UNITED STATES
CONSUMER PRODUCT SAFETY COMMISSION
4330 EAST WEST HIGHWAY
BETHESDA, MD 20814

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BALLOT VOTE SHEET

Date: April 3, 2013

TO : The Commission
Todd A. Stevenson, Secretary

THROUGH: Kenneth R. Hinson, Executive Director
Stephanie Tsacoumis, General Counsel

FROM : Patricia M. Pollitzer, Assistant General Counsel, RAD

SUBJECT : Petition CP12-3; Architectural Glazing Petition

BALLOT VOTE DATE: April 9, 2013

Staff is forwarding to the Commission a briefing package concerning a petition (CP12-3) submitted by counsel for the Safety Glazing Certification Council (SGCC). The petition requests that the Commission initiate rulemaking to amend 16 C.F.R. part 1201, *Safety Standard for Architectural Glazing Materials*, to replace the testing procedures in section 1201.4 of the standard with the testing protocol in ANSI Z97.12009$^{\epsilon}$, *American National Standard for Safety Glazing Materials Used in Buildings – Safety Performance Specifications and Methods of Test*. The staff recommends that the Commission grant the petition.

Please indicate your vote on the following options:

I. Grant Petition CP 12-3.

_____ _____
Signature Date

II. Deny Petition CP 12-3 and direct staff to draft a letter of denial to the petitioner.

_____ _____
Signature Date

III. Defer decision on Petition CP 12-3.

_____ _____
Signature Date

IV. Take other action (please specify):

_____

_____

_____

_____ _____
Signature Date

Attachment: Architectural Glazing Petition Briefing Package

Architectural Glazing Petition Briefing Package

Petition CP12-3
Request to Initiate Rulemaking to Amend 16 C.F.R., part 1201:
Safety Standard for Architectural Glazing Materials

April 3, 2013

For Additional Information, Contact

Brian M. Baker, Project Manager
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Table of Contents

Executive Summary

On June 26, 2012, the U.S. Consumer Product Safety Commission (CPSC or Commission) received a letter from William M. Hannay, counsel for the Safety Glazing Certification Council (SGCC), requesting that the Commission initiate rulemaking to amend 16 C.F.R. part 1201,[1] *Safety Standard for Architectural Glazing Materials* (the mandatory standard). The petitioner asserts that the public and the manufacturers of architectural glazing products would be better served by replacing the older testing procedures found in section 1201.4 of the mandatory standard, with the more modern testing protocol in ANSI Z97.12009$^{\epsilon}$, *American National Standard for Safety Glazing Materials Used in Buildings – Safety Performance Specifications and Methods of Test* (the ANSI standard).

The petitioner and several of the commenters represent that private industry commonly tests to both standards to certify their product for use. The petitioner adds that by testing under the ANSI standard only, the glazing industry would avoid the expense of duplicative testing using outdated methodology, which ultimately would result in less variance in collected data and would result in the production of glazing materials that would be less likely to expose consumers to an unreasonable risk of injury. Additionally, the petitioner notes that the test procedures in the mandatory standard have not been significantly updated since they were originally promulgated in 1977. On the other hand, ANSI Z97.1 has been revised regularly, the petitioner notes, to require more rigorous testing of a broader range of architectural glazing products.

As noted by the petitioner, the ANSI standard requires testing of multiple samples to meet the ANSI standard's additional testing and durability requirements. In contrast, the mandatory standard does not impose these additional test procedures and has been interpreted to require only one sample for testing. Hence, the petitioner believes that the ANSI standard is the more rigorous test. In Exhibit C to the petition, located within this package at Tab A, the petitioner lists other differences between the two standards.

The petitioner also regards the mandatory standard as a source of confusion for architects, manufacturers of glazing products, and third party testing laboratories. The petitioner's position was supported by four out of the five comments received during the 60 day comment period, one of the comments in favor of petitioner's position was submitted by a third party testing laboratory.

Staff believes that ANSI Z97.1-2009$^{\epsilon}$ is the more technically advanced standard. ANSI Z97.1-2009$^{\epsilon}$, staff maintains, provides greater clarity than the mandatory standard, and it offers more data on the product to the fabricator.

[1] Petition CP 12-3, Tab A.

The current version of the ANSI standard is referenced in several building codes[2]; and the standard is also referenced in several new standards, such as the standard for glass table tops; however, the petitioner notes, the mandatory standard does not cover these items. When the mandatory standard was first issued, it was nearly identical to ANSI Z97.1-1975. However, as glazing methods and testing technology improved, and the range of products using safety glass expanded, the ANSI standard was updated continually, but revisions to the mandatory standard were minimal and infrequent.

Participating hospitals in CPSC's National Electronic Injury Surveillance System (NEISS) recorded 1,266 cases from 1980 to 2011 of emergency department treated injuries associated with architectural glazing products. Ninety-seven percent of the cases involved treatment of lacerations. The three largest contributors to injuries treated in NEISS hospital emergency departments were glass or partial glass storm doors, accounting for 47 percent of the injuries. Shower doors and enclosures and sliding glass doors each accounted for 22 percent of the treated injuries. Within CPSC's incident databases (IPII, INDP and DTHS) which include incidents submitted by the public to CPSC along with consumer product related news clippings, death certificates, and coroner or medical examiner reports, staff identified 324 incidents associated with architectural glazing products since 1978. Ninety five fatalities were reported in these 324 incidents. Of the non-fatal reported incidents, 66 percent were associated with shower doors and enclosures. Glass or partial storm doors were associated with 18 percent of the non-fatal reported incidents while sliding glass doors were associated with 7 percent of the reported incidents.

Based on information provided by SGCC, staff describes the possible effects on manufacturers if the mandatory standard test procedures were replaced by the ANSI standard test procedures. The SGCC conducts certification testing for most of the industry (approximately 70 percent by their estimate). Currently, of the products certified through SGCC, 98 percent are reportedly tested to both the mandatory standard and the ANSI standard. Consequently, if the voluntary standard were made mandatory, SGCC estimates the great majority of its customers (who currently certify to both standards) would significantly reduce their overall certification costs. Manufacturers whose products are not certified by SGCC would also likely benefit, to the extent that they also test to both standards. However, manufacturers that currently test only to the existing mandatory standard would see their testing costs rise because of the more extensive testing and sampling requirements of the ANSI standard.

Staff recommends that the Commission grant the petition and direct staff to initiate the rulemaking process to amend the mandatory standard's test procedures. Staff will work to incorporate the follow-on rulemaking project and associated resources in the FY2014 Operating Plan. Substituting the ANSI standard testing methods for the mandatory standard testing procedures would bring the test procedures of the current regulation up to date with modern practices. The mandatory standard references out-of-date standards and practices that are not used in current industry testing. In addition to improvements to

[2] International Building Code (IBC) 2012, International Residential Code (IRC) 2012

current test methods, staff estimates that the majority of the glazing industry, which SGCC represents, will see a reduction in the cost of fabricating, shipping, and testing samples.

Granting the petition and amending the mandatory standard as requested by the petitioner is likely to have only a small effect on injuries and deaths associated with architectural glazing (i.e., to the extent that testing to the voluntary standard by the 1-2% who currently do not test to it, will result in safer glazing materials). In reviewing current incident reports, the amount of detail needed to identify whether the product was tested under the mandatory regulation or the voluntary standard is lacking.

UNITED STATES
CONSUMER PRODUCT SAFETY COMMISSION
BETHESDA, MD 20814

This document has been electronically approved and signed.

Memorandum

Briefing Memorandum

Date: April 3, 2013

TO : The Commission
Todd A. Stevenson, Secretary

THROUGH : Stephanie Tsacoumis, General Counsel
Kenneth R. Hinson, Executive Director
Robert J. Howell, Deputy Executive Director for Safety Operations

FROM : DeWane Ray, Assistant Executive Director,
Office of Hazard Identification and Reduction

Brian M. Baker, Mechanical Engineer, Project Manager
Division of Mechanical Engineering, Directorate for Laboratory Sciences

SUBJECT : Architectural Glazing Petition

Staff of the U.S. Consumer Product Safety Commission (CPSC or Commission) has prepared this briefing package in response to a petition requesting that the Commission initiate rulemaking to replace the test methods found in section 1201.4 *Safety Standard for Architectural Glazing Materials* (the mandatory standard), with the methods found in the voluntary standard, ANSI Z97.1-2009ϵ, *American National Standard for Safety Glazing Materials Used in Buildings – Safety Performance Specifications and Methods of Test* (the ANSI standard).

I. BACKGROUND

On June 26, 2012, the Commission received a letter from William M. Hannay, counsel for the Safety Glazing Certification Council (SGCC), asking the Commission to initiate rulemaking to amend the mandatory standard, by substituting the testing provisions of the voluntary ANSI Z97.1-2009ϵ standard for the testing procedures in the mandatory standard. The Office of the General Counsel docketed the request as a petition under the Consumer Product Safety Act, [3] and the Commission published a request for comments in the *Federal Register* on August 30, 2012.[4] These comments, and staff's responses to issues raised by the comments, are discussed in Section E of this briefing memo.

[3] Docketed CP 12-3. See Tab A.
[4] 77 FR 52635. See Tab B

The petitioner maintains that the public would be better served by replacing the mandatory standard testing procedures with the voluntary standard testing procedures, which are revised regularly. The petitioner further maintains that the glazing industry also will avoid the expense of duplicative testing.

Architectural glazing is a type of glass building material typically strengthened through one of several processes including, but not limited to, annealing, laminating, tempering, toughening, heat strengthening, and chemical strengthening. Glazing products are commonly used as a type of structural glass, thereby making such products suitable for use in storm doors, bathtub and shower doors, and sliding glass doors, among other uses.

Glazing products currently are regulated by the *Safety Standard for Architectural Glazing Materials*, 16 C.F.R. part 1201, which specifies certain testing requirements for products designed to help ensure that upon failure or fracture of the glass, the resulting fragments do not pose a threat to consumer safety.

To support the claim that the requested action is necessary, the petitioner highlights Congress's expressed preference in consumer product safety standards, "whenever compliance with such voluntary standard would eliminate or adequately reduce the risk of injury addressed and it is likely that there will be substantial compliance with such voluntary standards." Petition at p. 6. Additionally, the petitioner notes that the mandatory standard was heavily influenced by ANSI Z97.1-1972, and the mandatory standard has not been revised significantly since its promulgation in 1977. The petitioner points out that ANSI Z97.1 has: "continued to evolve and improve through and including the current . . . version, and has been regularly modified to deal with important issues that have arisen over years." (Id).

The petitioner notes that the mandatory standard does not provide a testing method for several commonly used forms of architectural glazing, such as bent glass, which is used in both commercial and residential applications. The petitioner notes that the ANSI standard requires multiple samples be tested to meet the ANSI standard's additional testing and durability requirements. In contrast, the mandatory standard does not have these additional test procedures and has been interpreted to require only one sample for testing. In Exhibit A to the petition, the petitioner lists other differences between the two standards and concludes that the ANSI standard provides for a more rigorous testing process. The petitioner requests that the Commission amend the existing consumer product safety standard.

II. DISCUSSION

A. Incident Data

The memo at Tab C provides CPSC staff's review of incidents involving injuries related to architectural glazing.

CPSC Reported Injuries and Deaths

Staff searched the Injury and Potential Injury Incident (IPII), In-Depth Investigation IDI), and Death Certificate databases for injuries reported to the Commission and identified 324 incidents for the period from 1978 to 2012.[5] Since 1978, 95 architectural glazing-related fatalities were reported to the CPSC. Shower doors and enclosures accounted for 53 percent of the injuries and deaths. Glass or partial glass storm doors accounted for 20 percent of the reported injuries and deaths, and sliding glass doors accounted for 11 percent of the reported injuries and deaths. Very few of these reported incidents indicate multiple persons as victims. At least two of the incidents involve wired glass, which is exempt from the mandatory standard.

Source	Injury(1)	Hospitalized	Death	Total	Percent
1978-1982	9	2	14	25	8%
1983-1987	14	4	20	38	12%
1988-1992	9	7	21	37	11%
1993-1997	40	7	8	55	17%
1998-2002	44	7	6	57	18%
2003-2007	28	2	19	49	15%
2008-2012	54	2	7	63	19%
Total	198	31	95	324	100%
Percent	61%	10%	29%	100%	

Table 1: Reported Architectural Glazing Breakage Incidents by Five-Year Period, 1978–2012

Table 1 presents the incident data summarized by injury severity within 5-year time periods. The data does not appear to reflect a trend. The slight increase of reported incidents over the 35-year period may be due to increased use of the product or an increased recognition of ways to report complaints.

[5] CPSC staff searched these databases: Injury and Potential Injury Incident, In-Depth Investigation, and Death Certificate databases.

Emergency Department Treated Injuries (NEISS Database)

In addition to reviewing the CPSC Databases, staff also found 1,266 cases during the period from 1980 through 2011 involving injuries from architectural glazing products treated in the emergency departments of CPSC's National Electronic Injury Surveillance System (NEISS) member hospitals (Table 2). For the most recent 20 years of available data, 1992 to 2011, staff found 934 such cases. Based on these cases, staff computed a national estimate of 46,100 emergency department-treated injuries, with a coefficient of variance (C.V.) of 13.49 percent. The 95 percent confidence interval for this estimate is 33,900 to 58,300. Ninety-seven percent of the cases during the 1992 to 2011 period, which were reviewed by staff, involved lacerations. More than two-thirds of the emergency department treated injuries occurred to the arm (43%) or hand (25%). Glass or partial glass storm doors were associated with 47 percent of the emergency department treated injuries. In contrast, sliding glass doors and shower doors and enclosures accounted for less than half of the portion of such injuries, 22 percent each.

Source	NEISS Cases	Estimated Total	Coefficient of Variation	Lower 95% Confidence Bound	Lower 95% Confidence Bound
1992-1995	307	18,000	0.2588	8,900	27,200
1996-1999	197	10,100	0.1639	6,800	13,300
2000-2003	265	11,600	0.1326	8,600	14,600
2004-2007	93	3,700	0.1934	2,300	5,100
2008-2011	72	2,700	0.2338	1,500	3,900
Total	934	46,100	0.1349	33,900	58,300

Table 2: NEISS Hospital Estimated Architectural Glazing Breakage Incidents Grouped by Four-Year Period, 1992–2011

Again, focusing on the 934 incidents from the last 20-year period (1992 to 2011), staff generated an estimate of 46,100 emergency department-treated injuries for the 20-year period. Staff reported that during this 20-year time period, the estimated number of emergency department-treated architectural glazing breakage incidents declined from 18,000 in the first 4-year period (1992 to 1995), to 2,700 in the latest 4-year period (2008 to 2011), representing an 85 percent drop in recorded cases.

B. Health Sciences Analysis—Injuries from Non-Safety Architectural Glazing

Collision with architectural glazing materials that do not meet federal regulations and the products that incorporate these materials, have the potential to produce severe laceration, puncture, and penetration injuries, which may prove fatal. The mass and motion of the body are critical determinants of whether the impact of the body with the glass will lead to the glass shattering.

When subjected to a hard enough impact, architectural glazing materials commonly referenced as "safety glass" or "safety glazing materials", often shatter into fragments. These fragments can range in size, sharpness, and hardness, depending on how the product was treated by the manufacturer during production. In comparison, non-safety glass often fragments into large, sharp shards, of which their weight alone could pose a serious risk to consumer safety. Lacerations are the most common hazard associated with glazing failures, and can range from superficial to extreme in their severity. Severe injuries often require surgery and rehabilitation, which may result in the loss of motion, sensation, or permanent disfigurement.

The majority of emergency department treated cases during the 1980 to 2011 time period involved laceration. Injury severity ranged from minor lacerations, abrasions, and contusions, to more severe laceration, puncture, and penetration injuries. The body part most often involved in these incidents was the arm (43%), hand (25%), and leg (13%). The incidents captured in NEISS suggest that the most severe injuries (*i.e.*, injuries that necessitated transfer to another hospital or admission to the hospital where emergency room treatment was provided) represented approximately 5 percent of the total.

Although many incident reports lacked detailed information about the injury, a review of the incidents from the CPSC databases suggests that many of the injuries and deaths resulted from products that did not meet the mandatory standard; the deep laceration injuries and puncture and penetration wounds reported in these incidents, some of which were fatal, most likely resulted from large glass fragments produced by broken pieces of non-safety glass.

C. Mandatory and Voluntary Standards

1. Mandatory Standard—Scope and Requirements

Under 16 C.F.R. part 1201, "Glazing material" is defined as "glass, including annealed glass, organic coated glass, tempered glass, laminated glass, wired glass or combination thereof where these are used." 16 C.F.R. § 1201.2 (a)(11). The architectural products that are subject to the safety requirements for glazing materials are "storm doors or combination doors, bathtub doors and enclosures, shower doors and enclosures, and sliding glass doors (patio-type)." 16 C.F.R. § 1201.1 (a)(1). Section 1201.3(b) provides that any architectural material that has not been listed in the regulation is not subject to the requirements of the entire regulation.

The mandatory standard exempts the following items:

"(1) Wired glass used in doors or other assemblies to retard the passage of fire where required by federal, state, local, or municipal fire ordinance.
(2) Louvers of jalousie doors;
(3) Openings of doors which a 3 inch diameter sphere is unable to pass;
(4) Carved glass[. . .] dalle glass[. . .] leaded glass [. . .] used in doors and glazed panels . . . if . . . the coloring, texturing, or other design qualities cannot be removed without destroying the material; the primary purpose is decorative; and the glazing material is conspicuously colored or textured so as to be plainly visible and identifiable as aesthetic or decorative rather than functional . . . The glazing material is divided into segments by conspicuous and plainly visible lines;
(5) Glazing materials used as curved glazed panels in revolving doors;
(6) Commercial refrigerator cabinet glazed doors."

-16 C.F.R. §1201.1(c)

The mandatory standard's overall intent is "to reduce or eliminate unreasonable risks of death or serious injury to consumers when glazing material is broken by human contact." The standard requires that glazing materials within the scope of the standard must meet an impact test and environmental durability tests. They also must comply with certain labeling requirements.

The mandatory standard requires that "all glazing material to which [the] standard is applicable…shall meet the impact and environmental test requirements in §1201.4 [testing methods]…"

2. ANSI Z97.1-2009$^{\epsilon}$ – Scope and Requirements

ANSI Z97.1-2009$^{\epsilon}$ was developed by a consensus committee and is subject to a review by committee on a continual basis. It stands as a successor to the 2004, 1984 (reaffirmed in 1994), 1975, 1972, and 1966 editions. As stated in §1.1, the purpose of the standard is not to define what glazing materials are, or where they should be used, but to "establish specifications and methods of testing for the safety properties of safety glazing materials," and that "conformance of a material to this standard demonstrates the minimum acceptable safety characteristics of the material in use." Further in the same section, the scope of the standard is identified as follows: "to promote safety and reduce the likelihood of cutting and piercing injuries when the glazing materials are broken by human contact, as used for all building and architectural purposes."

The voluntary standard does not provide any exemptions.

The voluntary standard does not list any "requirements"; however, it provides test methods and specifications that are similar to those in the mandatory standard. The differences between the test procedures in the two standards are discussed below.

3. Comparison of the mandatory standard and the ANSI standard

The petitioner requests that the test procedures provided in the ANSI standard replace the test procedures (§ 1201.4 and Figures 1 - 5) in the mandatory standard. The petitioner asserts that the procedures in the mandatory standard reference obsolete test standards and obsolete equipment, while the practices in the newer ANSI standard are up-to-date. The petitioner further asserts that the voluntary standard is more current because of ANSI's regular 5- to 10-year cycle of review, which allows the ANSI voluntary standard to be updated by committee. In contrast, the mandatory standard has not been updated regularly.

In 1977, the test procedures in the mandatory standard and the ANSI standard were similar. The mandatory standard was based on the version of ANSI Z97.1 available in 1977. Since the Commission issued the mandatory standard, it has remained unchanged, except for the revocation of test procedures involving plastic glazing.[6]

In comparison, ANSI Z97.1 has gone through several periodic revisions, and the most current version (2009$^{\epsilon}$) includes additional testing methods for hazards that are either exempted in, or not addressed by, the mandatory standard. ANSI Z97.1-2009$^{\epsilon}$ is more comprehensive than 16 C.F.R. part 1201 for tempered glass specimens because ANSI Z97.1-2009$^{\epsilon}$ provides a means for evaluating tempered glass specimens that did not fracture as a result of the impact test. The test the petitioner refers to is the Center Punch Fragmentation Test, which purposely fractures the unbroken, impact-tested tempered glass specimen with a center punch and a hammer. The fractured pieces of the tempered glass specimen are evaluated by weighing the 10 largest fragments. A tempered glass specimen is considered to conform to ANSI Z97.1-2009$^{\epsilon}$ as acceptable for use as safety glazing if the 10 fragments weigh no more than the equivalent of 10 in^2 of the original, unbroken specimen, combined with no fragments longer than 4 inches in length. The purpose of this post-test evaluation is to ensure that the size of the fragments is not large enough to cause serious injury, if the glass is eventually broken.

