

## Safety Glazing

The Consumer Product Safety Commission (CPSC) developed the guidelines for Testing and Certifying Safety Glazing Glass Products used in Architectural applications of glass products (Glass Products used in Windows for Residential and Commercial Applications). This Certification Process can be certified through an independent organization (SGCC) or by self certifying the product. Some glass manufacturers self certify their products. Cardinal has elected to use SGCC (the Safety Glazing Certification Council) to conduct independent testing of our products to assure our customers and ourselves that we are supplying safety glazing materials that meet the requirements of CPSC and SGCC. Cardinal permanently logo's our glass products used in safety glazing applications to indicate that we meet the requirements of SGCC and CPSC.

The local and national building codes recognize the CPSC 16 CFR 1201 Cat 1 and Cat 11 (Category 1 and Category 11) as the standard that must be met for glass products used in windows. Cat 1 is for products less than 9 sq. ft. and Cat 11 is for products of unlimited size. The testing

requirements for Cat 1 and Cat 11 are different with Cat 11 being more stringent. Cardinal tests to Cat 11 as we naturally fabricate products greater than 9 square feet.

For ANSI Z-97.1 2004, (American National Standards Institute), the testing for certification is very similar to what is required to meet the CPSC standard requirements. The local and national building codes for safety glazing glass products recognizes the ANSI Z 97.1 2004 criteria for safety glazing products used in applications other than windows i.e. aquariums, freezer doors, interior applications (i.e. malls), handrails, etc. Some of Cardinal plants supply safety glazing glass products for these applications and therefore are in the composite program of SGCC (CPSC and ANSI). To be in this program, additional testing of safety glazing materials needs to be done and the CPSC 16 CFR 1201 Cat 11, ANSI Z 97.1, and SGCC identifier logo will be placed on the glass.

Safety Glazing may be required to meet any local and/or national building codes. The Safety Glazing Certification Council (SGCC) provides for the certification of safety glazing materials found to be in compliance with one or both of the following specifications: A comparison of the ANSI Z-97.1-2004, CPSC 16CFR1201 I and CPSC 16CFR 1201 II standards is listed on next page.

**SAFETY GLAZING STANDARDS**

	<b>ANSI Z-97.1-2004</b>	<b>CPSC 16 CFR 1201 I</b>	<b>CPSC 16 CFR 1201 II</b>
Use of Standard	To test and identify glasses as safety glazing materials which will be used in locations where required in building codes. Monolithic annealed glass in any thickness, is not considered a safety glazing material under this standard.	To test and identify glasses as safety glazing materials which will be used in any location that is subject to human impact resistance requirements (limited to products having an area not greater than 9 sq. ft.)	To test and identify glasses as safety glazing materials which will be used in any location that is subject to human impact resistance requirements (unlimited size)
Impact Test Requirements	Class A: 100# bag dropped from height of 48 inches Class B: 100# bag dropped from height of 18 inches Class C: 100# bag dropped from height of 12 inches	100# bag dropped from height of 18 inches	100# bag dropped from height of 48 inches
Evaluation Criteria for Tempered Glass to Pass Standard	a. No fracture at specified Class drop height or, b. if fracture occurs at the specified Class drop height, the ten largest crack free particles shall not weigh more than 10 square inches of the glass tested	a. No fracture at 18 inches or, b. if fracture occurs, the ten largest crack free particles shall not weigh more than 10 square inches of the glass tested	a. No fracture at 18 inches or, b. if fracture occurs, the ten largest crack free particles shall not weigh more than 10 square inches of the glass tested
Evaluation Criteria for Laminated Glass to Pass Standard	a. No fracture at specified Class drop height or, b. if fracture occurs at the specified Class height, no hole through which a 3 inch diameter sphere will freely pass is allowed	a. No fracture at 48 inches or, b. if fracture occurs, the ten largest crack free particles shall not weigh more than 10 square inches of the glass tested	a. No fracture at 48 inches or, b. if fracture occurs, no hole through which a 3 inch diameter sphere will freely pass is allowed
Evaluation Criteria for Wired Glass to Pass Standard	a. No fracture at 12 inches or, b. if fracture occurs, no hole through which a 3 inch diameter sphere will freely pass is allowed	Not Applicable	Not Applicable

The attached GANA (Glass Association of North America) information details the differences between the CPSC and ANSI standards.

