabrication have arisen. These questions focus on alignment of the glass plies, edge polishing before and after fabrication, and interlayer appearance. Designer and customer requirements for the same high quality finished edge they can consistently receive with monolithic glass are driving the industry to develop guidelines to accommodate these evolving needs. No such guidelines currently exist.

Exposed Edge Applications

One objective of the fabricator is to produce a heat-treated (heat-strengthened or fully tempered) laminate consisting of two or more lites of glass bonded together with an interlayer material having one or more exposed edges that ultimately meets the aesthetic requirements for the intended application. Covered laminated glass edges are not visible and, therefore, not an aesthetic concern after installation. However, when the edges are exposed, the alignment of glass plies and overall appearance of the laminate edge are likely to be critical to the designer and building occupant in most applications. Note: It is also important to advise the customer that laminate edges, when viewed from the edge, have a layered appearance (glass + interlayer + glass), and will not look like a monolithic lite of glass.

According to ASTM C1048, heat-treated exposed-edge glass shall be polished prior to heat-treating. If the specification calls for monolithic tempered glass, the polished edge will not look any different after the heat-treating process. If the glass is to be heat-treated and assembled into a laminate consisting of glass and an interlayer material, alignment issues leading to aesthetic concerns may arise. Due to cutting tolerances, glass slippage during the laminating process, actual handling, and indexing of the lites in the laminate, all of the edges may not align to an acceptable condition after the laminating process. The challenge for the fabricator is to minimize mismatch (imperfect alignment) and trim the interlayer material so that the laminate edge looks aesthetically pleasing.

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Glass Technical Paper FB62-19

Thermal Stress in Heat-Treated Spandrel Glass

Introduction

Spandrel glass is glass that has been rendered near opaque and glazed in wall areas covering structural columns, floors, walls, or other building elements that are intended to be concealed from outside view. Increasing standards of energy efficient initiatives are placing unique and unanticipated demands on spandrel glazing. In the case of insulating glass units (IGUs) installed as spandrel glass, the use of opaque paints and enamels, low-e coatings, thick insulation and other energy efficiency elements are creating, in essence, highly efficient solar collectors. As a result, inner lites of the IGU have been known to reach temperatures of 230 °F or more, resulting in center to edge temperature differences exceeding 130 °F. These gradients create a large thermal stress which, under certain circumstances, may lead to breakage.

Recently, attention has been drawn to several incidents in which spandrel glass has experienced solar-induced thermal stress breakage. Although a relatively rare occurrence, certain design elements are combining to create conditions that allow such breakage to happen. This document discusses the phenomenon of thermal stress build-up, the factors that contribute to it and potential mitigation options.

NOTE: Considerations for other components such as sealants (PIB and/or silicone) and interlayers is not part of the scope of this GTP.

Background

Thermal Gradient Build-Up

Solar Energy generates heat in objects as they absorb sunlight. The intensity of the sunlight is characterized as the Solar Irradiance (SI) and depends upon the latitude, altitude, time of year, time of day, cloud cover, air mass, and other factors. The greater the SI, the greater is the potential for heat build-up under a given set of conditions. As for all objects exposed to sunlight, a glass lite will experience a temperature increase until a balance is reached between the heat gained by absorbing the solar radiation and heat lost through convection, conduction, and re-radiation mechanisms.

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Published GTPs

Glass Technical Paper FB65-20 (2020)

Glass for Personal Protective Barriers

Personal Protective Barriers

Retail, medical, educational and manufacturing facilities are implementing changes due to the worldwide outbreak of COVID-19, a respiratory illness believed to spread primarily by droplets from coughs or sneezes of infected persons to those nearby. Many businesses are installing clear personal protective barriers to physically shield employees from each other and from consumers to reduce potential exposure to the virus. In many applications, the barriers will become a permanent fixture; therefore, aesthetics and cleanability are important design considerations. Barriers can be constructed of plastic sheet or glass. Glass has several advantages in physical barrier applications and may be preferred over plastic, especially for permanent and public-facing barrier installations. Compared to plastic, glass is easy-to-clean, transparent and aesthetically-pleasing.

Figure 1: Safety glass installed for personal protective barriers (left photo) can provide a sleek, professional, sanitary, yet welcoming feel for consumers entering retail stores compared to plastic barriers (right photo) where rough edges and hazy distortion combined with surface scratches detract from the consumer experience and collect dirt and potentially bacteria.

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AIA Presentations

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Let's Discuss…

What do you want to see?

Is there a big topic that's missing?

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