The mandatory standard does not provide an equivalent test to the Center Punch Fragmentation Test. The mandatory standard provides for accelerated environmental durability testing of laminated glass and organic-coated glass, but the mandatory standard exempts tempered glass, wired glass, and annealed glass. The mandatory standard does not provide for accelerated environmental durability testing of plastic glazing materials because those tests were removed from the mandatory standard by the Commission in the early 1980s. ANSI Z97.1-2009$^{\epsilon}$ includes, organic-coated glass, tempered glass, laminated glazing, plastic glazing, and fire-rated wired-glass and does not exempt any specific glazing materials whereas 16 C.F.R. part 1201 does. Note that the petitioner's requested amendment would not change the scope of the mandatory standard and thus would not expand any requirements to products or materials that are currently exempt from the mandatory standard.

[6] 47 FR 27856 - June 28, 1982.

The mandatory standard references several out-of-date or obsolete standard practices. ASTM G26-70 - Practice for Operating Light Exposure Apparatus (Xenon-Arc Type) With and Without Water for Exposure of Nonmetallic Materials, and ASTM D2565-70 - Practice for Xenon-Arc Exposure of Plastics Intended for Outdoor Applications, have been replaced by ASTM with new testing methods, using newer equipment to perform the exposure tests.

If the Scope and Definitions section of 16 C.F.R. part 1201 is retained with only the Test Specifications of ANSI Z97.1-2009$^{\epsilon}$ replacing the Test Procedures at 16 C.F.R. § 1201.4, the result will be a more comprehensive mandatory standard. This would include the Center Punch Fragmentation Test for a tempered glass glazing product. Impact specimens that do not fracture when tested to 400 foot-pounds are considered as meeting the requirements of 16 C.F.R. part 1201, while ANSI Z97.1-2009$^{\epsilon}$ continues the evaluation with a Center Punch Fragmentation test to determine if the specimen fractures into sufficiently small pieces to be considered as conforming to the requirements of ANSI Z97.1-2009$^{\epsilon}$.

In addition, ANSI Z97.1-2009$^{\epsilon}$ provides a conformance impact test for fire-resistant wired glass, while the mandatory standard exempts fire-resistant wired glass. ANSI Z97.1-2009$^{\epsilon}$ also provides requirements to which bent glass glazing and plastic glazing must conform if these glazing products are to be used as safety glazing, which 16 C.F.R. part 1201 does not provide. Testing for plastic glazing in 16 CFR part 1201 was revoked in 1980 and 1982, while ANSI Z97.1-2009$^{\epsilon}$ provides weathering, indoor aging, hardness, and flexural modulus tests for plastic glazing. Amending the test procedures in 16 C.F.R. § 1201.4 as the petition requests would not change the exemptions in the mandatory standard.

D. Market Information and Economic Considerations

The petitioner, SGCC, estimates that it manages the certification testing for approximately 70 percent of the industry and certifies 1,726 individual products from 262 participating plant locations. The SGCC estimates imply a total market size of about 375 manufacturing facilities and about 2,500 products, assuming those manufacturers certified by SGCC are representative of the market. In a comment on a separate NPR in 2011, the Glass Association of North America (GANA) estimated that there were around 400 manufacturers in the architectural glazing market, which is consistent with the estimate from SGCC.[7]

Currently, 98 percent of products certified by SGCC are reportedly certified to both ANSI Z97.1-2009$^{\epsilon 2}$ and 16 C.F.R. part 1201. Consequently, if the voluntary standard were made mandatory, and manufacturers only had to certify their products to a single standard, SGCC estimates an average annual certification cost savings of about $1,284 per manufacturer. The costs to the manufacturers only testing to the voluntary standard

[7] Public comment from the Glass Association of North America submitted in response to the NPR on the testing and certification rule (16 C.F.R. part 1107).

would be left unchanged, though the costs to manufacturers testing only to the mandatory standard would increase due to the greater sampling needed to test to the requirements of the ANSI standard. Of manufacturers outside SGCC's membership, those that currently test to both standards would also likely see a savings in testing costs. However, to the extent that manufacturers test only to 16 C.F.R. part 1201, certification costs would rise.

E. Public Comments

The CPSC received comments from five entities (four individuals on behalf of organizations or firms, and one organization) in response to the notice published in the *Federal Register* on August 30, 2012 (77 FR 52625). All of the entities submitting comments are associated with the manufacture or use of architectural glazing. All of the commenters support the petitioner's request that the testing procedures in 16 C.F.R. § 1201.4 be replaced with the testing procedures in ANSI Z97.1, and each commenter provides essentially the same rationale for the commenter's position. All five comments can be found at Tab G. A summary of the comments' topics and staff's responses are provided below:

Topic 1: Replacement of 16 C.F.R. § 1201.4 with ANSI Z97.1 would eliminate duplication of testing procedures.

Three of the commenters state that replacing the testing procedures in the mandatory standard with the ANSI Z97.1 testing methods would "eliminate the duplication of having to test to two procedures." Another commenter states that this amendment would address the "duplication of effort and cost that is now required by the existence of two different procedures with the same purpose."

Staff Response: Testing to both standards forces a duplication of test procedures at an additional expense to the test facilitator. The voluntary and mandatory regulations are two different standards, and must be tested separately. In some cases these tests bear the same test procedures and acquire the same result.

Topic 2: ANSI Z91.1 testing procedures are more rigorous and protect consumers better.

Three of the commenters state that because ANSI Z97.1 has been revised several times since the issuance of the mandatory standard in 1977, it provides a "more rigorous" testing procedure that will protect the public better. Another commenter states that replacing the § 1201.4 testing procedures with those in ANSI Z91.1 would "protect consumers better . . .."

Staff Response: None of the commenters provide any support for their claims that the ANSI standard test procedures are more rigorous or would protect consumers better. Tests in the mandatory standard that match tests in the ANSI standard are equivalent. The ANSI standard, however, is more comprehensive because, unlike the mandatory standard, it is not limited to certain architectural glazing products. The ANSI standard is also more comprehensive in that it provides a Center Punch Test for tempered glass. Samples that do not break during the Class A 400 ft-lb impact testing are subjected to the more rigorous Center Punch Test to verify that upon failure, it will break into sufficiently small pieces.

Topic 3: ANSI Z97.1 test procedures are more efficient and more modern.

Four of the commenters state that the ANSI test procedure is more efficient and more modern. One commenter asserts that the Section 1201.4 testing procedures are "materially out of date".

Staff Response: The commenters do not provide any specific instances to support their assertions, but ANSI Z97.1 test procedures are more up-to-date because they reference revised testing procedures and more modern equipment. Again, an example is the center punch fragmentation test, which occurs after the impact test. If a sample passes the impact test, the mandatory standard has no further evaluation for that sample. The voluntary standard requires that the fragmentation size be measured, through a center punch test with hammer and pointed chisel, after a sample has successfully passed the impact test. This methodology assures that in case of product failure, the fragments of the safety glazing material are of a minimal size.

Topic 4: One testing regime will provide clearer understanding to stakeholders.

Four of the commenters state that subjecting architectural glazing products to one testing regime only (which would be the result of the Commission replacing the Section 1201.4 with the ANSI Z91.1 testing procedures) would create a clearer understanding of the testing process for manufacturers, architects, building code officials, testing laboratories, and consumers.

One commenter states: "the inadequacies of 16 CFR 1201.4 harm the glass and glazing industry."

Staff Response: The latter commenter does not specify the nature of the harm. Topics 3 and 4 are similar. Staff believes that the ANSI test procedures are set forth more directly than the mandatory standard because the ANSI test procedures present most of the technical data needed for evaluation in tables. For example, testing for tempered glass is mentioned throughout the mandatory standard, whereas in the ANSI standard, the testing regime has been simplified by presenting it in a single table format. The ANSI standard also provides more detail in the drawing schematics for test apparatuses. The ANSI standard provides more types of tests for different materials. The mandatory standard provides some of the same tests but does not cover all of them, nor does it cover as many materials as the ANSI standard.

III. OPTIONS

1. Grant the petition.

If the Commission determines that the information presented by the petitioner and staff supports initiating a rulemaking to amend the mandatory standard by replacing the test procedures with the test procedures in ANSI Z97.1-2009$^{\epsilon}$, then the Commission could grant the petition. If the rulemaking process is initiated, Staff will begin the work necessary starting in FY14.

2. Deny the petition.

If the Commission determines that the information presented by the petitioner and staff does not support initiating a rulemaking to amend the mandatory standard by replacing the test procedures with the test procedures in ANSI Z97.1-2009,$^{\epsilon}$ the Commission could deny the petition.

3. Defer decision on the petition.

If the Commission determines that additional information is necessary to decide whether to grant or deny the petition, the Commission may defer action on the petition and direct staff to obtain additional information.

IV. CONCLUSIONS AND STAFF RECOMMENDATION

Staff recommends that the Commission grant the petition and direct staff to incorporate the follow-on rulemaking project and associated resources in the draft FY2014 Operating Plan for Commission consideration. Amending the standard as the petitioner requests would eliminate the need for manufacturers to run additional samples through identical tests at the cost of additional fabrication, shipping, and cost of testing. The current regulation references nonexistent standards and outdated test methods. Amending the standard as the petitioner requests would bring the mandatory standard up to date and can be expected to result in a minor decrease in injuries and deaths.

V. ATTACHMENTS

TAB A – Petition CP 12-3

Petition CP 12-3

SCHIFF HARDIN LLP

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June 26, 2012

BY E-MAIL

Mary F. Toro
Director of Regulatory Enforcement
Consumer Product Safety Commission
4330 East West Highway
Bethesda, MD 20814

Re: Petition of Safety Glazing Certification Council to Initiate Rulemaking

Dear Ms Toro:

Following up on our conference call last month, I am enclosing (in pdf format) a copy of the Petition of the Safety Glazing Certification Council to Initiate Rulemaking to Amend 16 C.F.R. Part 1201, Safety Standard for Architectural Glazing Materials, and three accompanying exhibits.

You had suggested that we submit this petition to you and that you would forward it to the Secretary of the Commission for docketing.

We appreciate your courtesy in this matter and look forward to working with the Staff in connection with our petition. Please let me know if you have any questions now or in the future.

Very truly yours,

William M. Hannay

cc: Thomas Henehan

Petition CP 12-3

BEFORE THE
U.S. CONSUMER PRODUCT SAFETY COMMISSION

PETITION REQUESTING THE COMMISSION TO INITIATE A RULEMAKING TO AMEND 16 C.F.R. PART 1201, SAFETY STANDARD FOR ARCHITECTURAL GLAZING MATERIALS

PETITION OF
SAFETY GLAZING CERTIFICATION COUNCIL

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June 26, 2012

BEFORE THE
U.S. CONSUMER PRODUCT SAFETY COMMISSION

PETITION REQUESTING THE COMMISSION TO INITIATE A RULEMAKING TO AMEND 16 C.F.R. PART 1201, SAFETY STANDARD FOR ARCHITECTURAL GLAZING MATERIALS

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INTRODUCTION

Pursuant to Sections 7 and 9 of the Consumer Product Safety Act, 15 U.S.C. Sections 2056 and 2058, and the U.S. Consumer Product Safety Commission ("Commission") regulations issued thereunder at 16 C.F.R. Part 1201, the Safety Glazing Certification Council files this petition requesting the Commission to initiate a rulemaking to amend 16 C.F.R. Part 1201, Safety Standard for Architectural Glazing Materials, by replacing the test procedures now contained in 16 C.F.R. § 1201.4 with the methods of test for safety glazing materials set forth in ANSI Z97.1 (most current version).

- The proposed amendment is illustrated in a markup of 16 C.F.R. Part 1201, attached hereto as Exhibit A.
- A copy of the most current version of ANSI Z97.1 is attached hereto as Exhibit B.[1]
- A comparison of the two test methods is attached hereto as Exhibit C.

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[1] The most current version of ANSI Z97.1 is designated "2009$^{\epsilon 2}$", meaning that it was approved pursuant to ANSI procedures in 2009 and was shortly thereafter amended to correct minor errata ("$^{\epsilon 2}$") after publication. The attached copy is licensed to CPSC for the purposes of this petition.

In support of this request, SGCC® submits the following information:

INTEREST OF THE PETITIONER

The Safety Glazing Certification Council ("SGCC®") is a non-profit corporation that provides for the certification of safety glazing materials to various safety standards, including 16 CFR Part 1201 and ANSI Z97.1. Established in 1971, SGCC® has the following purposes:

(a) To promote public safety by encouraging maintenance of the highest standards of excellence in the manufacture of safety glazing materials.

(b) To encourage and cooperate in developing standards related to other performance characteristics of glazing products.

(c) To plan, organize, direct, coordinate and maintain a certification program for glazing materials to assure that glazing products meet applicable standards or performance requirements adopted or approved by the Council.

The organization is managed by a board of directors comprised equally of representatives from the public interest sector and from the safety glazing industry. For more than thirty years, SGCC® has maintained a certification program under which manufacturers of safety glazing products voluntarily submit their products for testing to an SGCC-approved independent testing laboratory. The testing procedures used in SGCC®'s program are those established in ANSI Z97.1 and CPSC 16 C.F.R. Part 1201. Participants in the SGCC® program undergo facility auditing and independent test sample selection and testing every 6 months. SGCC® currently has over 150 licensed manufacturers with approximately 250 manufacturing or fabricating facilities in the United States and over 15 foreign countries.

Management and control of SGCC® is vested in a board of directors, half representing industry and half representing the public interest. To prevent industry dominance of SGCC®

actions, half the voting power of the board resides in the public interest directors regardless of the number of directors present at a meeting. For further information, see http://sgcc.org.

SGCC® licensees that manufacture or fabricate safety glazing materials must certify that the labeled material complies with the applicable specification (either or both 16 CFR Part 1201 or ANSI Z97.1). Compliance of a certified product with the applicable specification(s) is checked periodically by approved independent testing laboratories under the supervision of a qualified Administrator, retained by and responsible to SGCC®, who is unaffiliated with any licensee of safety glazing materials.

PROPOSED AMENDMENT TO PART 1201

Based on over 30 years experience in the administration of the certification of safety glazing materials under both ANSI Z97.1 and CPSC's 16 CFR Part 1201, SGCC® represents to the Commission that consumers and the glazing industry would be far better served by replacing Part 1201's older test procedures with ANSI Z97.1's more efficient and more modern procedures. By testing under a single test procedure for both standards, consumers would be assured of more uniform and up-to-date methods of testing to confirm the safety characteristics of glazing products, the industry will avoid the burden and confusion from having to conduct duplicative testing, and the test laboratory community will have the clarity of a single methodology and avoid the necessity of having to maintain separate types of testing equipment.

16 CFR Part 1201 serves two functions: (1) it serves as a specification for glazing materials in doors (and other locations) as described in § 1201.1 and (2) it sets forth a test methodology in § 1201.4 to establish that glazing products meet that specification. SGCC® does not propose any change to the scope and exemptions contained in § 1201.1; we do, however, recommend replacing the test methodology contained in § 1201.4.

SGCC® recommends that -- in lieu of the test methodology described in § 1201.4 -- ANSI Z97.1 (most current version) be substituted as the test method. Specifically, SGCC® proposes that all of the text of §1201.4 (and the accompanying Figs. 1-5) be deleted and that in their place be substituted the following:

> **§ 1201.4 Test procedures**
>
> Testing shall be in accordance with the test provisions of ANSI Z97.1 (most current version), "American National Standard for Safety Glazing Materials Used in Buildings – Safety Performance Specifications and Methods of Test."[2]

A copy of 16 C.F.R. Part 1201 -- marked to show the proposed deletion and addition -- is attached hereto as Exhibit A. A copy of the most current version of ANSI Z97.1 (licensed to CPSC for the purposes of this petition) is attached hereto as Exhibit B. *See* ANSI Z97.1, Sections 4 ("Specimens to Be Tested") and 5 ("Test Specifications").

HISTORY AND PROCEDURES OF ANSI Z97.1

ANSI Z97.1 (Standard - Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test) was first developed under the auspices of the American National Standards Institute in the 1960s. Successive Accredited Standards Committees (ASCs) have been formed over the intervening years to review, develop and maintain Z97.1 to establish the specifications and methods of test for the safety properties of "safety glazing materials" (glazing materials designed to promote safety and to reduce or minimize the likelihood of cutting and piercing injuries when the glazing materials are broken by

[2] Copies of ANSI Standard Z97.1 (most current version) are available from the American National Standards Institute, 25 W. 43rd Street, 4th Floor, New York, NY 10036, or online at http://webstore.ansi.org/FindStandards.aspx?SearchString=Z97.1&SearchOption=0&PageNum=0&SearchTermsArray=null%7cZ97.1%7cnull.

human contact) as used for all building and architectural purposes. The ASC maintains a public website at http://www.ansiz97.com.

The current version of the ANSI standard (2009$^{\epsilon 2}$) is a successor standard to the 2004$^{\epsilon}$ edition and is the product of several years of meetings, votes, and ongoing work by the Accredited Standards Committee and its members. The 2004$^{\epsilon}$ standard succeeded those of the 1984 (reaffirmed in 1994), 1975, 1972 and 1966 editions. The current standard, like its predecessors, was developed under procedures accredited by ANSI as meeting the criteria for American National Standards. The consensus committee that approved the Standard was balanced to ensure that individuals from competent and concerned interests have had an opportunity to participate. Approval of an American National Standard requires verification by ANSI that the requirements for due process, consensus, and other criteria for approval have been met by the standards developer, in this case ASC Z97.

Consensus is established when, in the judgment of the ANSI Board of Standards Review, substantial agreement has been reached by directly and materially affected interests. Substantial agreement means much more than a simple majority, but not necessarily unanimity. Consensus requires that all views and objections be considered, and that a concerted effort be made toward their resolution. The current ASC for Z97.1 consists of representatives from approximately 30 glass manufacturers, interlayer makers, fabricators, consultants, and specifiers as well as 12 individual members (including the Administrator of the SGCC®) and observers (including representatives of the CPSC).[3]

[3] The primary observer for the CPSC on ASC Z97 was Thomas Caton, and the alternate member was Mark Kumagai.

RATIONALE FOR THE AMENDMENT

Congress has expressed its preference in 15 U.S.C. § 2056(b) for the Commission to rely upon voluntary consumer product safety standards whenever compliance with such voluntary standards would eliminate or adequately reduce the risk of injury addressed and it is likely that there will be substantial compliance with such voluntary standards. Here, SGCC® believes that these Congressional concerns and the public interest would be well-served by the replacement of the existing test methodology set forth in Section 1201.4 with the methods of test for safety glazing material set forth in ANSI Z97.1 (most current version). (A chart comparing and commenting on the differences between CPSC 16 C.F.R. 1201 and ANSI Z97.1 is attached to this Petition as **Exhibit C**.)

As a historical matter, in its original development of 16 CFR Part 1201, the Commission was influenced by ANSI Z97.1.[4] The test methodology in Section 1201.4, however, has not been maintained and kept up-to-date, and many aspects of it that need clarification have not been clarified since its original adoption by the Commission. By contrast, ANSI Z97.1 has continued to evolve and improve, through and including the current 2009$^{\epsilon 2}$ version, and has regularly been modified to deal with important issues that have arisen over the years.[5] For example, 16 CFR § 1201.4 does not provide any guidance for testing "bent glass" – which has become a

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[4] The Commission noted that it reviewed information contained in ANSI Z97.1-1975 to determine appropriate levels of test impact energy, see 42 Fed. Reg. 1434, and revised its proposed labeling language to conform with ANSI Z97.1's labeling requirements, see 42 Fed. Reg. 1441. The test method set forth in 16 CFR § 1201.4 was also influenced by ANSI Z97.1-1972. *Cf.* 41 Fed. Reg. 6182 (Feb. 11, 1976) (proposed rule permitting continued use of Z97.1 impact test frames). This language, however, did not appear in the final version of the Rule in January 1977. *Cf.* 41 Fed. Reg. 1445.

[5] For the very reason that Z97.1 is regularly updated, SGCC® recommends that the phrase "most current version" be added to the references to Z97.1 in the revised Section 1201.4 in order to ensure that Part 1201's test procedures are always up-to-date.

commercially important building tool – while ANSI Z97.1-2009$^{\epsilon 2}$ does. There are other practical issues in the use of Section 1201.4 test equipment that have been clarified and addressed in Z97.1-2009$^{\epsilon 2}$ (*e.g.*, evaluation of laminated glass after breakage).