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## **Differences Between Safety Glazing Standards CPSC 16 CFR 1201 and ANSI Z97.1-2004**

In 1977, the U.S. Consumer Products Safety Commission (CPSC) adopted as a mandatory federal safety regulation *Safety Standard for Architectural Glazing Materials*, codified at 16 CFR Part 1201<sup>1</sup>. The CPSC amended its *Safety Standard for Architectural Glazing Materials* on several occasions subsequent to its initial adoption, the last time on June 28, 1982.

In 1966, an Accredited Standards Committee comprised of industry and public sector members first developed the *American National Standard for Safety Glazing Materials Used in Buildings – Safety Performance Specifications and Methods of Test*, under the auspices and protocol of the American National Standards Institute (ANSI). This ANSI standard has been reviewed and either renewed or revised periodically ever since, the last time in 2004. Its current version is ANSI Z97.1-2004<sup>2</sup>.

Set forth below are the more significant differences between these two standards, both standards applicable to safety glazing materials used in architectural applications. This bulletin makes no attempt to summarize all pertinent provisions of the two standards, only their significant differences.

### **Scope**

The principal differences between the CPSC's 16 CFR 1201 standard and the ANSI Z97.1-2004 standard relate to their scope and function. The CPSC standard is not only a test method and a procedure for determining the safety performance of architectural glazing, but also a federal standard that mandates where and when safety glazing materials must be used in architectural applications and preempts any non-identical state or local standard. In contrast, ANSI Z97.1 is only a voluntary safety performance specification and test method. It does not attempt to declare when and where safety glazing materials must be used, leaving those determinations up to the building codes and to glass and fenestration specifiers.

### **Application**

The CPSC requires the installation of safety glazing materials meeting 16 CFR 1201 only in storm doors, combination doors, entrance-exit doors, sliding patio doors, closet doors, and shower and tub doors and enclosures. Other than that, meeting CPSC's requirements is necessary only when and if a building code authority or other jurisdiction adopting safety glazing laws specifically mandates that safety glazing comply with the CPSC standard, 16 CFR 1201 – and most building codes do.

ANSI Z97.1, as a voluntary standard, applies only when, where, and if it is adopted by a building code authority or is specified in the approved plans and specifications of the architect, building contractor, or other glass specifier.

### **Test Specimens**

For impact testing, the CPSC requires only one specimen of each nominal thickness be submitted for testing and specifies it must be the largest size the manufacturer produces up to a maximum of size of 34" by 76".

ANSI Z97.1 requires that four specimens of each nominal thickness and size must be impact-tested. The manufacturer has the option of testing either 34" by 76" (+/- 1/8-inch) specimens or the largest size it commercially produces less than 34" by 76", but with a minimum size of 24" by 30".

### **Types of Glass**

The CPSC standard has no performance tests for plastics or for bent glass. ANSI Z97.1 has specific tests for both.

The CPSC exempts polished wired glass from its standard when used in fire rated applications and has no separate impact test specifically designed for or applicable to wired glass. ANSI Z97.1 has a separate impact test category just for fire-resistant polished wired glass.

The CPSC standard does not prohibit the use of ordinary annealed glass in hazardous locations as long as it passes the appropriate impact tests, consistent when the concept of a performance based impact test. (Thick, heavy annealed glass is likely to pass the CPSC 18-inch drop-height and 48-inch drop-height impact tests for Category I and II locations.) ANSI Z97.1-2004 contains an express limitation on annealed glass: "Monolithic annealed in any thickness is not considered safety glazing material under this standard."

### **Asymmetrical Glazing Material**

The CPSC standard requires all asymmetrical glazing materials to be impacted on both sides of each specimen and then evaluated under the pass-fail criteria. There is no exception.

ANSI Z97.1 requires that, with the exception of mirror glazing, all asymmetrical glass specimens must be impacted on both sides: two on one side and two on the other. With respect to mirror glazing products using reinforced or non-reinforced organic adhesive backing, all four specimens must be impacted only on the non-reinforced side “and with no other material applied.”

