



Hurricane Product Substitution

Introduction

Thousands of impact resistant windows, doors, and skylights have been tested and certified since Hurricane Andrew ravaged South Florida in 1992, causing billions in property damage. As a consequence of the damage inflicted by Hurricane Andrew, more stringent standards for window systems were adopted. The requirements put into place the following year called for testing of window and door systems and changes to any component--including framing materials, glazing, sealants, weather stripping, hardware and anchors typically necessitated retesting and recertification.

In order to reduce the cost to the consumer of this retesting as window and door systems were improved, rules were developed by Miami-Dade Product Control on what component changes required re-testing and what retesting was required. Miami Dade component substitution rules are not contained in a single document and are therefore not addressed in this document

ASTM International developed a formalized system of component substitution which is similar to the Miami-Dade rules. ASTM E 1996-2008 *Standard Specification for Performance of Exterior Windows, Curtain Walls, Doors and Impact Protective Systems Impacted by Windborne Debris in Hurricanes* contains a new appendix with this substitution criteria. This document should be read in conjunction with the Appendix.

How Does Component Substitution Get Determined?

The appendix of ASTM E 1996-2008 covers various types of fenestration and window systems, general substitution principles and detailed substitution allowances for glazing and framing systems. The basic objective of the substitution criteria is to balance reliability, safety and the need for feasible testing regimes. There are three substitution categories:

1. Automatic – requiring no additional testing;
2. Engineering Analysis – requiring demonstrated or documented performance through a review of materials that predicates a minimum of equivalent performance; and
3. Single Specimen – requiring one specimen, identical to the original specimen qualified with the only difference being the element to be substituted (i.e. interlayer type for laminated glass).

Full qualification is defined as a minimum of three new specimens being qualified with no credit given for any past test specimens. Full qualification is not considered part of the substitution

parameters as it is required when the desired substitutions are too extensive for a single product and have multiple variables that cannot be tested in a single test. Full qualification is a new test program that allows unlimited changes to any product as it is not limited by previous design parameters.

This document covers the basic substitution information for glazing only. The full guidelines can be found in ASTM E 1996-2008.

General Rules for Substitution

General premises for substitution require that three initial specimens OUT OF FOUR have passed all the appropriate criteria in ASTM E 1996-2008 and that the original specimens are identical in every way, including anchorage and mounting. The general premises that apply to any substitution are:

- Large size qualifies smaller as long as dimensions do not exceed dimensions of tested width or height.
- Small missile – all elements that are not infill elements shall be allowed automatically.
- Automatically substituted elements shall be allowed to be combined into a system without requiring engineering analysis or testing.
- New components shall be equal to or stronger than the components originally tested.
- Substitution shall not raise the design pressure above that at which the three initial specimens were qualified.
- Substitution not allowed if a failure occurs for ANY reason.
- No more than THREE substituted elements combined before retest.
- Glazing tapes, sealants, adhesives & back bedding substitution requires single test.
- Glazed products must be impacted twice per unit (even if initial panels only had one impact per unit).

Glass Infil Panels Rules:

- Color change is automatic, no additional testing is necessary.
- Substitution of a glass coating (reflective, coated, low-e, frit etc...) is automatic once it is determined that the product is durable and compatible with all the components of the system.
- Individual glass ply thickness increase shall require the testing of one additional specimen. A substitution with a decrease in glass ply thickness shall not be allowed.
- A glass type change from annealed to heat strengthened or chemically strengthened shall require the testing of one additional specimen.
- Glass type change from heat strengthened to annealed or heat-strengthened to chemically-strengthened shall not be allowed.
- Glass type change “To” or “From” fully tempered shall not be allowed.
- Glass decorative surface (sandblasted, acid etch etc.) substitution shall not be allowed.

Rules for Interlayers

- Any substitution of interlayer manufacturer or type shall require the test of one additional specimen that is identical to the initial three qualified with the only change being the interlayer type or brand.
- Decrease of the interlayer thickness of more than 10% for the same type interlayer as was originally qualified shall not be allowed.
- A decrease of interlayer thickness up to 10% for the same type or brand interlayer as was originally qualified shall require one test.
- Increase of the interlayer thickness of the same manufacturer and type as was originally qualified is automatically accepted.
- A change of interlayer color of the same manufacturer and type as was originally qualified is automatically accepted.
- Interlayer decorative treatment of the same manufacturer and type as was originally qualified is automatically accepted provided the decorative treatment does not contact the glass or plastic glazing. (Is located between two layers of interlayer)

Rules for Insulating Glass Units

- Glazing detail shall be unchanged other than to accommodate the thicker unit.
- Monolithic or laminated lite shall be attached to the glazing leg or bed in the same manner and position as originally tested.
- Changing the air spacer systems WITH a glazing stop or bead needs a single test.
- Changing the air spacer systems WITHOUT a glazing stop or bead is automatic.
- Changing from a system approved with an insulating glass unit to a monolithic or single laminated unit shall not be allowed.
- Asymmetrical insulating glass unit orientation (order of lites from outboard to inboard) of an asymmetrical insulating glass unit from the approved orientation shall not be allowed.

Conclusion

Complete systems must be designed for hurricane impact glazing. Hurricane component substitution rules allow manufacturers to reduce costs in certifying new glazing components if they are tested in an already approved system. This can translate into lower product development costs, and allows manufacturers to widen their product offerings more rapidly in an effort to respond to changing market or project needs, all while offering the customers the best glazing solution possible.

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