The use of a single test method and qualification procedure – ANSI Z97.1 (most current version) – would allow greater understanding by consumers, specifiers (such as architects), building code officials, as well as the industry and the test labs. Unlike Part 1201, ANSI Z97.1 is updated and reviewed on a five to ten year cycle so that it has and will remain in step with the industry and technology being used by consumers.[6]

In the view of SGCC®, ANSI Z97.1 is a more rigorous test standard than Part 1201 and will better protect the consumer. For example:

(1) Z97.1 requires that more samples be tested while Section 1201.4 has been interpreted as requiring only one sample to be tested,

(2) Z97.1 requires an additional center-punch test for some products, and

(3) Z97.1 builds in increased durability test requirements.

From a safety perspective, it should be noted that ANSI Z97.1 does not include wired glass as a "safety glazing material" and similarly excludes from the definition other types of glass that, if broken, can be hazardous not only because of their cutting and piercing potential, but also because a break may be life threatening.[7] The new interpretation and qualification

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[6] SGCC® notes that the National Highway Traffic Safety Administration ("NHTSA") has taken a similar approach to that recommended here. On July 12, 2005, NHTSA published a Final Rule amending 49 CFR 571.205, Glazing Materials, see 132 FR 39959, which adopts by reference ANSI/SAE Z26.1-1996 for the testing of automotive glazing materials.

[7] 16 CFR 1201(c) exempts from wired glass Part 1201 where its use is required by ordinance and also excludes certain other products. SGCC® is not requesting any change in these exemptions.

procedures for ANSI Z97.1 will allow for tighter control over glazing performance in hazardous locations including doors.

There is a trend towards adopting and referencing ANSI Z97.1 in other standards. For example, Z97.1 is now being referenced in Building Codes such as IBC 2012 and IRC 2012. In addition, Z97.1 is referenced in the new standard for glass in table tops being developed by ASTM's Subcommittee F15.42 on Furniture Safety. *See* ASTM WK22334, http://www.astm.org/database.cart/workitems/WK22334.htm. (Glass in table tops has been an issue with injuries over the past years and is not addressed in 16 CFR Part 1201.)

Currently, 16 CFR Part 1201 covers only doors, door leaves and such. Glazing materials, however, are being used in much broader expanses than in the past, and ANSI Z97.1 is commensurately broad. There is great confusion in the industry regarding which test methodology needs to be used in what circumstance and how different the tests are, as between the ANSI and CPSC standards. SGCC is often asked whether one test method is acceptable for the other. At present, manufacturers must shoulder the burden of paying for dual qualification testing when the adoption of a single test procedure could avoid that unnecessary duplication.

ANSI Z97.1 broadly defines and applies to safety glazing products for all applications, while 16 CFR Part 1201 applies more narrowly. The existence of two test methodologies for the two standards creates confusion among members of the industry, the consuming public, and the building code community. Because of this confusion, various specifying entities reference one or both standards. This in turn forces most manufacturers to perform redundant testing to both standards. This creates wasted expense and a misutilization of resources.

CONCLUSION

For these reasons, SGCC respectfully requests that this petition be docketed for public comment and urges the Commission to publish the revised 16 CFR § 1201.4 as a proposed rule and move rapidly towards issuance of the revision as a final rule under the Consumer Product Safety Act.

DATED: June 26, 2012

Respectfully submitted,

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EXHIBIT A

§ 1145.5 Emberizing materials (embers and ash) containing respirable free-form asbestos; risk of cancer associated with inhalation of asbestos fibers.

(a) The Commission finds that it is in the public interest to regulate the risk of cancer associated with inhalation of asbestos fibers from artificial emberizing materials (embers and ash) containing respirable free-form asbestos under the Consumer Product Safety Act (CPSA) rather than under the Federal Hazardous Substances Act (FHSA) because of the desirability of avoiding possibly lengthy, resource-consuming, inefficient rulemaking proceedings under the FHSA, and because of the availability of civil penalties under the CPSA for knowing noncompliance.

(b) Therefore, artificial emberizing materials (embers and ash) containing respirable free-form asbestos are regulated under the CPSA.

[42 FR 63354, Dec. 15, 1977]

§§ 1145.9–1145.15 [Reserved]

§ 1145.16 Lighters that are intended for igniting smoking materials and that can be operated by children; risks of death or injury.

(a) The Commission finds that it is in the public interest to regulate under the Consumer Product Safety Act any risks of injury associated with the fact that lighters intended for igniting smoking materials can be operated by young children, rather than regulate such risks under the Federal Hazardous Substances Act or the Poison Prevention Packaging Act of 1970.

(b) Therefore, if the Commission finds regulation to be necessary, risks of death or injury that are associated with lighters that are intended for igniting smoking materials, where such risks exist because the lighters can be operated by young children, shall be regulated under one or more provisions of the Consumer Product Safety Act. Other risks associated with such lighters, and that are based solely on the fact that the lighters contain a hazardous substance, shall continue to be regulated under the Federal Hazardous Substances Act.

[58 FR 37556, July 12, 1993]

§ 1145.17 Multi-purpose lighters that can be operated by children; risks of death or injury.

(a) The Commission finds that it is in the public interest to regulate under the Consumer Product Safety Act any risks of injury associated with the fact that multi-purpose lighters can be operated by young children, rather than to regulate such risks under the Federal Hazardous Substances Act or the Poison Prevention Packaging Act of 1970.

(b) Therefore, if the Commission finds regulation to be necessary, risks of death or injury that are associated with multi-purpose lighters because the lighters can be operated by young children shall be regulated under one or more provisions of the Consumer Product Safety Act. Other risks that are associated with such lighters, and that are based solely on the fact that the lighters contain a hazardous substance, shall continue to be regulated under the Federal Hazardous Substances Act.

[64 FR 71884, Dec. 22, 1999]

PART 1201—SAFETY STANDARD FOR ARCHITECTURAL GLAZING MATERIALS

Subpart A—The Standard

Subpart B [Reserved]

Subpart C—Statements of Policy and Interpretation

AUTHORITY: Secs. 2, 3, 7, 9, 14, 19, Pub. L. 92–573, 86 Stat. 1212–17; (15 U.S.C. 2051, 2052, 2056, 2058, 2063, 2068).

SOURCE: 42 FR 1441, Jan. 6, 1977, unless otherwise noted.

Subpart A—The Standard

§ 1201.1 Scope, application and findings.

(a) *Scope.* This part 1201, a consumer product safety standard, prescribes the safety requirements for glazing materials used or intended for use in any of the following architectural products:

(1) Storm doors or combination doors.
(2) Doors.
(3) Bathtub doors and enclosures.
(4) Shower doors and enclosures.
(5) [Reserved]
(6) Sliding glass doors (patio-type).

It also requires that these architectural products which incorporate glazing materials be constructed with glazing materials that meet the requirements of this part. The safety requirements are designed to reduce or eliminate unreasonable risks of death or serious injury to consumers when glazing material is broken by human contact.

(b) *Application.* This part 1201 shall apply to glazing materials, as that term is defined in § 1201.2(a)(11), for use in the architectural products listed in paragraph (a) of this section; and to those architectural products listed in paragraph (a) of this section if they are made with, or incorporate glazing materials as that term is defined in § 1201.2(a)(11). The standard applies to glazing materials and architectural products incorporating glazing materials that are produced or distributed for sale to or for the personal use, consumption or enjoyment of consumers in or around a permanent or temporary household or residence or in recreational, school, public, or other buildings or parts thereof. This part 1201 applies only to those glazing materials manufactured after the effective date of the standard; and to those architectural products identified in paragraph (a) of this section that are manufactured after the effective date of the standard. Thus, architectural products identified in paragraph (a) of this section manufactured after the effective date of the standard must incorporate glazing materials that comply with the standard. For purposes of this standard, fabricators are considered to be manufacturers of the architectural products listed in paragraph (a) of this section. Architectural glazing materials used in the products listed in paragraph (a) of this section and used in mobile homes are not subject to the provisions of this part 1201. While this part 1201 prescribes a test method to determine whether glazing materials subject to this part 1201 standard meet the requirements of the standard, the standard itself does not require that a manufacturer test any glazing materials or products subject to the standard. All obligations of manufacturers to perform testing are imposed by section 14 of the Consumer Product Safety Act and certification regulations which will be established by a separate rulemaking proceeding. However, the Commission intends to use the test procedures set forth in this part 1201 to determine whether materials and products subject to the standard meet the requirements of the standard.

(c) *Exemptions.* The following products, materials and uses are exempt from this part 1201:

(1) Wired glass used in doors or other assemblies to retard the passage of fire, where such door or assembly is required by a federal, state, local, or municipal fire ordinance.

(2) Louvers of jalousie doors;

(3) Openings in doors through which a 3 inch diameter sphere is unable to pass;

(4) Carved glass (as defined in § 1201.2(a)(36)), dalle glass (as defined in § 1201.2(a)(37)), or leaded glass (as defined in § 1201.2(a)(14)), which is used in doors and glazed panels (as defined in §§ 1201.2(a)(7) and (a)(10)) if the glazing material meets all of the following criteria:

(i) The coloring, texturing, or other design qualities or components of the glazing material cannot be removed without destroying the material; and

(ii) The primary purpose of such glazing is decorative or artistic; and

(iii) The glazing material is conspicuously colored or textured so as to be plainly visible and plainly identifiable as aesthetic or decorative rather than functional (other than for the purpose of admitting or controlling admission

of light components or heat and cold); and

(iv) The glazing material, or assembly into which it is incorporated, is divided into segments by conspicuous and plainly visible lines.

(5) Glazing materials used as curved glazed panels in revolving doors;

(6) Commercial refrigerated cabinet glazed doors.

(d) *Findings*[1]—(1) *The degree and nature of the risk of injury the rule is designed to eliminate or reduce.* The Commission finds that the nature of the risks of injury this standard is designed to eliminate or reduce are as follows:

(i) Lacerations, contusions, abrasions, and other injury or death resulting from walking or running into glazed doors or sliding glass doors believed to be open or glazed panels mistaken as a means of ingress or egress, or pushing against glazing material in doors or glazed panels in an attempt to open a door.

(ii) Lacerations, contusions, abrasions, and other injury or death resulting from accidentally falling into or through glazed doors, sliding glass doors, glazed panels, bathtub doors and enclosures and shower doors and enclosures.

(iii) Lacerations, contusions, abrasions, and other injury or death resulting from the act of installing, replacing, storing or otherwise manipulating glazing material in doors, sliding glass doors, glazed panels, bathtub doors and enclosures and shower doors and enclosures, or from broken glazing material in doors, sliding glass doors, glazed panels, bathtub doors and enclosures and shower doors and enclosures. The Commission estimates that 73,000 injuries associated with architectural glazing materials in the architectural products within the scope of this standard were treated in hospital emergency rooms during 1975, and that about 2,400 of these injuries required the patients to be hospitalized. Extrapolating to total injuries in the United States the Commission further estimates that approximately 190,000 injuries were associated with architectural glazing products covered by this standard. Although injuries occur at any age, children aged 14 and under appear to be at particular risk of injury since as a group they represent approximately half the injuries while comprising less than 30 percent of the population. Lacerations are the most common injuries associated with architectural glazing materials and account for 72 percent to 93 percent of the injuries associated with the architectural products identified in paragraph (a) of this section. These lacerative injuries span a broad spectrum of severity and extent of body part affected. During 1975, an estimated 200 injuries were treated in emergency rooms for lacerations over 25 to 50 percent of the victims' bodies and over 7,000 persons were treated for lacerations to the head or face. On the basis of all injury information available to the Commission, it is apparent that the severity of the injuries associated with architectural glazing materials ranges from minor cuts to damage to tendons, nerves, muscles, and blood vessels resulting in extensive surgery. Peripheral nerve injuries result in varying degres of loss in sensation and motion which may never be restored completely. Tendon and muscle injuries may involve loss of movement. Some victims of architectural glazing material incidents are disfigured, and sustain emotional trauma as well. Severing of arteries and veins has led to death. One way of quantifying the extent of the public health problem relating to injuries associated with products is to estimate the total number of disability days resulting from the injuries. Using average days of restricted activity by age for specific injuries and body parts (Vital and Health Statistics, Series 10, Number 57, National

[1] The Commission's findings apply to the architectural glazing standard as issued at 42 FR 1426, on January 6, 1977. Since that date, the Commission has revoked portions of the standard which prescribed requirements for "glazed panels" (45 FR 57383, August 28, 1980); an accelerated environmental durability test for plastic glazing materials intended for outdoor exposure (45 FR 66002, October 6, 1980); and a modulus of elasticity test, a hardness test, and an indoor aging test applicable to plastic glazing materials (47 FR 27856, June 28, 1982). However, the findings have not been revised and they are therefore, not fully applicable to the remaining requirements of the standard.

Center for Health Statistics, U.S. Department of Health, Education, and Welfare), it is estimated that about 230,000 days of restricted activity resulted from injuries associated with architectural products which were treated in emergency rooms alone.

(2) *The approximate number of consumer products, or types or classes thereof, subject to the standard.* The types of glazing materials affected by or subject to the standard are laminated glass, tempered glass, wired glass, organic-coated glass, annealed glass, and plastics. Architectural products that incorporate the aforementioned glazing materials that are also affected by or subject to the standard are: storm doors or combination doors, doors, bathtub doors, and enclosures, shower doors and enclosures, glazed panels and sliding glass doors (patio-type) (see paragraph (a) of this section). The Commission has estimated that 13 to 16 percent of the total market for glazing material incorporated in products within the scope of the standard will be affected by the standard. Most of the glazing subject to the standard is currently covered by state safety glazing legislation. To date, more than 30 states have enacted safety glazing legislation, but this legislation is neither consistent nor completely uniform among states. Annual markets for the architectural products which incorporate glazing material and that are within the scope of the standard have been estimated by the Commission in terms of square feet of glazed area and number of units. The market for glazing material incorporated in products within the scope of the standard was estimated to be 234.8 million square feet in 1975. These figures are discussed in the Economic Impact Statement, pp. 3-7, and appendix A to the Economic Impact Statement, pp. 18-30, which are available for review in the Office of the Secretary of the Commission, Washington, D.C. 20207.

(3) *The need of the public for the architectural glazing material and products incorporating that glazing material subject to the standard, and the probable effect of the standard upon the utility, cost or availability of those products to meet the need of the public*—(i) *The need of the public for the architectural glazing materials and products incorporating that glazing material.* The need of the public for architectural products within the scope of the standard incorporating glazing material is substantial since these products serve such functions as transmission of light, visual communication, protection from weather, ventilation, and indoor climate control, and since reasonable substitutes for these products do not exist as a group. Each of the types of glazing material subject to the standard has individual properties which meet public needs, although one type of glazing material is often an acceptable substitute for another.

(ii) *Probable effect of the standard upon the cost of architectural glazing materials and architectural products incorporating the glazing material to meet the need of the public for the products.* The probable cost effects of the standard for architectural glazing materials are listed below.

(A) The cost impact of the standard on consumers will be concentrated in those states with no present state safety glazing legislation. In those states, the average increase in cost per housing start resulting from the standard is estimated to range from $30 to $50, or approximately one-tenth of one percent of the price of a typical new house; and the cost for residential remodeling and replacement is expected to be in the range of $0.25 to $0.30 per household annually.

(B) The increased cost of glazing material for nonresidential uses will be paid ultimately by consumers through higher prices of goods and services. Generally, the increased cost of glazing is not passed to consumers immediately, but is spread over the life of the nonresidential structure. Therefore, the increased cost to consumers for glazing material in nonresidential structures will probably rise slowly over time to an annual level of approximately $1.10 per household in states with no safety glazing legislation and $0.20 to $0.50 per household in the other states. In many of the states with state regulations, the impact of the standard on residential construction and new housing prices will be near zero, since most of the glazing is currently covered by the state glazing legislation.

(C) The probable effect of the standard on the various glazing materials within the scope of the standard will differ. The retail price of laminated glass used in some Category II applications will probably increase by 10 to 15 percent per square foot. The incremental cost to consumers for ungraded laminated glass is estimated to be approximately $0.14 per household, annually. The cost to consumers for tempered glass, organic-coated glass, and plastics is not expected to increase because of the standard. Information available to the Commission indicates that the technology needed for producing wired glass which can comply with the standard is not readily available. See appendix A of the Economic Impact Statement, pp. 45–56, for the incremental cost calculation by product category and application.

(iii) *Probable effect of the standard upon the utility of architectural glazing materials and architectural products incorporating the glazing materials to meet the need of the public for the products.* The probable effect of the standard in regard to the utility of architectural glazing materials and the architectural products incorporating glazing material should be to increase the utility of the products. The basic effect of the standard would be the substitution of certain safer glazing materials for annealed glass in certain architectural products. The Commission believes that such a substitution would increase utility for most consumers because of the usually increased durability of the glazing material that complies with the Commission's standard, and the knowledge that the product incorporating the glazing material is safer. There will be disutility for those consumers who prefer non-complying wired glass and organic-coated glass when these materials become unavailable for certain applications due to their likely inability to comply with the standard. However, the share of the glazing material market claimed by organic-coated and wired glass is small.

(iv) *Probable effect of the standard upon the availability of architectural glazing materials and architectural products incorporating the glazing materials to meet the need of the public for the products.* The Commission finds that the proposed standard should not have impacts of significant magnitude on the availability of architectural products within the scope of the standard, since domestic production capacity appears to be sufficient to handle any increased demand for glazing material to be used in those products. In addition, an increased demand for raw materials necessary to manufacture glazing materials that comply with the standard will be small in comparison to the volume of raw materials currently used for glazing for the products that will be subject to the standard. Furthermore, no major change in demand for the architectural products subject to the standard incorporating glazing materials which would affect production is expected. The Commission finds that, in the absence of technological advances, certain glazing materials will no longer be available for particular applications. Unless technological advances are made, wired glass will be unavailable for use in the architectural products within the scope of the standard with the exception of fire door applications where special provisions of the standard apply. Similarly, organic-coated glass which has the film applied to annealed glass at the factory may no longer be available for Category II products due to an inability to pass those impact test provisions of the standard. The availability of glass replacement glazing in residential applications may be reduced, since plastic glazing often will be the only economical material available to consumers when immediate replacement is needed.

(4) *Any means of achieving the objectives of the standard while minimizing adverse effects on competition or disruption or dislocation of manufacturing and other commercial practices consistent with the public health and safety.* The Commission has considered other means of achieving the objective of the standard, but has found none that it believes would have fewer adverse effects on competition or that would cause less disruption or dislocation of manufacturing and other commercial practices, consistent with the public health and safety. For the glazing industry in general, the disruptions and dislocations

of existing manufacturing and commercial practices due to the standard are expected to be minor. However, it is possible that individual segments of the glazing materials industry are likely to be adversely affected by the standard. Specifically, there is likely to be disruption to the wired glass market, the organic-coated glass market and, to a lesser extent, to the laminated glass market. Manufacturers of wired glass will face a serious problem because technological improvements in the product will need to be made before wired glass can be used in Category I applications and because it probably will not be usable at all in Category II applications (see § 1201.2(a) (3) and (4) of the standard), since there appears to be little prospect at this time of developing a wired glass product capable of withstanding the Category II, 400 foot pound impact test prescribed in § 1201.4 of the standard. Laminated glass currently used for Category I applications can meet the 150 foot pound impact test requirements, but not all laminated glass currently used for Category II applications can meet the 400 foot pound impact test requirements. The price increase for technologically upgrading laminated glass will be borne by consumers. The Commission believes, however, that the competitive impact of the proposed changes would not severely weaken the position of laminated glass in the market place. The wired glass, organic-coated glass, and laminated glass markets affected by the standard are small in relation to the entire industry. The standard is not expected to have an appreciable impact on foreign or domestic competition. Increased competition is expected between primary glass temperers and regional temperers, with primary temperers taking an increased share of the original storm door, sliding door, bathtub enclosure and shower door markets. Sales of nonresidential glazing for major nonresidential buildings will remain with the primary glass companies. The regional temperers are expected to handle almost all the tempering of glazing for smaller nonresidential buildings. Thus, they will gain some of this market at the expense of local dealers and distributors. However, the distributors and dealers probably will operate as order takers for the smallest jobs. It is expected that glazing distributors and dealers will experience reduced market shares in both the residential and nonresidential new glazing markets. This will occur as a result of the transfer of business to the primary glass manufacturers and regional temperers, since tempered glass must be produced to size and it is not feasible to keep in inventory all sizes which might be needed.

(5) *Summary finding.* The Commission finds that there are unreasonable risks of injury associated with architectural glazing materials used in the architectural products listed in paragraph (a) of this section. In assessing the question of whether unreasonable risks of injury or injury potential are associated with architectural glazing materials, the Commission has balanced the degree, nature and frequency of injury against the potential effect of the standard on the ability of architectural glazing materials to meet the need of the public and the effect of the standard on the cost, utility, and availability of architectural glazing materials to meet that need. The Commission finds that this standard, including its effective date, is reasonably necessary to eliminate or reduce the unreasonable risks of injury associated with architectural glazing materials and that promulgation of the standard is in the public interest.