### **Impact Categories or Levels**

The CPSC standard has two distinct impact levels or categories, Category I and Category II, and specifies which defined hazardous location must contain Category II safety glazing materials and which may use Category I glazing materials. Glazing material successfully passing the impact test of a 48-inch drop height, a 400 foot-pound impact, is classified as “Category II” glass. Glazing material passing the 18-inch drop height, a 150 foot-pounds impact, is classified as “Category I” glass.

ANSI Z97.1 has adopted three separate impact categories or classes, based upon impact performance. ANSI Z97.1’s Class A glazing materials are comparable to the CPSC’s Category II glazing materials, passing a 48-inch drop height test, and its Class B glazing materials are comparable to the CPSC’s Category I glazing materials, passing the 18-inch drop height test. ANSI Z97.1 also has a product-specific Class C impact test, a 12-inch drop height test, applicable only for fire-resistant glazing materials.

### **Pass-Fail Impact Criteria**

The CPSC standard, like the ANSI standard, offers alternative criteria for evaluating whether a test specimen passes the impact test. The CPSC standard considers the specimen a pass if a 3-inch diameter solid steel ball, weighing 4 lbs., will not pass through the opening when placed on the horizontal specimen for one second. ANSI also used the 3-inch sphere measure, but does not require the sphere be a steel ball or specify the weight of the 3-inch sphere. It does require the sphere not pass freely through the opening when a force of 4 lbs. is applied to the sphere while the specimen is in a vertical position. There is no time element associated with this alternative.

A second alternative pass-fail criterion under the CPSC standard involves weighing the 10 largest particles selected within five minutes after the impact test – they must weigh no more than the equivalent weight of 10 square inches of the original specimen. The ANSI standard has an identical criterion, except it also includes product-specific qualifications applicable solely to selecting the 10 largest particles of tempered glass and offers a formula for determining the weight of 10 square inches of the original specimen.

The CPSC standard has no separate pass-fail impact criteria for the scenario in which the glass specimen separates from the frame after impact and breaks or produces a hole in the glass. The ANSI standard has a special criterion for that scenario – to pass, the glass is subjected to the same 3-inch sphere measure or to the weight criterion for the 10 largest particles.

The CPSC standard involves impact-testing of only a single specimen of each nominal glass thickness. Accordingly, if that specimen passes, all glass of that type and thickness is deemed to pass. Under the ANSI standard, four specimens of each type, size, and thickness must be impact tested, and if any one of the four specimens fails, there is a failure of that specific type, thickness, and size.

### **Labeling**

The CPSC standard, with one exception does not require labels on safety glazing materials. Organic coated glass, tested the environmental durability from one side only, must be labeled, according to the CPSC standard: it must have a permanent label on the coating stating, “Glaze This Side In,” and must contain a “message” remaining on the glass until installation stating, “See Permanent Label for Important Mounting Instruction.”

The CPSC statute, 15 U.S.C. § 2063, requires the safety glazing manufacturer to issue a certificate of compliance, certifying its glass conforms to the requirements of the 16 CFR 1201, either Category I or Category II. The CPSC standard permits (but does not require) this certification of compliance to take the form of a permanent label on the glass as long as the label contains all the statutorily mandated certification information: that is, it must specify “16 CFR 1201 Cat. I or II,” the name of the manufacturer, and the date and place of manufacture. (If the fabricator or manufacturer elects not to inscribe this certification information on a label applied to the safety glazing materials, the manufacturer must include this information on a separate paper or document accompanying the glass when shipped from the fabricator to the glass distributor or retailer.)



ANSI Z97.1 requires permanent labeling. The label must contain the glass supplier's name, distinctive mark, or designation, the characters "ANSI Z97.1-2004," either an "L" or a "U" indicating test size, either "A," "B," or "C," indicating the drop height class (Except plastic glazing does not require the drop height class designation), and the place of fabrication if the fabricator has more than one fabricating location. ANSI Z97.1 permits additional information the label, including glass thickness and date of manufacture.

ANSI Z97.1 specifies how to label glazing materials cut to size after manufacturing – stock sheets of laminated and fire-resistant wire glass must be labeled by the manufacturer, and all cut-sizes of laminated, fire-resistant wire glass, and tempered glass must be labeled by the company producing the cut-to-size glass. The safety-film installer must label all field-applied organic coatings (films). Glazing materials intended for use in indoor applications only must be permanently marked with the words "Indoor Use Only," and the phrase, "Glaze This Side In," on all organic-coated glass that has a specific side that should be exposed.

