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## **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.

- Secure, block, and brace individual cases of glass and preglazed materials to prevent falls.
- Ensure blocks or supports keep the bottom edge of materials well above potential puddles of rainwater or other conditions that could cause damage.
- Provide secure, temporary covering that prevents direct water flow, but ensures ventilation and combats condensation buildup on the glass.
- Clearly mark storage areas of glass cases and preglazed materials using colored ribbons or tape.
- Ensure that glazing components held in storage are not subjected to deposits from concrete and masonry building materials or hard water spotting from various sources of tap water at the job site.
- Ensure that stored materials are not exposed to activities of other trades such as welding, painting, insulating, and fireproofing.
- Establish a program for daily inspection of stored glass and glazing systems to monitor conditions and ensure prompt corrective action when needed.
- Follow manufacturer’s guidelines when using temporary protection films.
- Do not allow protective films to remain on the surface beyond their useful life, as removal methods may damage certain types of glass and/or their coatings.
- Do not expose open packs of glass to direct sunlight as the insulating effects of the glass layers may increase the thermal stress in the glass and may result in glass breakage.

**Trade Awareness**

As fenestration materials are delivered to a residential or commercial construction site, it is recommended that the glazing subcontractor and window cleaner contact the general contractor (in person and follow up in writing) to let him know how important it is that he make all construction trades aware of the potential for permanent damage and their level of responsibility in the event materials are subjected to harmful conditions. In the event of damage, prompt action is required to minimize damage.

**Site Handling and Installation**

Glass and glazing system manufacturer’s recommendations for site handling and installation procedures should be followed. Residential and light commercial windows, doors, and skylights should be installed in accordance with ASTM International document E 2112 – Standard Practice for Installation of Exterior Windows, Doors and Skylights. Glass for commercial glazing applications should be handled and installed in accordance with guidelines set forth in the Glass Association of North America (GANA) Glazing Manual.

**Post Installation Inspection and Protection**

After installation, special attention by all trades should be given to construction activities in order to prevent exposure of glass in windows, doors and skylights to weld splatter, paint, plaster, sealants, fireproofing, and alkali and chemical attack. The subcontractor, general contractor, or builder should inspect and document the condition of the glazed materials on a daily basis.

At this stage of construction, the glazing subcontractor should request, in writing, that the general contractor or builder remind other construction trades of the potential for irreparable damage to the glazed materials and to implement systems and procedures for protection. The following is a list of common conditions and causes that damage glass after installation:

**Condition:** Glass surface corrosion often characterized by permanent iridescent or white haze surface staining

**Cause:** Glass got wet during storage due to reasons such as, but not limited to, being stored outside uncovered, or extended storage with inadequate ventilation and/or improper glass separation

**Condition:** Glass surface or edge damage

**Cause:** Inadequate on-site protection; ill-advised or vulnerable storage locations; exposure to other trades

**Condition:** Chemical attack, surface pitting and hard-to-clean deposits

**Cause:** Overspray and runoff of chemicals from sealing/cleaning of concrete, masonry, roofing, etc; inadequate protection and/or poor storage location

**Condition:** Weld-splatter surface damage and reduction in glass strength

**Cause:** Location of glass near welding; inadequate protection of stored or installed glass

**Condition:** Stubborn, tenacious surface deposits from concrete and masonry runoff, as well as hard water spotting

**Cause:** Poor storage and/or protection of uninstalled glass; absence of prompt, interim cleaning of installed glass during construction

### **Construction Clean-Up**

If glass is exposed to harmful materials or conditions during construction, the general contractor or builder and the trade involved, if known, should be immediately advised by the glazing contractor of the potential damage. In the event that damage has already occurred, the glazing contractor and glass fabricator/supplier should be consulted to assess damage, take corrective actions, and mitigate the potential for future damage.

Deep surface scratches, contact by hot weld-splatter and edge damage threaten the structural integrity of glass and may require glass replacement. Surface contact with harmful materials will require prompt cleaning by professional window cleaners, such as members of the International Window Cleaners Association (IWCA).

If harmful exposure results in conditions that cannot be cleaned using typical glass cleaning procedures, a professional window cleaner should be consulted for recommendations on more aggressive glass cleaning procedures. The use of a more aggressive procedure may itself damage the glass. Careful thought and discussion must precede the use of aggressive cleaning procedures.

The general contractor or builder may need to schedule periodic glass cleaning during the construction process. Extended construction schedules and site conditions often result in dirt and debris build-up. Professional cleaning at the initial signs of build-up can decrease the potential for glass damage.

### **Long-Term Building Maintenance & Performance**

Following the completion of the construction project and throughout the life of the building, windows, doors, and skylights should be properly cleaned. Building facades may be exposed to sealant rundown, pollutants, dirt and debris,

which can attack and damage glass surfaces over time. Building maintenance schedules should include frequent cleaning to ensure long-term glass aesthetics and performance. Cleaning frequencies should be tailored to the individual characteristics inherent to these conditions as well as the severity of local environmental factors such as acid rain and atmospheric pollutants that vary from region to region.

Building owners should ensure that individuals cleaning fenestration materials are well aware of the glazing products in the building and their unique properties and are knowledgeable about and capable of using proper cleaning procedures and practices recommended by the glazing manufacturer and the glass industry.

Proper protection of glass in windows, doors, and skylights throughout the construction process and the life of a building are essential. Planning and execution of the practices described and recommended in this Paper will enable the glass to meet the aesthetic and performance expectations and the needs of the building occupants.

Most Glass Technical Papers are available free of charge. Visit [www.glass.org/store](http://www.glass.org/store) for the complete list, as well as other flat glass industry reference materials.

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