(Sec. 9(e), Pub. L. 92-573, 86 Stat. 1215 (15 U.S.C. 2058(e)) (5 U.S.C. 553)

[42 FR 1441, Jan. 6, 1977, as amended at 43 FR 57246 Dec. 7, 1978; 45 FR 57389, Aug. 28, 1980; 47 FR 27856, June 28, 1982; 49 FR 7107, Feb. 27, 1984]

§ 1201.2 Definitions.

(a) As used in this part 1201:

(1) *Annealed glass* means glass that has been subjected to a slow, controlled cooling process during manufacture to control residual stresses so that it can be cut or subjected to other fabrication. Regular polished plate, float, sheet, rolled, and some patterned surface glasses are examples of annealed glass.

(2) *Bathtub doors and enclosures* means assemblies of panels and/or doors that are installed on the lip of or immediately surrounding a bathtub.

(3) *Category I products* means any of the following architectural products:

(i) Storm doors or combination doors that contain no single piece of glazing material greater than 9 square feet (0.83 square meters) in surface area of one side of the piece of glazing material.

(ii) Doors that contain no single piece of glazing material greater than 9 square feet (0.83 square meters) in surface area of one side of the piece of glazing material.

(4) *Category II products* means any of the following architectural products:

(i) Shower doors and enclosures.

(ii) Bathtub doors and enclosures.

(iii) Sliding glass doors (patio type).

(iv) Storm doors or combination doors that contain any piece of glazing material greater than 9 square feet (0.83 square meters) in surface area of one side of the piece of glazing material.

(v) Doors that contain any piece of glazing material greater than 9 square feet (0.83 square meters) in surface area of one side of the piece of glazing material.

(5) *Distributor* means a person to whom a consumer product is delivered or sold for purposes of distribution in commerce, including persons cutting glazing material to size, except that such term does not include a manufacturer or retailer of such product.

(6) *Distribution in commerce* means to sell in commerce, to introduce or deliver for introduction into commerce, or to hold for sale or distribution after introduction into commerce.

(7) *Door* means an assembly that is installed in an interior or exterior wall; that is movable in a sliding, pivoting, hinged, or revolving manner of movement; and that is used by consumers to produce or close off an opening for use as a means of human passage.

(8) *Fabricator* means any person who assembles or otherwise incorporates glazing materials into an architectural product listed in §1201.1(a). A fabricator is considered a manufacturer as defined in paragraph (a)(16) of this section.

(9) *Glass* means a hard, brittle, amorphous substance produced by fusion, usually consisting of mutually dissolved silica and silicates that also contains sods and lime. It may be transparent, translucent, or opaque.

(10) [Reserved]

(11) *Glazing material* means glass, including annealed glass, organic coated glass, tempered glass, laminated glass, wired glass; or combinations thereof where these are used:

(i) In openings through the architectural products listed in §1201.1(a), or

(ii) As the architectural products themselves, e.g. unframed doors.

(12) *Jalouste door* means a door (as "door" is defined in paragraph (a)(7) of this section) having an opening glazed with operable, overlapping louvers. Each louver is one of a series of overlapping pieces of glazing material designed to admit ventilation and light but exclude rain and is typically operated by a crank and gear mechanism.

(13) *Laminated glass* means glazing material composed of two or more pieces of glass, each piece being either tempered glass, heat strengthened glass, annealed glass or wired glass, bonded to an intervening layer or layers of resilient plastic material.

(14) *Leaded glass* means a decorative composite glazing material made of individual pieces of glass whose perimeter is enclosed by lengths of durable metal such as lead or zinc and the pieces of glass are completely held together and supported by such metal. Such pieces of glass can be clear, colored, beveled, painted, or flashed and etched.

(15) *Manufacture* means to manufacture, produce or assemble.

(16) *Manufacturer* means any person who manufactures, fabricates or imports a glazing material or architectural product listed in §1201.1(a) that incorporates glazing material.

(17) *Mirror* means a treated, polished or smooth glazing material that forms images by the reflection of light.

(18) *Mobile home* means a structure transportable in one or more sections, which is eight body feet (2.4 body meters) or more in width and is thirty-two body feet (9.7 body meters) or more in length, and which is built on a permanent chassis and designed to be used as a dwelling with or without a permanent foundation when connected to the required utilities.

(19) *Other buildings or parts thereof* means buildings or parts thereof (other than residential, school, public, or recreational buildings) in which all or part of the building is open to the public with or without specific invitation. Included are buildings or parts thereof such as banks and recreational or retail facilities in a building and multiuse buildings that contain residential units.

(20) *Organic-coated glass* means a glazing material consisting of a piece of glass, coated and bonded on one or both sides with an applied polymeric coating, sheeting, or film.

(21) *Patio door* (See "sliding glass doors (patio-type)" in paragraph (a)(31) of this section).

(22) *Permanent label* means a label that will remain permanently legible and visible after installation of the glazing material and that would be destroyed in attempts to remove it from the glazing material and includes (but is not limited to) sandblast, acid etch, hot-stamp, and destructible polyester labels.

(23) [Reserved]

(24) *Private labeler* means an owner of a brand or trademark on the label of a consumer product which bears a private label, and includes any fabricator, distributor, or installer who cuts certified and permanently labeled glazing materials into smaller pieces.

(25) *Public building* means a building of public assembly or meeting including (but not limited to) a museum, place of worship, or restaurant.

(26) *Recreational building* means a building used for recreational purposes including (but not limited to) a theater, stadium, gymnasium, amusement park building or library.

(27) *Residential building* means a building, permanent or temporary, such as a single or multifamily residence, including (but not limited to) a house, apartment building, lodging home, dormitory, hotel, motel, hospital, sanitarium, and nursing home, used as a dwelling for one or more persons or families and any structure which is attached to, a part of, or appurtenant to such a building. Public areas of all residential buildings, such as lobbies and other common facilities, are included within the definition of "other buildings or parts thereof" in paragraph (a)(19) of this section. For purposes of this part 1201, a mobile home as defined in paragraph (a)(18) of this section is not considered to be a residential building.

(28) *Retailer* means a person to whom a consumer product is delivered or sold for purposes of sale or distribution by such person to a consumer; the term retailer includes a person who cuts glazing material to size for consumers.

(29) *School building* means a building designed primarily for the conduct of educational instruction and includes the classrooms, libraries, administrative offices, auditoriums, eating and sanitary facilities, stadiums, gymnasiums and all other structures associated with such buildings.

(30) *Shower door and enclosure* means an assembly of one or more panels installed to form all or part of the wall and or door of a shower stall.

(31) *Sliding glass door (patio-type)* means an assembly of one or more panels, at least one of which is suitably movable for use as a means of human ingress or egress. The term includes the nonmovable and movable panels of such assembly.

(32) *Storm door (or combination door)* means a movable assembly, used in tandem with an exterior door to protect the exterior door against weather elements and/or to improve indoor climate control.

(33) *Tempered glass* means a piece of specially heat treated or chemically treated glass that cannot be cut, drilled, ground, or polished after treatment without fracture. When fractured at any point, if highly tempered, the entire piece breaks into small particles.

(34) *Wired glass* means a single piece of annealed glass that contains wire embedded in the body of the glass.

(35) *Commission* means the Consumer Product Safety Commission.

(36) *Carved glass* means a decoration glazing material in which a permanent visible design has been produced by polishing, grinding, or otherwise removing portions of the surface.

(37) *Dalle glass* or dalle de verre (including faceted glass) means a decorative composite glazing material made of individual pieces of glass which are

INSERT

§ 1201.4 Test Procedures

Testing shall be in accordance with the test provisions of ANSI Z97.1 (most current version), "American National Standard for Safety Glazing Materials Used in Buildings – Safety Performance Specifications and Methods of Test." 2/

2/ Copies of ANSI Standard Z97.1 (most current version) are available from the American National Standards Institute, 25 W. 43rd Street, 4th Floor, New York, NY 10036, or online at http://webstore.ansi.org/FindStandards.aspx?SearchString=Z97.1&SearchOption=0&PageNum=0&SearchTermsArray=null%7cZ97.1%7cnull.

imbedded in a cast matrix of concrete or epoxy.

(b) Definitions given in the Consumer Product Safety Act, and not repeated in this section, are applicable to this part.

(c) Test methods and recommended practices published by the American Society for Testing and Materials (ASTM) [1], and referred to in this part 1201, are hereby incorporated by reference into this part.

(d) Test methods and recommended practices published by the American National Standards Institute (ANSI) and referred to in this part 1201, are hereby incorporated by reference into this part.

(Sec. 8(e), Pub. L. 92-573, 86 Stat. 1215; (15 U.S.C. 2058(e); (5 U.S.C. 553))

[42 FR 1441, Jan. 6, 1977, as amended at 42 FR 61860, Dec. 7, 1977; 43 FR 50422, Oct. 30, 1978; 43 FR 57247, Dec. 7, 1978; 45 FR 57389, Aug. 28, 1980; 47 FR 27856, June 28, 1982]

§ 1201.3 General requirements.

(a) All glazing materials to which this standard applies, as described in § 1201.1, shall meet the impact and environmental test requirements in § 1201.4, and shall be labeled by manufacturers in accordance with § 1201.5.

(b) Glazing materials used in architectural products not listed in § 1201.1(a) are not subject to this part. Any material not listed in the definition of "glazing material" in § 1201.2(a)(11) is not subject to this part 1201.

[42 FR 1441, Jan. 6, 1977, as amended at 47 FR 27856, June 28, 1982]

§ 1201.4 Test procedures.

(a) *Types of tests*—(1) *Impact test.* Specimens shall be struck as prescribed by paragraph (d)(1) of this section using equipment specified by paragraphs (b) (1) and (2) of this section. Results of the impact test are to be interpreted in accordance with paragraph (e)(1) of this section. The test specimens shall be selected in accordance with paragraphs (c) (1) and (2) of this section.

(2) *Accelerated environmental durability tests.* Each specimen of glazing material subject to this part 1201 shall be tested in accordance with the accelerated tests referenced in table 1, "Accelerated Tests" of this section. However, tempered glass, wired glass, and annealed glass are not required to be subjected to the accelerated environmental durability tests.

TABLE 1—ACCELERATED TEST (APPLICABLE PARAGRAPHS)

Glazing materials	Specimen	Test equipment	Exposure	Criteria for passing
Laminated glass	§ 1201.4(c)(1) and (c)(3)(i)	§ 1201.4(b)(3)(i)	§ 1201.4([illegible])(i)	§ 1201.4(e)(2)(i)
Organic coated glass	§ 1201.4(c)(1) and (c)(3)(ii)	§ 1201.4(b)(3)(ii)	§ 1201.4(e)(2)(i)(B)	§ 1201.4(e)(2)(i)(B)
Tempered glass	Exempt			
Wired glass	Exempt			
Annealed glass	Exempt			

(3) Separate testing is required for different glazing materials or for differences within a type of glazing material that could noticeably affect performance in the impact or environmental durability tests. Such differences could include (but are not limited to): Nominal thickness or thicknesses, method of manufacture (in appropriate cases), types and amounts of additives, and composition of base materials and adhesives.

(b) *Test equipment*—(1) *Impact test frame and subframe.* (See figures 1, 2, 3, and 4.) (i) The impact test frame shall be constructed to minimize movement and deflection of its members during testing. For this purpose, the structural framing and bracing members shall be steel angles 3 inches by 5 inches by ¼ inch (7.7 centimeters by 12.7 centimeters by 0.7 centimeters) or other sections and materials of equal or greater rigidity.

[1] ASTM test methods and recommended practices are approved by, published by, and available for purchase from the American Society for Testing and Materials, 1916 Race Street, Philadelphia, Pennsylvania 19103.

lengthwise direction of the glass specimen for the full 6 inch (15 centimeter) length. Carefully peel this strip from the glass panel and test it for breaking strength in the tensile tester.

(*iv*) *Interpretation of results.* The organic coating tensile strength shall be judged satisfactory if the average tensile value of the weathered specimens is no less than 75 percent of the average of the control specimens. Weathered and control specimens are to be tested alternately.

(Sec. 9(e) Pub. L. 92-573, 86 Stat. 1215; (15 U.S.C. 2058(e)); (5 U.S.C. 553); sec. 9(h), Consumer Product Safety Act, as amended by the Consumer Product Safety Amendments of 1981 (Pub. L. 92-573, as amended by Pub. L. 97-35, 15 U.S.C. 2057(h)) and 5 U.S.C. 553)

[42 FR 1441, Jan. 6, 1977, as amended at 43 FR 43709, Sept. 27, 1978; 43 FR 57594, Dec. 8, 1978; 45 FR 66007, Oct. 6, 1980; 46 FR 63250, Dec. 31, 1981; 47 FR 27857, June 28, 1982]

§ 1201.5 Certification and labeling requirements.

(a) Manufacturers and private labelers of glazing materials covered by this part 1201 shall comply with the requirements of section 14 CPSA (15 U.S.C. 2063) and regulations issued under section 14.

(b) [Reserved]

(c) Organic-coated glass that has been tested for environmental exposure from one side only must bear a permanent label on the coating stating "GLAZE THIS SIDE IN" and shall bear in the central 50 percent of the surface area the following message in letters at least ¼ inch (7 millimeters) high: "SEE PERMANENT LABEL FOR IMPORTANT MOUNTING INSTRUCTION." The latter message shall be attached to either side of the glazing by any means which shall ensure the message will remain in place until installation.

[42 FR 1441, Jan. 6, 1977, as amended at 45 FR 66007, Oct. 6, 1980]

§ 1201.6 Prohibited stockpiling.

(a) *Stockpiling.* For the purposes of this section, the term *stockpiling* means manufacturing or importing the affected products between the date of issuance of this part in the FEDERAL REGISTER and the effective date set out below in § 1201.7 at a rate significantly greater (prescribed in paragraph (b) of this section) than the rate at which the affected products were produced or imported during a base period (prescribed in paragraph (c)(2) of this section).

(b) *Prohibited acts.* Manufacturers and importers of glazing materials, fabricators, and manufacturers or importers of architectural products specified in § 1201.1(a) who incorporate glazing material shall not incorporate glazing materials which do not comply with the requirements of this part 1201 into such products between the date of issuance of this part in the FEDERAL REGISTER and the effective date set out in § 1201.7 below at a rate greater than the rate of production or importation during the base period (defined in paragraph (c)(2) of this section) plus ten percent. For wired glass used in doors or other assemblies subject to this part 1201 and intended to retard the passage of fire, when such doors or other assemblies are required by a Federal, State, local or municipal fire ordinance, the rate of production during the base period may be increased annually by no more than 10 percent.

(c) *Definitions.* As used in this section:

(1) *Rate of production (or importation)* means the total number of affected architectural products incorporating glazing material not complying with this part manufactured or imported during a stated base period.

(2) *Base period* means, at the option of the manufacturer or importer, any period of 180 consecutive days prior to January 6, 1977, said period to be selected within an interval which begins July 6, 1975.

§ 1201.7 Effective date.

The effective date of this part 1201 shall be July 6, 1977 except:

(a) For glazing materials used in doors or other assemblies subject to this part and intended to retard the passage of fire when such doors or other assemblies are required by a Federal, State, or local or municipal fire ordinance, the effective date shall be January 6, 1980.

(b) Architectural glazing materials manufactured before July 6, 1977 may be incorporated into architectural products listed in § 1201.1(a) through July 5, 1978 if:

(1) The architectural glazing material conforms to ANSI Standard Z97.1–1972 or 1975, "Performance Specifications and Methods of Test for Safety Glazing Material Used in Buildings," 1972 or 1975[2], which is incorporated by reference, and

(2) The architectural glazing material is permanently labeled to indicate it conforms to ANSI Z97.1–1972 or 1975 or is accompanied by a certificate certifying conformance to ANSI Z97.1 1972 or 1975.

(c) Tempered glass manufactured before July 6, 1977 may be incorporated into architectural products listed in § 1201.1(a) through July 5, 1981 if:

(1) The tempered glass conforms to ANSI Z97.1–1972 or 1975; and

(2) The tempered glass is permanently labeled to indicate it conforms to ANSI Z97.1–1972 or 1975 or is accompanied by a certificate certifying conformance to ANSI Z97.1–1972 or 1975.

(d) Laminated glass manufactured on or after July 6, 1977 through December 3, 1977 may be incorporated into category II products as defined in § 1201.2(a)(4) through July 5, 1978 if:

(1) The laminated glass conforms to ANSI Z97.1–1972 or 1975; and

(2) The laminated glass is permanently labeled to indicate that it conforms to ANSI Z97.1–1972 or 1975 or is accompanied by a certificate in accordance with section 14(a) of the CPSA certifying conformance to ANSI Z97.1–1972 or 1975.

(e) Architectural products manufactured between July 6, 1977 and July 5, 1978 incorporating glazing material in accordance with paragraph (b) of this section, may be distributed and sold without restriction.

(f) Architectural products manufactured between July 6, 1977 and July 5, 1981 incorporating tempered glass in accordance with paragraph (c) of this section, may be distributed and sold without restriction.

(g) Architectural products identified in § 1201.2(a)(4) manufactured between July 6, 1977 and July 5, 1978 incorporating laminated glass in accordance with § 1201.7(d) may be distributed and sold without restriction.

(h) Patinaed glass manufactured between July 6, 1977 and January 8, 1979, in accordance with the Commission's stay order published in the FEDERAL REGISTER of August 9, 1977 (42 FR 40188), may be sold without restriction. Architectural products incorporating such glazing may also be sold without restriction.

[43 FR 50422, Oct. 30, 1978, as amended at 43 FR 57247, Dec. 7, 1978; 46 FR 63250, Dec. 31, 1981]

[2] Copies of ANSI Standard Z97.1–1972 or 1975 are available from the American National Standards Institute, 1430 Broadway, New York, New York 10018. They are also available for inspection at the National Archives and Records Administration (NARA). For information on the availability of this material at NARA, call 202–741–6030, or go to: *http://www.archives.gov/federal_register/code_of_federal_regulations/ibr_locations.html.* This incorporation by reference was approved by the Director of the Federal Register. These materials are incorporated as they exist in the editions which have been approved by the Director of the Federal Register and which have been filed with the Office of the Federal Register.