### **Certification**

Neither the CPSC standard nor the ANSI Z97.1 standard requires third-party testing, certification, or labeling. However, the CPSC, as noted above, requires that a certification of compliance accompany all safety glazing materials, but, as an alternative, permits this certification to take the form of a permanent label on the glass. The CPSC standard permits the manufacturer to self-certify as long as it is able to certify compliance with 16 CFR 1201 based upon "a reasonable testing program." The CPSC standard does not define "a reasonable testing program," but it contemplates periodic testing, the frequency of which is dependent upon unspecified factors associated with the nature of the glass and manufacturing process of the fabricator. ANSI Z97.1 does not address certification.

### **Impact Testing Apparatus**

Relatively minor technical differences exist between the test frames and impactors specified in the CPSC standard and those in ANSI Z97.1. The ANSI standard prescribes special test frame and subframe configurations for impact-testing bent glass; the CPSC standard has no provisions for testing bent glass. The ANSI standard includes detailed specifications for the impactor suspension device and traction and release system and for their operation; the CPSC standard does not.

### **Weathering Tests**

The CPSC standard requires a weathering test only for organic coated glass. ANSI requires a weathering test for laminated glass and plastics as well as for organic coated glass.

The CPSC accelerated weathering test (only for organic coated glass) uses the xenon arc Weatherometer. The ANSI standard gives the manufacturer the choice of one of three weathering exposure alternatives, the xenon arc exposure, the enclosed twin carbon arc exposure, or the one-year outdoor exposure in South Florida. The ANSI prescribed xenon arc apparatus and procedure are the more current versions of the pertinent ASTM standard,<sup>3</sup> ASTM G155-00 and ASTM D2565-92A, than the versions referenced in the CPSC standard. The CPSC's xenon arc procedure for interpreting results of the adhesion test requires an average adhesion value or pull force of no less than 90% of the average of the unexposed organic-coated glass specimens in order to "pass," whereas the ANSI standard requires no less than 75% of the average of the unexposed specimens.

### **Modulus and Hardness Tests**

The CPSC standard contains no modulus or hardness test whereas the ANSI standard requires both, but only for plastic glazing materials.

### **Indoor Aging Tests**

The CPSC standard does not prescribe any indoor aging test; the ANSI standard requires specified indoor aging tests for plastics and organic coated glass intended for indoor-use only, followed by impact tests.

### **Non-Architectural Applications**

Neither the CPSC nor the ANSI standard claims to require or address the use of tested safety glazing materials in non-architectural applications, not even in consumer products incorporating glass, such as fire-place screens, table tops, or similar furniture, subject to human impact. No state or local laws or ordinances are known to mandate safety glazing in these non-architectural applications either.



Notwithstanding the absence of a law or regulation requiring safety glazing materials, a potential personal-injury lawsuit asserting product liability could call into question the reasonableness of the actions of the product manufacturer, specifier, fabricator, or distributor who is responsible for installing non-safety glass in a product subject to human impact. The recognized industry standard of care to which the court holds the “defendant” accountable may dictate the use of safety glazing materials in that particular application.

*The Glass Association of North America (GANA) has produced this Glass Informational Bulletin solely to provide general information as to principal differences between the federal safety regulation CPSC 16 CFR 1201 and American National Standard ANSI Z97.1-2004. This bulletin makes no attempt to summarize all pertinent provisions of the two standards or to indicate where and when safety glazing materials must be used. The user of this Bulletin has the responsibility to ensure that building code requirements and project specifications are considered to determine where and when safety glazing materials must be used. GANA disclaims any responsibility for any specific results related to the use of this Bulletin, for any errors or omissions contained in the Bulletin, and for any liability for loss or damage of any kind arising out of the use of this Bulletin.*

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<sup>1</sup> U.S. Code of Federal Regulations: Title 16, Volume 2; Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402, United States

<sup>2</sup> American National Standards Institute, 11 W. 42 Street, New York, NY 10036, United States, Phone: 212.642.4900, Website: [www.ansi.org](http://www.ansi.org)

<sup>3</sup> ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959, United States, Phone: 610.832.9500, Website: [www.astm.org](http://www.astm.org)

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