FIGURE 1 TO SUBPART A OF PART 1201—GLASS IMPACT TEST STRUCTURE

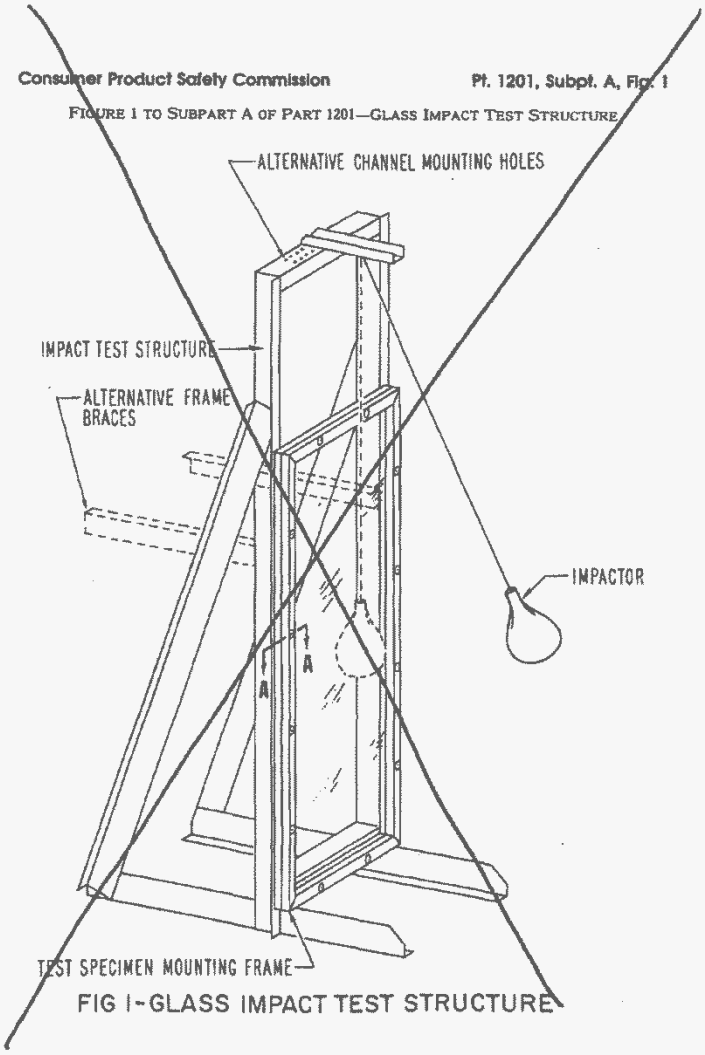

FIG 1-GLASS IMPACT TEST STRUCTURE

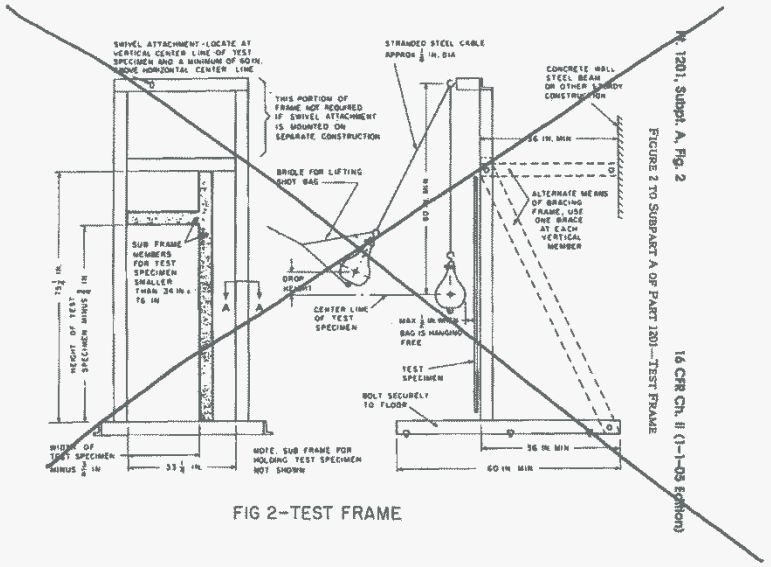

FIG 2–TEST FRAME

FIGURE 2 TO SUBPART A OF PART 1201—TEST FRAME

208

FIGURES 3 AND 4 TO SUBPART A OF PART 1201—TEST SPECIMENS

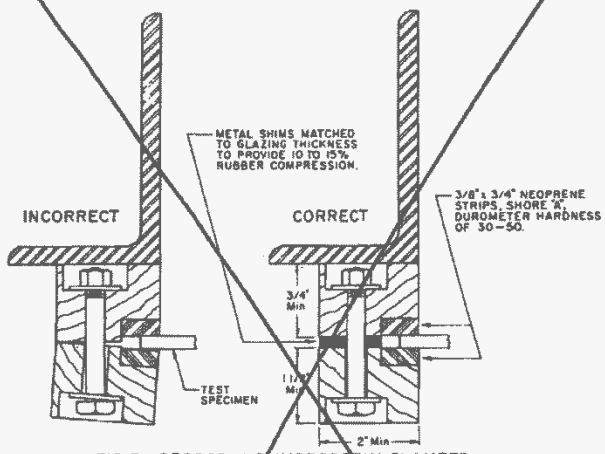

FIG 3—PROPERLY & IMPROPERLY CLAMPED TEST SPECIMEN (>1/8" THICK)

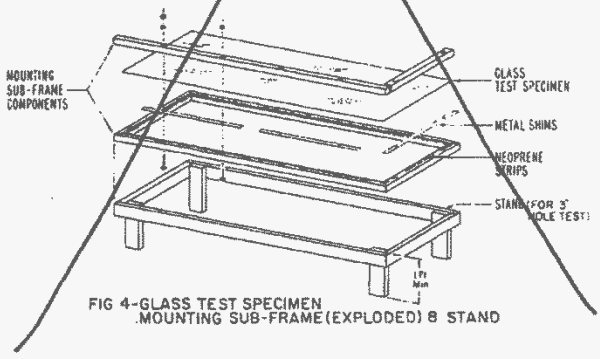

FIG 4-GLASS TEST SPECIMEN MOUNTING SUB-FRAME (EXPLODED) & STAND

FIGURE 5 TO SUBPART A OF PART 1201—IMPACTOR

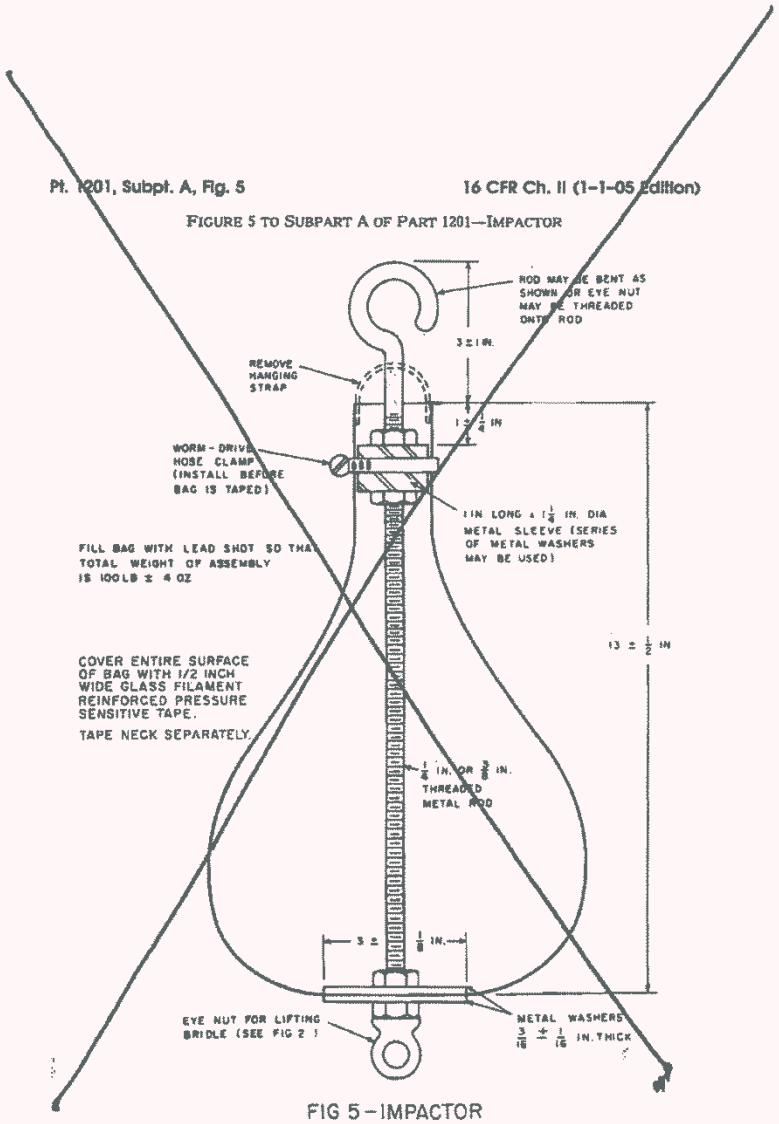

FIG 5 – IMPACTOR

Subpart B [Reserved]

Subpart C—Statements of Policy and Interpretation

§ 1201.40 Interpretation concerning bathtub and shower doors and enclosures.

(a) *Purpose and background.* The purpose of this section is to clarify the scope of the terms "bathtub doors and enclosures" and "shower door and enclosure" as they are used in the Standard in subpart A. The Standard lists the products that are subject to it (§ 1201.1(a)). This list includes *bathtub doors and enclosures,* a term defined in the Standard to mean "assemblies of panels and/or doors that are installed on the lip of or immediately surrounding a bathtub" (§ 1201.2(a)(2)). The list also includes *shower doors and enclosures,* a term defined to mean "(assemblies) of one or more panels installed to form all or part of the wall and/or door of a shower stall" (§ 1201.2(a)(30)). Since the Standard became effective on July 6, 1977, the question has arisen whether the definitions of these products include glazing materials in a window that is located over a bathtub or within a shower stall and in the exterior wall of a building. The definitions of the terms "bathtub doors and enclosures" and "shower door and enclosure" contain no specific exemption for glazing materials in such windows. If read literally, the Standard could include glazing materials in an exterior wall window located above a bathtub because that window could be interpreted as being "immediately surrounding" the bathtub. Similarly, the Standard, if read literally, could include glazing materials in an exterior wall window because that window could be interpreted as forming "all or part of the wall * * * of a shower stall."

(b) *Interpretation.* When the Consumer Product Safety Commission issued the Standard, it did not intend the standard to apply to any item of glazing material in a window that is located over a bathtub or within a shower stall and in the exterior wall of a building. The Commission clarifies that the Standard does not apply to such items of glazing material or such windows. This interpretation applies only to the term "bathtub doors and enclosures" and "shower door and enclosure" and does not affect the applicability of the Standard to any other product.

[46 FR 45751, Sept. 15, 1981]

PART 1202—SAFETY STANDARD FOR MATCHBOOKS

Sec.

AUTHORITY: Secs. 2, 3, 7, 9, 14, 16, and 19, Pub. L. 92-573, 86 Stat. 1212-17 (15 U.S.C. 2051, 2052, 2056, 2058, 2063, 2065, and 2068).

SOURCE: 43 FR 53709, Nov. 17, 1978, unless otherwise noted.

§ 1202.1 Scope and effective date.

(a) *Scope.* This part 1202, a consumer product safety standard, prescribes the safety requirements, including labeling requirements, for the matchbook. This part 1202 applies to all matchbooks manufactured in or imported into the United States after its effective date.

(b) *Effective date.* The effective date shall be May 4, 1978.

§ 1202.2 Findings.[1]

(a) *Risk of injury.* The Commission finds that unreasonable risks of injury from accidents are associated with matchbooks. These unreasonable risks,

[1] The Commission's findings apply to the matchbook standard that it published on May 4, 1977 (42 FR 22656-70). On Mar. 31, 1978, the U.S. Court of Appeals for the First Circuit set aside portions of that standard (*D. D. Bean & Sons, Co.* v. *CPSC,* 574 F. 2d 643). On Nov. 17, 1978, the Commission published a revised version of the standard which reflects the court's decision. However, the findings have not been revised and they are therefore not fully applicable to the revised matchbook requirements. For example, the revised standard does not address the unreasonable risk of injury of "[b]urn injuries that have been sustained by persons from fires that have been set by the afterglow of extinguished bookmatches" (§ 1202.2(a)(6)) because the court set aside the afterglow performance requirement.

(ii) The structural framing shall be welded or securely bolted at the corners and braced by one of the alternate methods shown in figure 1 and shall be securely bolted to the floor.

(iii) The inner subframe (see figures 2, 3, and 4) for securing the test specimen on all four edges shall be reinforced at each corner. The material is shown as wood in figure 3, but other materials may be used: *Provided,* The test specimen will contact only the neoprene strips, which shall have a shore A durometer hardness of 30 to 50.

(iv) Any reasonable means may be used to secure the subframe to the test frame so long as the mounting is secure and the pressure on the glazing in the subframe is not significantly altered when the subframe is removed.

(v) Pressures on the test specimen shall be controlled, and the compression of the neoprene strips shall be between 10 and 15 percent of the original thickness of the neoprene. Securing methods such as wing bolts and clamps shall be uniformly spaced no greater than 18 inches (45 centimeters) apart with no fewer than two on any edge. To limit the compression of the neoprene and prevent distortion of the subframe, metal shims of an appropriate thickness shall be used as shown in figures 3 and 4.

(2) *Impactor.* (i) The impactor shall be a leather punching bag as shown in figure 5 on this section. The bag shall be filled with No. 7½ chilled lead shot to a total weight of completed assembly as shown in figure 5, of 100 pounds ±4 ounces (45.36±0.11 kilograms). The rubber bladder shall be left in place and filled through a hole cut into the upper part. After filling the rubber bladder, the top should be either twisted around the threaded metal rod below the metal sleeve or pulled over the metal sleeve and tied with a cord or leather thong. Note that the hanging strap must be removed. The bag should be laced in the normal manner. The exterior of the bag shall be completely covered by ½ inch (1.3 centimeters) wide glass filament reinforced pressure sensitive tape. (Figure 5.)

(ii) Provisions shall be made for raising the impactor or to drop heights of up to 48 inches (1.22 meters). At its release it shall have been supported so that the rod going through its center was in line with the steel support cable in a manner designed to minimize wobble or oscillation after its release.

(3) *Environmental durability test equipment*—(i) *Boil test.* Two containers of water shall be provided with means to maintain one at 150° ±5 °F (66° ±2 °C) and the second at a slow boil at atmospheric pressure. The containers shall be large enough to accept a rack holding three specimens, each 12 inches (30 centimeters) square, of the glazing material in a vertical position. The rack shall be positioned so that each specimen is surrounded by at least one inch (2.5 centimeters) of water.

(ii) *Simulated weathering test.* The equipment shall be a xenon arc (water-cooled) Weather-Ometer employing a lamp rated at 6500 watts and automatic light monitoring and control systems. Borosilicate inner and outer filters shall be used. An appropriate water spray cycle shall be used. Operating procedures shall be in accordance with ASTM G 26–70, "Standard Recommended Practice for Operating Light—and Water-Exposure Apparatus (Xenon-Arc Type) for Exposure of Nonmetallic Materials," April 13, 1970, as augmented for plastics by ASTM D 2565–70, "Standard Recommended Practice for Operating Xenon-Arc Type (Water-Cooled) Light- and Water-Exposure Apparatus for Exposure of Plastics," Procedure B, June 12, 1970, which are incorporated by reference. Copies of both documents are available from the American Society for Testing and Materials, 1916 Race Street, Philadelphia, Pennsylvania 19103. They are also available for inspection at the National Archives and Records Administration (NARA). For information on the availability of this material at NARA, call 202–741–6030, or go to: *http://www.archives.gov/federal_register/code_of_federal_regulations/ibr_locations.html.* This incorporation by reference was approved by the Director of the Federal Register. These materials are incorporated as they exist in the edition which has been approved by the Director of the Federal Register and which has been filed with the Office of the Federal Register.

(c) *Test specimens*—(1) *Condition of specimens.* All specimens shall be tested

as supplied by the manufacturer, following removal of any temporary protective masking materials. No tests shall be commenced before the specimens have been stored in the laboratory for 4 hours. Specimens shall be arranged to permit free circulation of air to all surfaces during this period.

(2) *Impact specimens.* Impact specimens shall be of the largest size manufactured up to a maximum width of 34 inches (86 centimeters) and a maximum height of 76 inches (1.9 meters). Specimens shall be tested for each nominal thickness offered by the manufacturer.

(3) *Environmental durability specimens*—(i) *Boil test.* Three pieces 12 inches by 12 inches (30 centimeters by 30 centimeters) with nominal thickness identical to those submitted for the impact test shall be used.

(ii) *Weathering tests*—(A) [Reserved]

(B) *Organic-coated glass—(1) Orientation specified.* Six organic-coated glass specimens 2 inches by 6 inches (5 centimeters by 15 centimeters) by nominal thickness identical to those submitted for the impact test shall be used.

(2) *Orientation unspecified.* Nine organic-coated glass specimens, 2 inches by 6 inches (5 centimeters by 15 centimeters) by nominal thickness identical to those submitted for the impact test shall be used except that when the glazing material is symmetric across its thickness, six specimens may be used.

(iii) *Indoor service.* Four additional samples identical to those submitted for the impact test.

(d) *Test procedures*—(1) *Impact test procedure.* Each specimen shall be struck within 2 inches (5 centimeters) of its geometric center with the impactor dropped from a single height, designated according to the product category. Specimens for Category I shall be impacted one time from a drop height of 18 to 18½ inches (458 to 470 millimeters). Specimens for Category II shall be impacted one time from drop height of 48 to 48½ inches (1.22 to 1.23 meters). For all specimens that are not symmetric from surface to surface, an equal number of specimens shall be impacted on each side. For glazing materials which will be evaluated by paragraph (e)(1)(iii) of this section, this impact test procedure is not required.

(2) *Environmental durability test procedures*—(i) *Boil test.* The specimens shall be immersed in the 150 F (66 °C) water for 3 minutes. They shall then be quickly removed and immersed in the boiling water and left there for 7 hours. The specimens shall then be removed, cooled, and dried for examination as specified in paragraph (e)(2)(i) of this section.

(ii) *Accelerated weathering test.* The specimens shall be retained in the Weather-Ometer (paragraph (b)(3)(ii) of this section) for a period of 1200±1 hours, and exposed to a radiant flux of 50 microwatts per square centimeter (12 calories per second per square centimeter) while monitoring at a wavelength of 340 nanometers.

(A) [Reserved]

(B) *Organic-coated glass—(1) Orientation specified.* Three specimens shall be mounted with the surface that is intended to be oriented indoors faced away from the radiation source; the other three specimens shall be kept in darkness at 73 °F (23 °C) for use as controls. Materials so tested shall be labeled according to §1201.5(c) of this part 1201.

(2) *Orientation unspecified.* Three specimens shall be mounted with one of the surfaces toward the radiation; three specimens shall be mounted with the other surface toward the radiation, and three specimens shall be kept in darkness at 73 °F (23 °C) for use as controls. When the glazing material is symmetric across its thickness, three specimens shall be irradiated.

(e) *Interpretation of results*—(1) *Impact test.* A glazing material may be qualified for use in both Category I and Category II products if it meets the impact requirements for Category II. A glazing material shall be judged to pass the impact test if the specimen tested meets any one of the criteria listed in paragraphs (e)(1) (i) through (v) of this section:

(i) When breakage occurs (numerous cracks and fissures may occur) no opening shall develop in the test sample through which a 3 inch (76 millimeter) diameter solid steel sphere, weighing 4 pounds ±3 oz (1.81±0.08 kilograms), passes when placed (not dropped) in the opening and permitted to remain for a period of one second.

For this criterion, the sample after being impacted shall be placed, while remaining in the subframe, in a horizontal, impact side up position with a minimum of one foot (31 centimeters) of free space immediately beneath the specimen.

(ii) When breakage occurs, what appear to be the 10 largest particles shall be selected within 5 minutes subsequent to the test and shall weigh no more than the equivalent weight of 10 square inches (64 square centimeters) of the original specimen. For the purposes of this section *particle* means a portion of a broken test specimen which is determined by identifying the smallest possible perimeter around all points in the portion of the broken test specimen, always passing along cracks or exposed surfaces.

(iii) [Reserved]

(iv) The specimen does not remain within the subframe and no breakage is caused by the impactor.

(v) The specimen does not break.

(2) *Environmental durability tests*— (i) *Boil test.* The glass itself may crack in this test, but no bubbles or other defects shall develop more than ½ inch (12 millimeters) from the outer edge of the specimen or from any crack that may develop. Any specimen in which the glass cracks to an extent that confuses the interpretation of the results shall be discarded, and another specimen shall be tested in its stead.

(ii) *Accelerated weathering test*—(A) [Reserved]

(B) *Organic-coated glass.* Specimens shall be judged satisfactory if they pass both the adhesion test and the tensile test described below in paragraph (e)(11)(B) (*1*) and (*2*) of this section.

(*1*) *Adhesion test (organic-coated glass only)*—(*i*) *Specimens.* The specimens for this test are the 2 inch by 6 inch (5 centimeters by 15 centimeters) weathered specimens and the control specimens. The specimens shall be conditioned just prior to the performance of the adhesion test at 73° ±6 °F (23° ±3 °C) and 50±5 percent relative humidity for 24 hours.

(*ii*) *Apparatus.* The test apparatus shall consist of a constant-rate-of-extension-type (CRE) tensile tester with the moving crosshead set to move at 12 inches per minute (5 millimeters per second) and load range such that the average pull force will fall at 30 to 50 percent of full scale. A cutter shall be used containing new razor blades for cutting 1 inch (25 millimeter) wide specimens of the organic coating on the glass. The razor blades shall be used one time only.

(*iii*) *Procedure.* Using the razor cutter, cut a straight, 1 inch (25 millimeter) wide strip of the organic coating in the lengthwise direction of the glass specimen along and within ¼ inch (6 millimeters) of one edge. Peel back, cleanly and evenly, about 2 inches (50 millimeters) of one end of the 1 inch (25 millimeters) wide organic strip. Attach a strip of reinforced pressure sensitive tape to the side of the organic strip opposite the adhesive, to extend this free end to about 8 inches (200 millimeters) in length. Place the end of the glass panel from which the organic strip was removed in the lower clamp of the tensile tester and and the free end of the tape in the upper clamp. Peel the remainder of the organic strip from the glass mechanically and obtain a record of the pull force value. Determine and record the average pull force value for each specimen from the chart. Weathered and control specimens are to be tested alternately.

(*iv*) *Interpretation of results.* The organic-coated glass adhesion shall be judged satisfactory if the average pull force for the weathered specimens is no less than 90 percent of the average pull force for the control specimens.

(*2*) *Tensile strength test (organic-coated glass only).* (*i*) The specimens for this test are the same 2 inch by 6 inch (5 centimeter by 15 centimeter) specimens used in the adhesion test.

(*ii*) *Apparatus.* The CRE tensile tester shall be used with the moving crosshead set to move at 2 inches per minute (0.8 millimeter per second) and the load range such that the specimens will break at 30 to 60% of full scale. A cutter shall be used containing new razor blades for cutting ½ inch (12 millimeter) wide specimens of the organic coating on the glass. The razor blades shall be used one time only.

(*iii*) *Procedure.* Using the ½ inch (12 millimeter) razor cutter, cut a straight strip of the organic coating in the

American National Standard

for safety glazing materials used in buildings – safety performance specifications and methods of test

Standard ANSI Z97.1-2009[ε2]

25 West 43rd Street,
New York, New York 10036

ANSI Z97.1 – 2009^{e2}
Revision of ANSI Z97.1-2004e

American National Standard
for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test

Secretariat

Glazing Industry Secretariat Committee

Approved by Accredited Standards Committee (ASC) Z97
November 2009

American National Standards Institute, Inc.

ANSI Z97.1-2009^{e} – Modification to section 5.1.2.1.2 (1), (2), (3) and (4) to clarify interpretation of allowable changes after weathering.

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FORWARD

(This forward is not part of ANSI Z97.1-2009$^{\epsilon 2}$)

This standard was developed under procedures accredited as meeting the criteria for American National Standards. The consensus committee that approved the Standard was balanced to ensure that individuals from competent and concerned interests have had an opportunity to participate. It was developed within the approved scope as stated in section 1.1 of the standard.

This Standard is available for public review on a continuing basis. This provides an opportunity for additional public input from industry, academia, regulatory agencies, and the public-at-large. The use of an addenda system will allow revisions made in response to public review or committee actions to be published as required.

This standard, which is the result of extended and careful consideration of available knowledge and experience on the subject, is intended to provide minimum requirements that are recommended for use, adoption, enforcement by federal, state and local authorities and by model codes. It is recommended that this standard be referenced but not incorporated in any statute.

This Standard does not recommend where safety glazing should be used or, when it is used, what type of glazing material should be used. For this information one should consult other codes, standards and manufacturer's information.

Neither the standards committee nor the secretariat feel that this standard is perfect or in its ultimate form. It is recognized that, although safety-glazing materials are widely used and accepted, new developments are to be expected and revisions of the standards are necessary as the art progresses and further experience is gained.

This standard is a successor standard to the 2004e edition. The 2004e standard succeeded those of the 1984 (reaffirmed in 1994), 1975, 1972 and 1966 editions.

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2. The standard or portions of a standard intended to be enforced shall be written in mandatory language.
3. The scope or application of the reference material shall be clearly described.
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5. The standard shall not prescribe a proprietary agency for quality control or testing.

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Secretary, Z97 Main Committee
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Table of Contents

Table of Figures

Table of Tables

American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test

1 Scope, Purpose, and Limitations

1.1 Scope.

This standard establishes the specifications and methods of test for the safety properties of safety glazing materials (glazing materials designed to promote safety and reduce the likelihood of cutting and piercing injuries when the glazing materials are broken by human contact) as used for all building and architectural purposes.

1.2 Purpose.

The purpose of this standard is to prescribe the minimum safety performance characteristics of safety glazing materials. This standard affords a basis for; (1) safety standards for adoption in regulations by federal, state, and local regulatory bodies; and (2) for use by building code officials, architects, designers, specifiers and others as a reference standard. Approval of a material under this standard constitutes acceptance of its safety characteristics and the retention of those characteristics. It is not to be construed as appraisal of its durability or appearance as a glazing material.

1.3 Limitations.

1.3.1 Conformance of a material to this standard demonstrates minimum acceptable safety characteristics of the material in use.

1.3.2 While this Standard relates to the minimum safety performance property test criteria for safety glazing materials, the lowest classification level herein per section 5.1.2 has NOT been accepted by all jurisdictions (e.g. CPSC 16 CFR 1201, building codes, etc...) as "safe performance" for unrestricted human impact accident modes. Therefore Class C herein applies to glazing material acceptable by the authority having jurisdiction that either:

(1) has restricted human impact accident modes in application; or that

(2) has a combination of minimal impact characteristics with a fire safety function other than energetic human impact alone.

1.3.3 Conformance of a material to this standard is not to be construed as an appraisal of its strength, durability or appearance as a glazing material, nor does this standard specify situations in which safety-glazing materials should be used.

1.3.4 This standard does not address the methods used for the installation of safety glazing materials.

1.3.5 A condition of conformance of a material to this standard is its uniform production so that it will consistently exhibit these safety characteristics.

1.3.6 Monolithic annealed glass, monolithic heat strengthened glass, monolithic chemically strengthened glass and monolithic fire rated wired glass are not considered safety glazing materials under this standard.

2. Referenced Standards

This standard is intended for use in conjunction with the cited editions of the following standards (see ANNEX X1 for edition year):

ASTM C1036, Standard Specification for Flat Glass[1].

ASTM C1048 Standard Specification for Heat-Treated Flat Glass - Kind HS, Kind FT, Coated and Uncoated Glass[1].

ASTM C1172 Standard Specification for Laminated Architectural Flat Glass[1].

ASTM C1349 Standard Specification for Architectural Flat Glass Clad Polycarbonate[1].

ASTM C1464 Standard Specification for Bent Glass[1].

ASTM D618 Standard Practice for Conditioning Plastics for Testing[1].

ASTM D756 Practice for Determination of Weight and Shape Changes of Plastics under Accelerated Service Conditions[1].

ASTM D785 Standard Test Method for Rockwell Hardness of Plastics and Electrical Insulating Materials[1].

ASTM D790 Standard Test Methods for Flexural Properties of Un-reinforced and Reinforced Plastics and Electrical Insulating Material[1].

ASTM D883 Standard Terminology Relating to Plastics[1].

ASTM D1003 Standard Test Method for Haze and Luminous Transmittance of Transparent Plastics[1].

ASTM D1435 Standard Practice for Outdoor Weathering of Plastics[1].

ASTM D2240 Standard Test Method for Rubber Property-Durometer Hardness[1].

ASTM D2565 Standard Practice for Xenon Arc Exposure of Plastics Intended for Outdoor Applications[1].

ASTM D6110 Standard Test Methods for Determining the Charpy Impact Resistance of Notched Specimens of Plastics[1].

ASTM E308 Practice for Computing the Colors of Objects by Using the CIE System[1].

1 ASTM, International. 100 Barr Harbor Drive, West Conshohocken, PA

ASTM E313 Standard Practice for Calculating Yellowness and Whiteness Indices from Instrumentally Measured Color Coordinates[1].

ASTM G155 Standard Practice for Operating Xenon Arc Light Apparatus for Exposure of Non-Metallic Materials[1] .

Consumer Product Safety Commission (CPSC) 16 Code of Federal Regulations (CFR) Part 1201 Safety Standard for Architectural Glazing Materials[2] .

ISO 4892.2 Plastics - Methods of Exposure to Laboratory Light Sources - Part 2 Xenon Arc Sources[3] .

2 United States Code of Federal Regulations: title 16, volume 2; superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402, United States.

3 International Organization for Standardization (ISO) Geneva Switzerland

3 Definitions

asymmetric material. Glazing in which component layers of its construction makeup are different in thickness, kind, type or pattern texture about its interlayer and/or central plane surface.

bent glass. Flat glass that has been shaped while hot into a form that has curved surfaces.

bubble. A visible gas pocket in the interlayer material or in the plastic glazing sheet material, or between the interlayer and another layer of glass or plastic glazing sheet material.

cracking. The visible breaking, splitting or fissuring, either partially or completely through the thickness of an individual layer of material.

crack-free particle. A portion of a broken test specimen that is determined by identifying the smallest possible perimeter around all points in the portion of the broken test specimen, always passing along un-separated cracks or exposed surfaces.

crazing. The visible breaking, splitting or fissuring of a material, typically patterned with a network of fine lines that do not penetrate through the thickness of an individual layer of material.

delamination. A condition in which one of the glass or plastic glazing sheet material layers loses its bond to an interlayer and separates physically.

discoloration. A visibly noticeable chemical or process induced color deviation in the appearance of a material.

fire-resistant wired glass. Flat transparent or translucent soda lime silicate glass which has an interconnected steel wire mesh, incorporated in the glass during its manufacturing process. To be considered as fire resistant, this product shall be covered by an appropriate listing body and when installed shall be labeled accordingly.

laminated glazing. A manufactured assembly consisting of at least one sheet of glass bonded to at least one other sheet of glass or plastic glazing material with an organic interlayer. Note: when broken, numerous cracks appear, but glass fragments tend to adhere to the interlayer. See ASTM C1172 for additional information.

> ***2-ply glass laminates.*** A laminated glass consisting of two sheets of glass bonded together with an interlayer.
>
> ***multi-ply glass laminates.*** A laminated glass consisting of more than two layers of glass and/or plastic glazing sheet material bonded together by interlayers, where both of the outer surfaces are glass.

glass/plastic laminates. A laminated glass consisting of one or more layers of glass and one or more layers of plastic glazing sheet material bonded together with one or more interlayer(s) in which the plastic surface faces inward when the glazing is installed in a structure.

mirrors. Architectural glazing materials whose intended use is based on their reflective quality. These materials are composed of a reflective surface and may have a substrate of glass, or plastic.

organic-coated glass. An assembly consisting of a sheet of glass covered on one or both surfaces with either: (1) an adhesive-applied organic film or sheeting, or (2) an applied coating. When broken numerous cracks appear, but the glass fragments tend to adhere to the applied organic material.

plastic glazing material. A single sheet of synthetic plastic material, a combination of two or more such sheets laminated together, or a combination of plastic material and reinforcement material in the form of fibers or flakes. This material contains as an essential ingredient an organic substance of large molecular weight; is solid in its finished state; and, at some stage in its manufacture or in its processing into finished articles, can be shaped by flow. See ASTM C1349 for additional information.

safety glazing materials. Glazing materials so constructed, treated, or combined with other materials that, if broken by human contact, the likelihood of cutting or piercing injuries that might result from such contact is reduced.

tempered glass. (also known as a toughened glass). Glass of any shape that has been subjected to a thermal treatment process characterized by uniform heating followed by rapid uniform cooling to produce compressively stressed surface layers. See ASTM C1048 for additional requirement information.

4 Specimens to Be Tested

Table 1: Grouping of Tests for Safety Glazing Materials

Test	Glazing Type[1]				
	Laminated Glazings	Tempered Glass	Organic Coated Glass	Plastic Glazing	Fire Resistant Wired Glass
Impact Test 5.1	X	X	X	X	X
Center Punch Fragmentation Test 5.2		X[2]			
Boil Test 5.3	X[3]				
Weathering Test 5.4	X[4,5]		X[4,5]	X[5]	
Indoor aging Test 5.4.3			X	X	
Hardness Test 4.7, 5.1.4 (3)				X[6]	
Modulus Test 4.7, 5.1.4 (3)				X[6]	

1 Bent and mirror glazing shall be tested in accordance with requirements of the base-glazing product; see section 4.4
2 Center Punch Fragmentation test is used to evaluate the fracture pattern of tempered glass specimens that do not break during impact test of section 5.1.
3 Excludes glass/plastic laminates
4 Weathering tests on laminated and organic coated glasses shall be performed on the thinnest construction of all components in clear glass with clear plastics.
5 Products intended for indoor use only are not subject to weathering test.
6 Only required if breakage occurs under impact

4.1 Condition of Specimens.

Tests shall be applied to specimens as shipped by the manufacturer and shall be representative of commercial production, except that any protective masking material shall be removed prior to test.

4.2 Thickness of Specimens.

The thickness of the specimens to be tested shall be measured and recorded along with the nominal thickness in accordance with accepted industry practice (for glass as set forth in ASTM C1036 or other national or international standards.). No manufacturer shall mark or advertise as

passing the tests, described in this standard, any product of different nominal thickness than that of the specimens passing the tests.

4.3 Size Classification of Specimens.

A description of impact specimens to be tested as required for size classification as set forth below:

Unlimited Size (U)	34 inches by 76 inches, ± 0.125 (1/8) inch (863 mm by 1930 mm, ± 3 mm)
Limited Size (L)	Appropriate to Manufacturer, Largest size commercially produced by the manufacturer less than 34 inches by 76 inches, ± 1/8 inch (863 mm by 1930 mm, ± 3 mm). Minimum specimen size: 16 inches by 30 inches, ± 1/8 inch (406 mm by 762 mm, ± 3 mm).

No manufacturer submitting specimens that are in the Limited Size Classification shall mark or advertise as passing the tests, described in this standard, any product with either dimension greater than those of the specimens passing the tests.

4.4 Specimens for Impact Tests.

For impact test (see section 5.1) of any safety glazing material, four specimens, each of the thickness and size described in sections 4.2 and 4.3 respectively, shall be required. If the test specimens are of an asymmetric material, two shall be impacted from each side.

For impact test after aging (see section 5.4.4) of safety glazing materials used in indoor applications, four specimens, each of the thickness and size described in sections 4.2 and 4.3 respectively, shall be required. If the test specimens are of an asymmetric material two shall be impacted from each side.

For mirror glazing products using either reinforced or non-reinforced organic adhesive backing material, four specimens each with the backing material applied, of the thickness and size described in sections 4.2 and 4.3 respectively, shall be required. The specimens shall be impacted only on the non-reinforced side and with no other material applied.

Bent glass test methods shall be the same as for flat sample testing except as referenced in the text and figures of this standard (See **Figure 4, 4.1, 4.2, 4.3, 5** and **6**). For unlimited size (U) classification of bent glass, 34 in x 76 in (864 mm x 1930 mm) specimens with a simple arc-shaped bend of 40 inches (1016 mm) shall be tested. Interpretation of results shall be the same. See ASTM C1464 for additional information.

Note: *Where project specific requirements or limitations in production exist, other shapes and sizes may be tested and classified as limited (L).*

4.5 Specimens for Boil Test.

For boil test (see section 5.3) three specimens, each 12 inches by 12 inches, representative of commercial production and of identical manufacture and nominal thickness as submitted for impact testing (see section 4.4), shall be required.

4.6 Specimens for Weathering Tests.

For weathering tests (see section 5.4), specimens as described in sections 4.6.1 and 4.6.2, representative of commercial production and of like thickness as submitted for impact testing (see section 4.4), shall be required.

4.6.1 Plastic Glazing Material.

One un-backed panel, a minimum 6 inches by 6 inches (152 mm by 152 mm), shall be exposed. One additional un-backed panel, a minimum 6 inches by 6 inches (152 mm by 152 mm), shall be kept in darkness and used as a control.

NOTE: A minimum of five specimens, each 0.5 inch by 5 inches (12.7 mm by 127 mm), is necessary for the Charpy Impact Test (ASTM D6110). Alternate panel sizes may be used provided that enough material exists to cut a total of five specimens after exposure. Edges shall be trimmed from exposed panels prior to cutting specimens to minimize edge effects. For materials suspected of being anisotropic, the direction of one axis shall be marked on each panel, and all specimens shall be cut in the same direction.

4.6.2 Laminated Glass and Organic-Coated Glass.

Six specimens, each, a minimum of 2 inches by 6 inches (50 mm by 152 mm) shall be prepared. Three specimens shall be exposed and three shall be kept in darkness and used as controls.

4.7 Specimens for Modulus and Hardness Tests

4.7.1 Specimens for Flexural Modulus.

The specimen dimensions are dependent on the thickness of the material and the span distance capabilities of the testing machine. The dimensions shall meet the requirements of ASTM D790 for flatwise tests. For common plastic glazing thicknesses and common testing machine capabilities, specimens 0.5 inch (12.7 mm) wide and 5 inches (127 mm) long can meet the requirements. Decreased width and/or increased length may be needed in some cases to meet the span to depth ratio, span to width ratio and span to length requirements of the standard.

4.7.2 Specimens for Rockwell Hardness.

The specimens shall be at least 1 inch (25 mm) square and at least 1/4 inch (6 mm) thick. Materials less than 0.25 inch (6 mm) thick may be stacked provided that the precautions noted in ASTM D785 are met.

5 Test Specifications

5.1 Impact Test.

Required specimens shall be tested as submitted except that any protective masking or protective material shall be removed prior to the test. Any applied coating integral to the specimens shall not be removed. The specimens shall be conditioned to a uniform test temperature between 65°F and 85°F (18°C and 29°C) for at least 4 hours with separation to permit free air circulation.

5.1.1 Apparatus.

The test apparatus shall consist of a test frame and an impactor system. The test frame consists of a main frame mounted on two base beams with stiffening members and a sub-frame, in which the specimen is held. The impactor system consists of the impactor, traction, release, and suspension devices.

(1) Main Frame. The main frame shall be constructed to minimize movement, deflection, twisting or racking of its members during testing. For this purpose, the structural framing members shall be steel angles 3 inches by 5 inches by 0.25 inch (76 mm by 127 mm by 6 mm) or other sections and materials of equal or greater rigidity. The main frame shall be welded or securely bolted at the corners and braced as shown in **Figure 1**, **Figure 2** and **Figure 3**.

The main frame is mounted to a rigid floor and/or wall. Horizontal members made of steel sections connect the main frame to a rigid wall. The base beams are connected to the main frame by diagonal members of steel sections (see **Figure 1**, **Figure 2** and **Figure 3**). Attach the two base beams of the main frame to a concrete base or floor using bolts M16 or equivalent.

Internal dimensions of main frame[4] (**Figure 2**) shall be:
Internal width: 33.25 inches ±0.2 inch (835 mm ±5 mm)
Internal height: 75.25 inches ± 0.2 inch (1902 mm ±5 mm)

[4] The internal dimensions of the main frame shall be 1.1 inch (28 mm) less than unlimited-size (34 inches by 76 inches [863 mm by 1930 mm]) specimen dimensions.

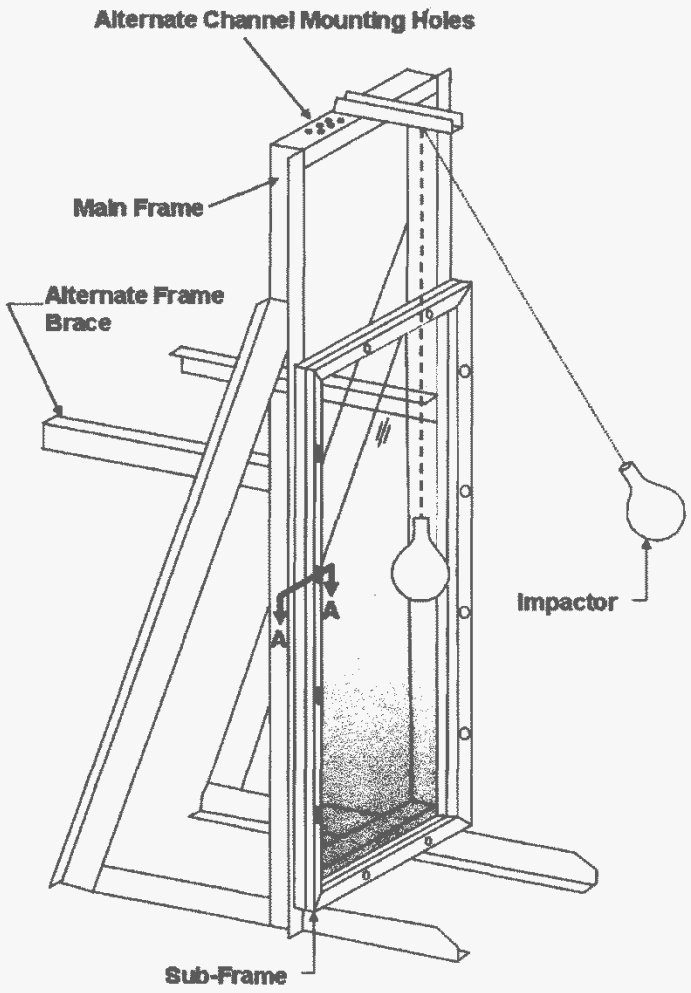

Figure 1: Impact Test Structure

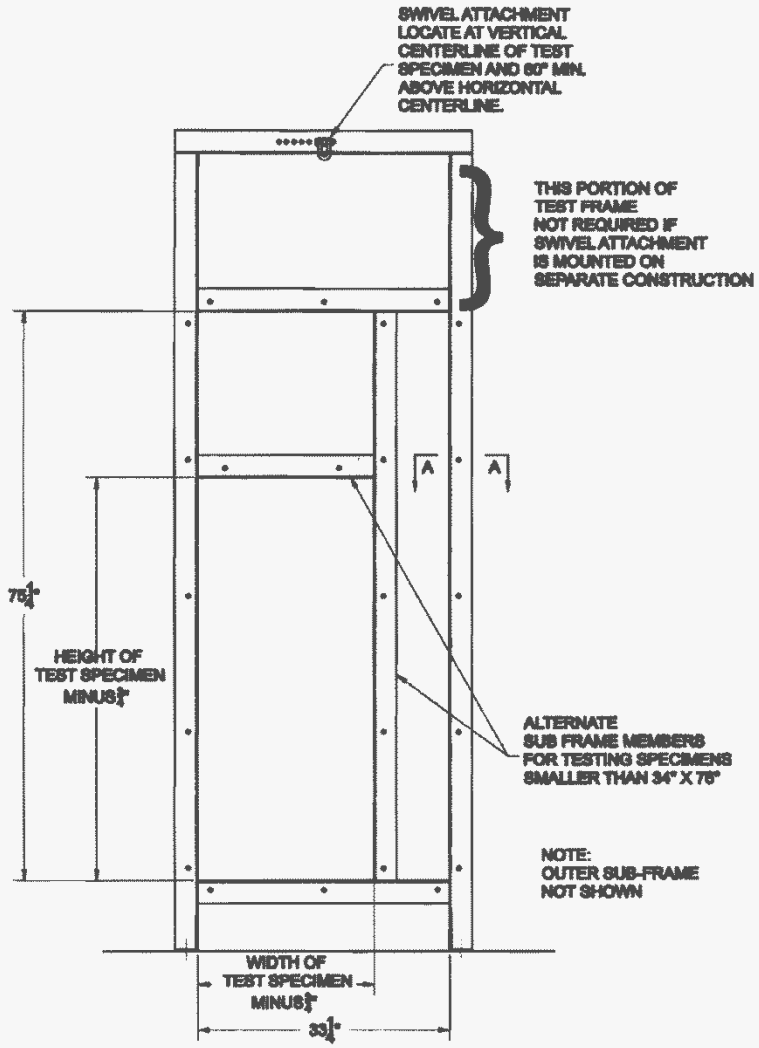

Figure 2: Impact Test Frame - Front View

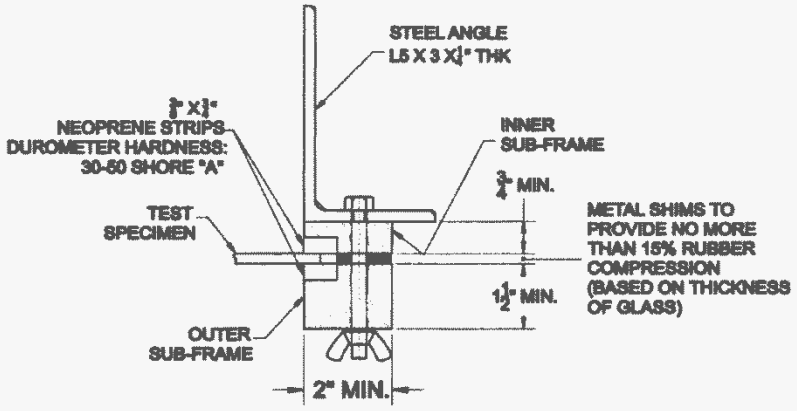

Figure 2.1: Detail of Section A-A PROPERLY Clamped Test Specimen (>1/8 inch (3 mm))

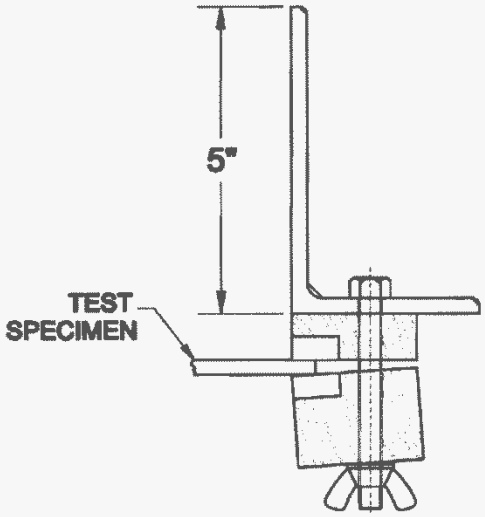

Figure 2.2: Detail of Section A-A IMPROPERLY Clamped Test Specimen (>1/8 inch (3 mm))

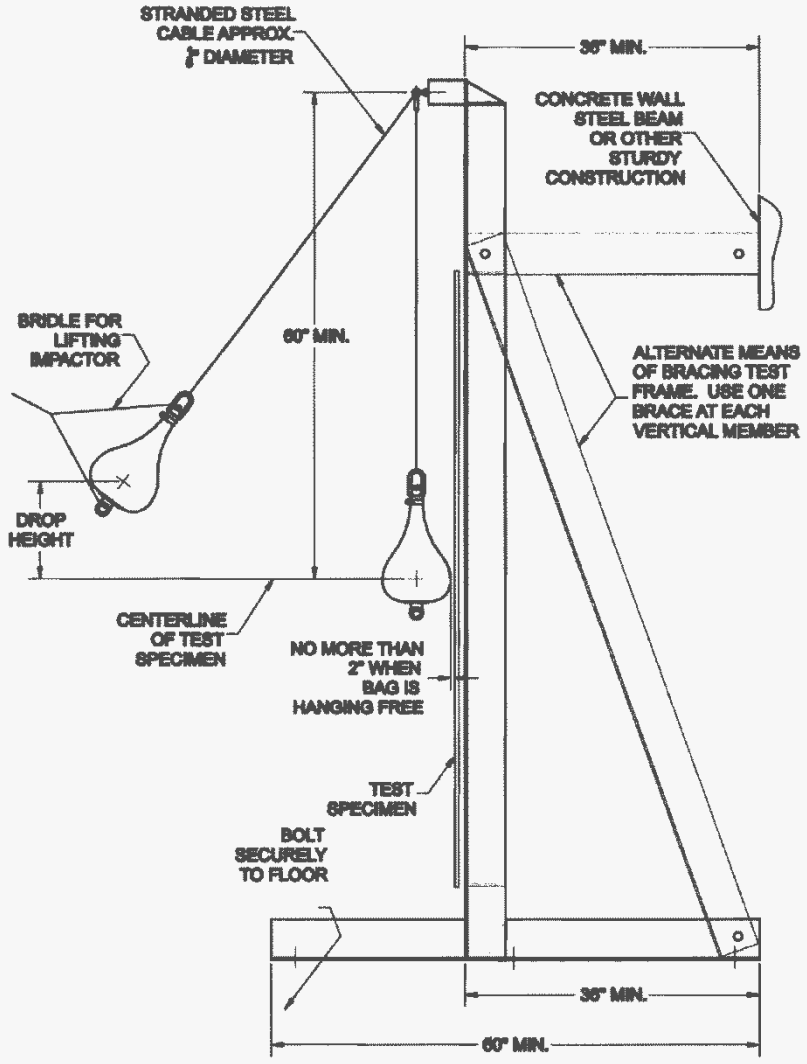

Figure 3: Impact Test Frame – Side View

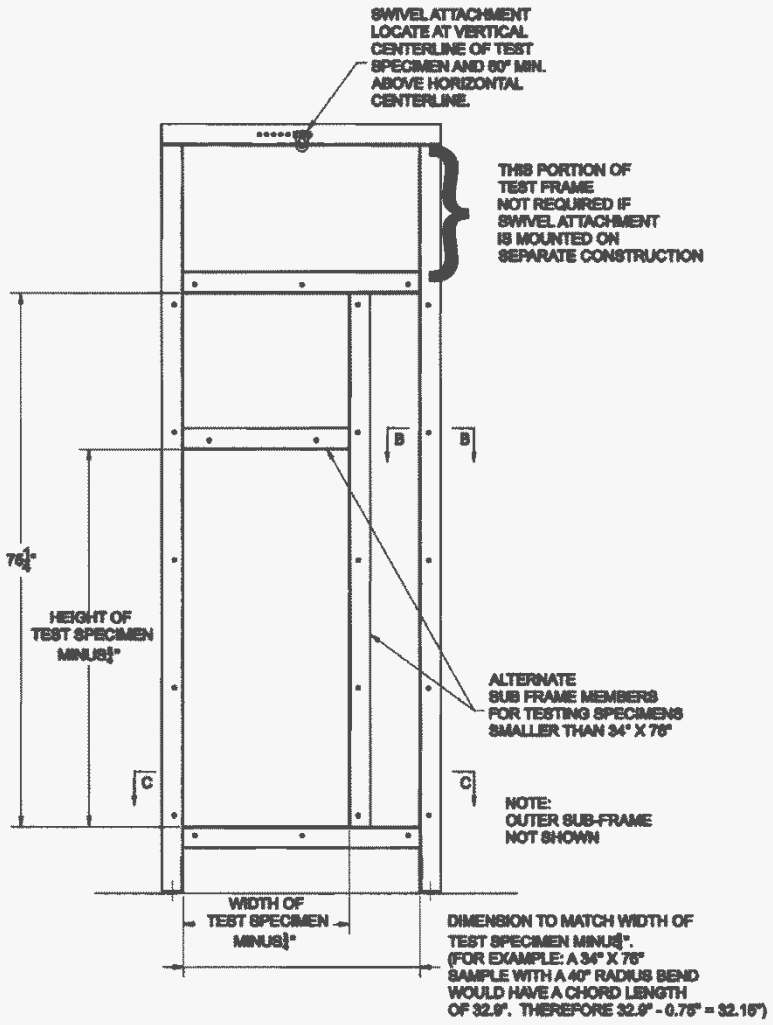

Figure 4: Impact Test Frame – Bent Glazing – Front View

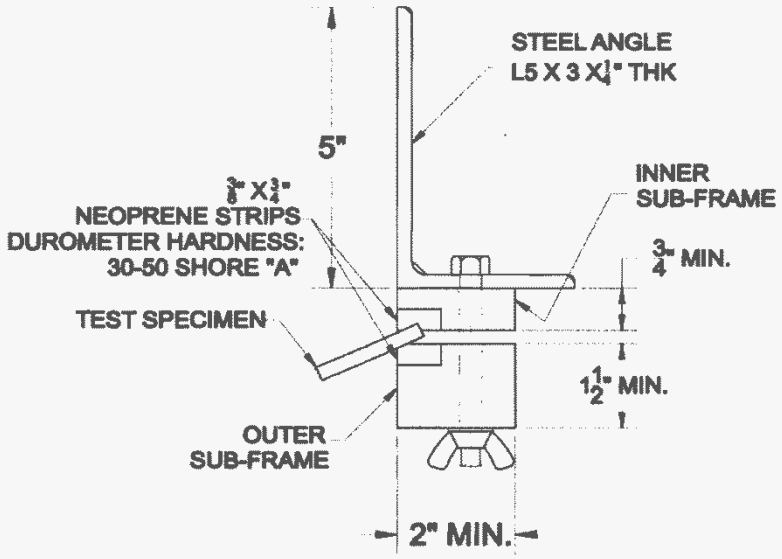

Figure 4.1: Detail of Section B-B

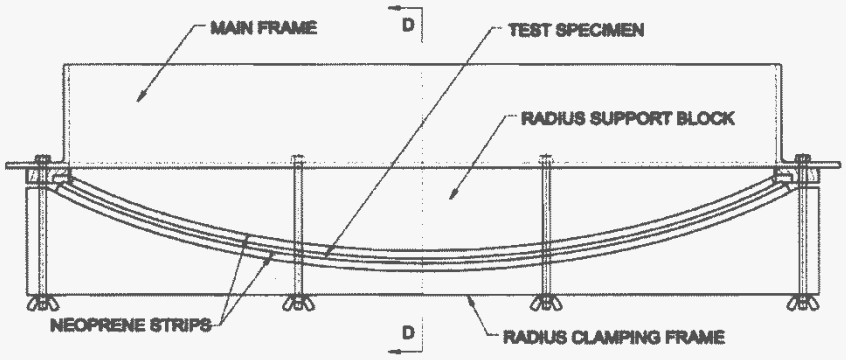

Figure 4.2: Detail of Section C-C

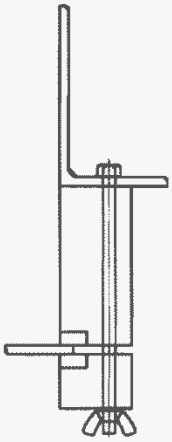

Figure 4.3: Detail of Section D-D

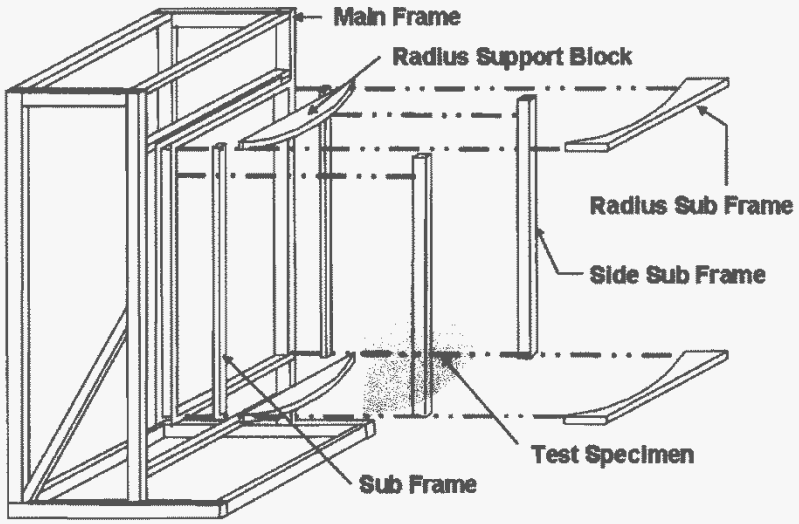

Figure 5: Bent Glass Impact Test Frame (Exploded View)

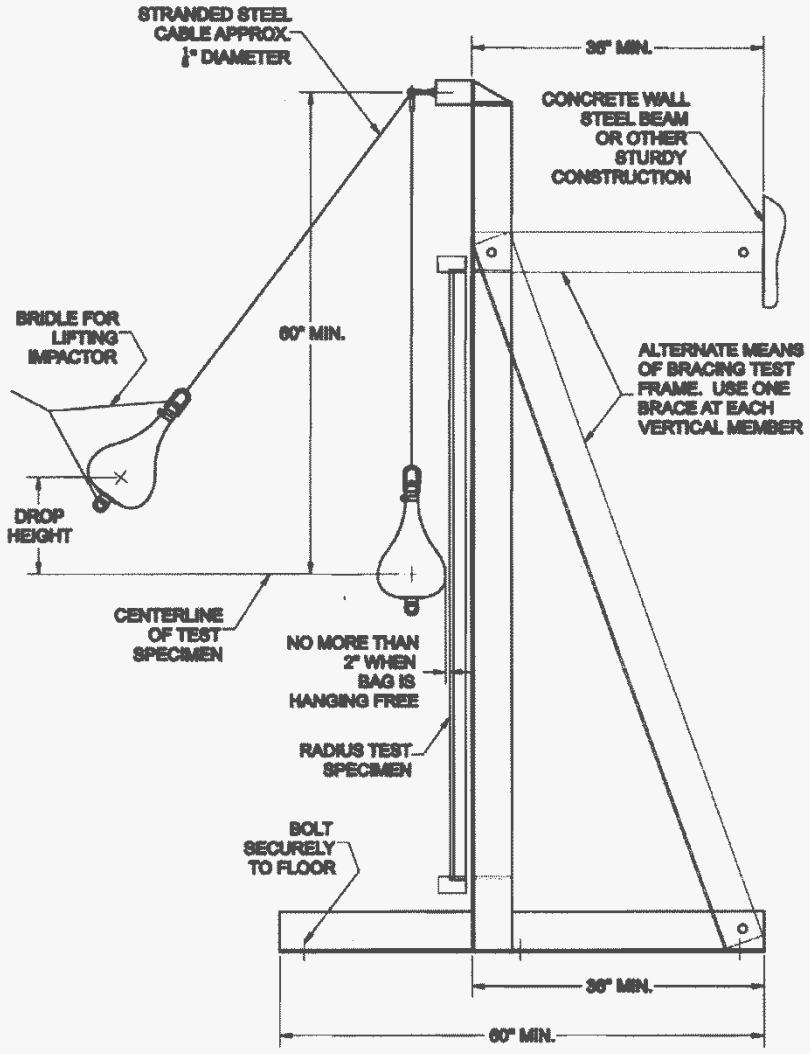

Figure 6: Impact Test Frame - Bent Glazing - Side View

(2) Sub-frame. (Test Specimen Mounting Frame). (See **Figure 1** and **Figure 2**) The sub-frame for securing the specimens on all four edges consists of two parts made from wood or other material which is hard enough to withstand the pressure exerted by the clamping forces. Each part shall be provided with a groove or rebate in which a strip of elastomeric rubber is laid; the specimen shall only contact the elastomeric rubber strips.

The inner sub-frame (**Figure 2.1** and **Figure 2.2**), which is in contact with the specimen, is 2-inches by 0.75 inch (50 mm by 19 mm) minimum. The outer part of the sub-frame holds the specimen and is 2 inches by 1.5 inches (50 mm by 38 mm) minimum.

The sub-frame is fixed to the main frame by at least twelve bolts (M10 bolts, scissors clamps or equivalent). These shall be fixed at the points marked on **Figure 1** and **Figure 2**, with no fewer than two on any edge and spaced no more than 18 inches (450 mm) apart.

To provide and limit elastomeric rubber compression and avoid sub-frame distortion, non-compressible shims appropriate to glazing thickness shall be used to separate the inner and outer parts of the sub-frame (See **Figure 2.1**).

The elastomeric rubber strip, the only element of the sub frame that the test specimen shall come into contact with, shall be 0.8 inch (20 mm) wide by 0.4 inch (10 mm) thick and have a Shore-A hardness of 40 ± 10. (ASTM D2240, Standard Test Method for Rubber Property - Durometer Hardness).

NOTE: Modifications that clearly do not alter the function or performance of the main frame or sub-frame are acceptable. Any reasonable means may be used to secure the sub-frame to the main frame provided the mounting is secure and the pressure on the glazing specimen in the sub-frame is controlled.

(3) Impactor. The impactor shall consist of the leather bag described in **Figure 7**, a commercial punching bag[5] with its bladder left in place, or any other leather bag of nominally identical shape and size. The bag shall be filled with lead shot of 2.4 mm + 0.1 mm diameter (nominal USA No. 71/2 or European No. 7 lead shot) and taped. After filling with lead shot, the top shall be either pulled over the metal sleeve and tied with a cord; or twisted around the threaded eyebolt shaft and tied below the metal sleeve, or both. To reduce bag damage during testing, the exterior of the leather bag surface shall be completely covered with glass filament reinforced pressure sensitive polyester adhesive tape[6], 0.5 inch to 0.6 inch (12 mm to 15 mm) in width and 0.006 inch (0.15 mm) thick. Tape the entire bag, using three (3) rolls or 180 yards (165 m) total length, and taping in a diagonal-overlapping manner. Tape the neck of the bag separately, with additional glass filament reinforced tape of the same kind. The total mass of the impactor assembly shall be 100 lb +4 oz (45.4 kg + 0.2 kg), excluding traction system attachments.

[5] Such as 9 inch (229 mm) diameter by 14 inch (356 mm) high Everlast 4207 (raw, full grain 3 ounce (85 grams) cowhide) or Everlast 4212 (split 3 ounce (85 grams) cowhide) available from Everlast Sports, Bronx, New York, USA. These are trade names. This information is given for the convenience of users and does not constitute an endorsement of any product named. Equivalent products may be used if they can be shown to lead to the same results.
[6] Such as 3M No. 898 (a trade name), or equal. (See footnote5 regarding trade name).

To reduce bag deformation during testing, the bag shall be rotated about the axis of its suspension device before each specimen or sample set, by no less than 30 degrees, and by no more than 90 degrees.

NOTE: To reduce bag damage during testing, a thin homogeneous or non-woven plastic film no more than 0.005 inch (0.13 mm) thick or a loosely draped woven cloth towel weighing no more than 0.05 g/cm2 (0.0113 oz./in2) shall not be attached to the impactor, but rather may be suspended vertically in front of the surface of the specimen at a distance no more than 0.4 inch (10 mm).

The impactor shape shall be maintained constant during testing. To reduce visible deformation of the impactor, it shall be removed from the suspension device and pummeled with a rubber mallet into its approximate original shape.

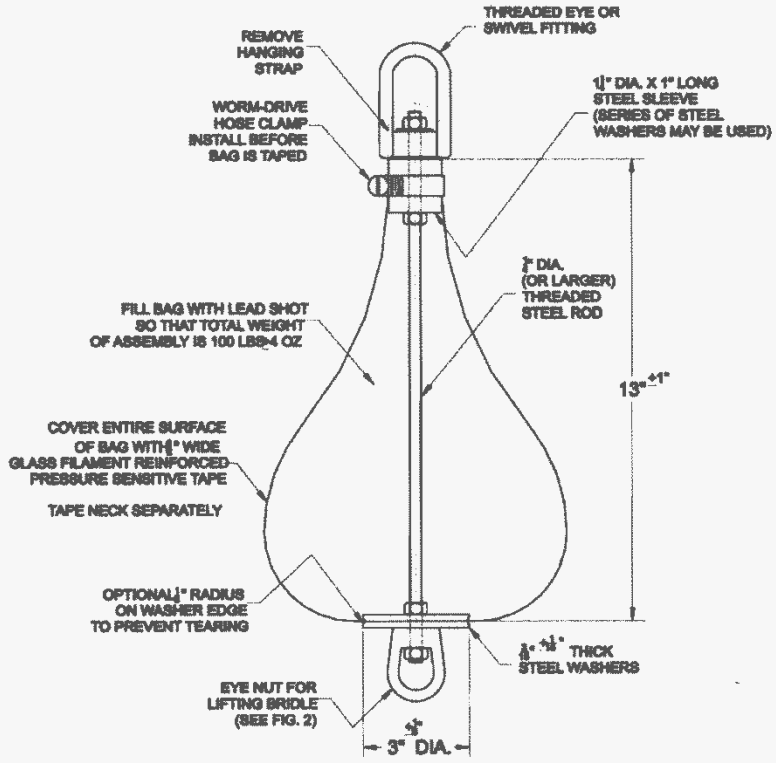

Figure 7: Impactor

(4) Suspension Device. The impactor is suspended by means of a single, stranded steel cable, approximately 0.125 inch (3 mm) diameter, from an upper swivel-fixture above the head of the main frame at an elevation of which the minimum distance between the swivel-fixture and impactor centerline is 60 inches (1,524 mm). The upper swivel-fixture must be rigid to ensure the point of suspension remains stationary. The lower swivel(s) or equivalent shall be provided on the bag for rotation of the impactor about its suspension device axes between impact events.

When at rest, the surface of the impactor, at it's maximum diameter, shall be located no more than 2 inches (51 mm) from the surface of the specimen and no more than 2 inches (51 mm) from the center of the specimen.

(5) Traction and Release System. A traction system shall be used which enables the impactor to be brought into its launch position. The launch position depends on the drop height selected. The traction cable is connected to the impactor traction system by a release mechanism, with provisions for rotating the impactor.

To position the impactor at the selected drop height, a traction force shall be applied to raise the impactor such that the axis of the impactor shall be aligned with the suspension cable, with the cable remaining taut. To ensure this, the top and bottom ends of the impactor shall be connected to the release device by a suitable link.

5.1.2 Impact Classification.

Glazing materials shall be submitted for impact testing to a selected drop height class.

5.1.2.1 Drop Height Class.

Glazing materials conforming to this standard are classified by their performance under the impact test at the selected drop height.

Class A - glazing material that complies with the requirements of section 5.1.4 when tested by the procedure of section 5.1.3 at a drop height between 48 inches and 48.5 inches (1219 mm and 1232 mm) using an impact specimen appropriate to the size classification.

Class B - glazing material that complies with the requirements of section 5.1.4 when tested by the procedure of section 5.1.3 at a drop height of between 18 inches and 18.5 inches (457 mm and 470 mm) using an impact specimen appropriate to the size classification.

Class C - shall apply only for fire-resistant wired glass. It is a material that complies with the requirements of section 5.1.4 when tested by the procedure of section 5.1.3 at a drop height of between 12 inches and 12.5 inches (305 mm and 318 mm) using an impact specimen size of 34 inches by 76 inches (863 mm by 1930 mm).

5.1.2.2 Drop Height Qualification.

Glazing material qualified for classification at the higher impact drop height level "Class A", shall be deemed to comply with the lower impact drop height level "Class B".

5.1.3 Procedure.

(1) Place and center each specimen in the sub-frame so each edge is encased in the elastomeric rubber strip to a depth of at least 0.4 inch (10 mm). With the specimen mounted, the elastomeric rubber strip shall not be compressed by more than 15% of its thickness. For bolts, torque shall be 15 ft-lb. + 4 ft-lb (20Nm+ 5Nm).

(2) Select a drop height classification from section 5.1.2.1. Rotate the impactor as required. Raise the impactor to the selected drop height intended for classification and stabilize it. At the selected drop height, the suspension device shall be taut and the axes of the impactor and cable shall be in line.

(3) The impactor, stabilized in the launch position in a vertical plane normal to the test specimen, is released and falls without initial velocity or axial rotation. At least one impact shall occur on each test specimen. Unbroken specimens may be reused for higher classification impact testing.

(4) Classify the test specimen according to the Glazing Types in Table 2. Inspect each test specimen after impact and record and report whether it complied or did not comply with the Applicable Interpretation of Results contained in Table 2. If classified as Tempered Glass, open the sub frame to allow any particles to be released and fall free.

(5) If any of the required specimens fail to comply with the requirements of section 5.1.4, the material shall not be classified for impact.

(6) For asymmetric materials, the test shall be carried out on both sides using equal numbers of separate specimens.

(7) When the required number of specimens are impacted and inspected, report the impact classification as described in section 5.1.2. If all specimens tested by impact either do not break, or break according to the requirements of section 5.1.4, the glazing material shall be classified as described in section 5.1.2, at the impact level tested. Classification shall comprise the word "Class", followed by a letter designation ("A" or "B" or "C") for drop height class.

(8) If it is required to test the material to a higher impact classification level, repeat the test on the required number of undamaged specimens of the same material at the higher impact level. At the fabricator's discretion, previously tested but unbroken specimens may be used for higher impact classification testing.

(9) Each specimen of bent glass will be impacted on the convex surface at the center of the specimen perpendicular to the frame from the selected drop height (see **Figure 6**).

Note: The convex surface is tested due to the realistic constraints of the test set-up in impacting the concave surface. Additionally, as of the date of this publication no data was available that showed one surface is more or less likely to break during impact.

Table 2: Applicable Interpretation of Results for Shot Bag Impact

Interpretation of Results	Laminated Glass	Tempered Glass	Plastic Glazing	Organic Coated Glass	Fire Resistant Wired Glass
5.1.4 (1)	X			X	X
5.1.4 (2)		X			
5.1.4 (3)			X		
5.1.4 (4)	X	X	X	X	X

5.1.4 Interpretation of Results.

Evaluation after impact shall occur whether the specimen remains fully engaged in the frame, partially engaged in the frame, or is entirely disengaged from the frame. A glazing material shall be judged to pass the impact test if any one of the applicable criteria below is met by each of the required number of impact specimens tested.

(1) When breakage occurs with appearance of numerous cracks and fissures, but remains substantially in one piece and no tear or shear or opening develops within the vertical specimens through which a 3.0 inch (76 mm) diameter sphere can pass using a horizontally applied force of 4.0 lb. (18 N) or less.

(2) When breakage occurs, the 10 largest crack-free particles shall be selected within 5 minutes subsequent to the impact and shall weigh no more than the equivalent weight of 10 square inches (640 square millimeters) of the original specimen. For purposes of impact test evaluation when breakage occurs, the average thickness of a tempered glass specimen containing grooves, bevels, or other thickness altering fabrication shall be considered the average of the thinnest measurement of each of the ten (10) geometrically largest crack-free particles. This average thickness will then be used to determine the maximum allowable weight of the ten (10) largest crack-free particles.

NOTE: The weight in ounces of 10 square inches of glass is equal to 14.5 times the glass thickness in inches. The weight in grams of 10 square inches of glass is equal to 412 times the glass thickness in inches (16.18 grams/mm).

(3) When breakage occurs due to impact, the stiffness and hardness of the specimens shall be determined. A modulus of elasticity (see ASTM D790) less than 550,000 psi (3.9 Gpa) and a Rockwell hardness (see ASTM D785) less than M or R 140 shall indicate satisfactory compliance.

(4) The specimen does not break after impact. See section 5.2 for all specimens of tempered glass that do not fracture.

5.2 Center Punch Fragmentation Test

This test is to be performed in addition to the test described in section 5.1. Specimens for testing shall previously have been tested per section 5.1. Specimens temperature shall be between 65°F and 85°F (18.3°C and 29.4°C) prior to testing.

5.2.1 Equipment

The following equipment is required:

(1) A sharp impactor such as a pointed hammer of about 2.65 ounces (75 g) mass, or a spring loaded center punch (such as Starrett No. 18C automatic center punch) or similar appliance can be used.

(2) A means of specimen support consisting of a flat base with adjustable horizontal curbs to prevent scattering of fragments.

(3) A calibrated scale suitable for accurately weighing selected particles to the nearest 0.004 ounce (0.1 gram).

(4) A calibrated micrometer similar to Starrett No. 230, 0 inch – 1 inch (0 mm to 25 mm) capable of measuring the thickness of the selected specimen / particle.

5.2.2 Procedure

(1) Place the specimen on the flat base and place the curb lightly along the specimen edges so the sample can elongate slightly yet the fragments remain interlocked.

(2) Strike the test specimen 1 inch (25-mm) inboard of the longest edge at its midpoint until fracture occurs.

5.2.3 Particle Weight Determination

(1) Within five minutes after fracture collect and weigh the ten (10) largest crack-free particles. In the event any of the ten (10) largest particles cracks after original selection, all pieces shall be weighed.

(2) For transparent flat glass, measure the thickness of the largest particle. For patterned glass thickness measurement, see ASTM C1036 for thickness measurement technique. Record the thickness.

5.2.4 Center Punch Fragmentation Interpretation of Results

(1) The total weight of the ten (10) largest crack-free pieces shall weigh no more than the equivalent weight of 10 square inches (6452 mm2) of the original test sample. (The weight in ounces of 10 square inches of glass is equal to 14.5 times the glass thickness in inches. The weight in grams of 10 square inches of glass is equal to 412 times the glass thickness in inches (16.18 grams/mm)).

(2) No one particle shall be longer than 4 inches (102 mm).

5.2.5 If any of the required specimens fail to comply with the requirements of section 5.2.4, the material shall not be classified for impact.

5.3 Boil Test for Laminated Glass.

This test shall be made to determine the probable effect of exposure to high temperature and humidity conditions for a long period of time.

5.3.1 Procedure.

Three 12 inch by 12 inch (305 mm x 305 mm) flat specimens, as submitted, shall be immersed, vertically, in water at 150°F ± 10°F (65.6°C ± 6°C) for 3 minutes and then quickly transferred to and similarly immersed in boiling water. The specimens shall be kept in the boiling water for 2 hours and then removed.

5.3.2 Interpretation of Results.

The glass itself may crack in this test, but no bubbles or other defects shall develop more than 0.5 inch (12 mm) from the outer edge of the specimen or from any crack that may develop. Any specimen in which the glass cracks to an extent confusing the results shall be discarded without prejudice, and another specimen shall be tested instead.

5.4 Weathering Tests for Laminates, Organic-Coated Glass and Plastics.

The purpose of these tests is to determine whether these safety-glazing materials will successfully retain their safety characteristics after exposure to weathering conditions for an extended period of time. The weathering methods described in section 5.4.1 shall be used for all materials subjected to exterior exposure. After weathering, organic-coated glass shall be tested as described in sections 5.4.2.1 and 5.4.2.2; laminates shall be tested as described in sections 5.4.2.1 and 5.4.2.3, and plastics shall be tested as described in section 5.4.2.4 in order to evaluate whether or not the safety glazing meets the weathering requirements. Plastic and Organic coated materials intended for interior use only shall be subjected to the requirements of section 5.4.3.

5.4.1 Weathering Methods.

The specimens shall be subjected to one of the following two weathering exposure alternatives. For laminated and organic-coated glass, three (3) specimens with the side marked for exterior exposure shall be exposed to the energy source. Three (3) additional specimens shall be controls and shall be held in darkness at 73.4ºF ± 3.6ºF (23ºC ± 2ºC) until needed (see sections 5.4.2.2 and 5.4.2.3). For the plastics, see section 4.6.1.

5.4.1.1 Natural Exposure.

5.4.1.1.1 Procedure.

The specimens shall be exposed in accordance with ASTM D1435 using a 26° North latitude, direct exposure, facing South, open-backed mounting.

5.4.1.1.2 Location.

The specimens shall be exposed in South Florida, United States

5.4.1.1.3 Duration.

The specimens shall be exposed for one year. On average, a one year exposure approximates a Total Ultraviolet (TUV) exposure of 300 ± 25 MJ/m2 at 295-385 nm.

5.4.1.2 Accelerated Exposure.

5.4.1.2.1 Apparatus.

The specimens shall be subjected to exposure in a Xenon-Arc Type Operating Light Apparatus as specified in ASTM G155.

5.4.1.2.2 Procedure.

The specimens shall be exposed 3,000 hrs in accordance to ASTM D2565 (or ISO 4892.2) and the following conditions:

5.4.1.2.3 Filter Type.

Borosilicate inner and outer (or equivalent)

5.4.1.2.4 Cycle.

Utilize Cycle 1 of ASTM D2565. (102 minutes of irradiation, 18 minutes of irradiation and water spray.)

5.4.1.2.5 Black Panel Temperature.

145° ± 4°F (63° ± 2°C)

5.4.1.2.6 Relative Humidity.

50% ± 5%

5.4.1.2.7 Spray Water.

Deionized

5.4.1.2.8 Level of Irradiance.
0.35 ± 0.02 watts/m2@ 340 nm, or 41.5 ± 2.5 w/m2 from 300 – 400nm.

5.4.1.2.9 Exposure.
3000 hours. On average, 3000 hour Xenon arc exposure approximates a TUV exposure of 300 ± 25 MJ/m2 equivalent to one year South Florida exposure at 26° North Latitude direct exposure facing South.

5.4.2 Tests after Weathering

Specimens exposed in accordance with section 5.4.1.1 and/or section 5.4.1.2 shall be tested after weathering according to the procedures outlined in sections 5.4.2.1 and 5.4.2.2. For organic-coated glass, section 5.4.2.1; for laminates, section 5.4.2.3; and for plastics section 5.4.2.4.

5.4.2.1 Tests after Weathering for Laminated and Organic Coated Materials

Assessment of optical changes after weathering are included for Laminated and Organic Coated materials as significant changes can be indicative of product degradation which may have an affect on impact and safety performance.

5.4.2.1.1 Specimens shall be measured at a point more than 10 mm inward from any edge.

5.4.2.1.2 When compared to control (unexposed) samples, no weathered specimen shall exhibit more than the allowable change, as specified, for the following properties:

(1) **Visible Light Transmittance** change not greater than 5 percentage units (e.g.: 91% control ± 5% = 96% or 86%) as measured according to ASTM D1003; Standard Test Method for Haze and Luminous Transmittance of Transparent Plastics.

(2) **Yellowness Index** (for clear products only) change not greater than 0.5 YI units (e.g.: 0.70 YI control + 0.5 = 1.20) as measured according to ASTM E313; Standard Practice for Calculating Yellowness and Whiteness Indices from Instrumentally Measured Color Coordinates.

(3) **Haze** change not greater than 0.5 percentage units (e.g.: 0.70 control ± 1.20 or 0.20) as measured according to ASTM D1003; Standard Test Method for Haze and Luminous Transmittance of Transparent Plastics.

(4) **Delta E** less than or equal to 5 units as measured according to ASTM E308; Practice for Computing the Colors of Objects by Using the CIE System.

5.4.2.2 Tests after Weathering for Organic-Coated Glass Only.

Organic-Coated Glass specimens shall be judged satisfactory if they pass the requirements of section 5.4.2.1, adhesion test (see section 5.4.2.2.1) and the tensile strength test (see section 5.4.2.2.2).

5.4.2.2.1 Adhesion Test.

5.4.2.2.1.1 Specimens.

Six specimens, (nominally 2 inch by 6 inch (52 mm by 152 mm)) prepared as described in section 4.6.2 shall be tested. The specimens shall be conditioned just prior to the performance of the adhesion test at 73.5°F ± 3.5°F (23°C ± 2°C) and 50% ± 2% relative humidity for 24 hours.

5.4.2.2.1.2 Apparatus.

The test apparatus shall be (a) a tensile tester of the constant-rate-of-extension (CRE) type with the moving crosshead set to move at 12 inches (305 mm) per minute and the load range set so that the average peel force will fall at 30%-50% of full scale and (b) a cutting device containing new razor blades for cutting 1 inch (25 mm) wide specimens (use each blade one time only).

5.4.2.2.1.3 Procedure.

Using the 1 inch (25 mm) razor cutting device, cut a straight strip of the organic coating in the lengthwise direction of the glass sample. Peel back about 2 inches (52 mm) of one end of the 1 inch (12 mm) wide organic strip. Attach a strip of pressure-sensitive tape to the side of the organic strip opposite the adhesive to extend this free end to about 8 inches (203 mm) in length. Place the end of the glass panel from which the organic strip was removed in the lower clamp of the tensile tester and the free end of the tape in the upper clamp. Peel the remainder of the organic strip from the glass mechanically and obtain a record of the peel value. Determine the average pull for each specimen from the chart record.

5.4.2.2.1.4 Interpretation of Results.

The organic-coated glass adhesions shall be judged satisfactory if the average adhesion value of the three exposed specimens is no less than 75% of the average adhesion value of the three control (unexposed) specimens.

5.4.2.2.2 Tensile Strength Test.

5.4.2.2.2.1 Specimens.

The samples for this test are the same specimens used in the adhesion test (see section 5.4.2.2.1) and conditioned as in section 5.4.2.2.1.1.

5.4.2.2.2.2 Apparatus.

The test apparatus shall be (a) a CRE tensile tester set as follows: gage length - 2 inches (52 mm); crosshead speed - 2 inches (52 mm) per minute; load range - set full-scale load so that specimens will break at 30%-60% of full scale and (b) a cutter containing new razor blades for cutting 1/2 inch (12 mm) wide specimens (use each blade one time only).

5.4.2.2.2.3 Procedure.

Using the 1/2 inch (12 mm) razor cutting device, cut a straight strip of the organic coating in the lengthwise direction of the glass sample for the full 6 inch (152 mm) length. Carefully peel this strip from the glass panel and test it for breaking strength in the tensile strength tester.

5.4.2.2.2.4 Interpretation of Results.

The organic-coating tensile shall be judged satisfactory if the average tensile value of the three exposed specimens is no less than 75% of the average tensile value of the three control specimens.

5.4.2.3 Tests after weathering for laminated glass only.

5.4.2.3.1 Specimens.

After exposure, the test specimens may be cleaned, if necessary, using a procedure recommended by their manufacturer to remove any residues present.

5.4.2.3.2 Conditioning.

Both the unexposed and exposed specimens shall be conditioned prior to examination or further testing for a minimum of 48 hours at 71°F to 75°F (22°C to 24°C) and 50% ± 2% relative humidity.

5.4.2.3.3 Viewing.
When irradiated and conditioned, the exposed specimens shall be examined and compared visually with the unexposed controls. Specimens shall be placed in a vertical position. The viewer shall look through the specimen using daylight without direct sunlight, or using a background light suitable for observing blemishes. View at 36 inch (910 mm).

5.4.2.3.4 Interpretation of Results.
Any improvement in clarity or discoloration is acceptable. When examined after ultraviolet exposure, each exposed test specimen shall be substantially free of noticeable decomposition as defined by absence of the following specific kinds of developed defects or blemishes, when observed by this inspection method in comparison to unexposed control specimen(s):

(1) No bubbles or delamination shall be visible more than 0.4 inch (10 mm) from any outer edge of the specimen, and

(2) No crazing or cracking is allowed.

(3) If no noticeable decomposition and no other defects develop upon exposure, the glazing material shall be reported as visually acceptable. Otherwise, unacceptable glazing material shall be reported as visually blemished.

5.4.2.4 Tests after Weathering for Plastics Only.

5.4.2.4.1 Specimens shall be evaluated before and after exposure in accordance with ASTM D6110, Charpy Impact Test, method B, with the following exceptions:

(1) The specimens shall not be notched.

(2) The specimens shall be tested with the exposed surface in tension.

(3) The specimens shall be exposed and tested flatwise.

(4) The span shall be reduced to 2 inches (52 mm) for thin material that may slip through the supports without breaking.

(5) The average of five (5) samples take from the weathered specimens shall be reported.

5.4.2.4.2 Interpretation of Results.
Plastic materials shall be acceptable for use as safety glazing if the impact strength as measured by the Charpy Impact Test is not reduced by more than 25% as a result of the natural or accelerated exposure. No bubbles or other physical degradation shall develop in the exposed portion.

5.4.3 Aging Tests for Plastics and Organic-Coated Glass Used in Indoor Applications Only[7].

The purpose of these tests is to determine whether plastic and organic-coated glass for indoor use only will successfully retain their safety characteristics after exposure to simulated aging conditions for an extended period of time. The specimens described in 4.4 for impact test after aging shall be used.

5.4.3.1 Aging Tests for Plastics used in Indoor Applications Only

Specimens passing the requirements of natural or accelerated exposure (section 5.4.1) and subsequent testing (section 5.4.2) are deemed qualified for indoor applications.

5.4.3.1.1 Apparatus.

A non-corroding container with a shelf suitable to support the test specimen above the solution used for maintaining the required humidity. The container shall be tightly sealed except for a small capillary which permits release of vapor pressure that might otherwise lift the top off the container. Each test specimen shall be tested preferably in a separate container.

5.4.3.1.2 Testing Procedures.

The plastic shall be subject to exposure to warm, humid and dry cycles. Four plastic specimens shall be subjected the following procedures:

5.4.3.1.2.1 Test Conditions.

Conduct tests in the standard laboratory atmosphere of 73.4 ± 3.6°F (23 ± 2°C) and 50 ± 5 % relative humidity.

5.4.3.1.2.2 Conditioning.

Condition the test specimens at 73.4 ± 3.6°F (23 ± 2°C) and 50 ± 5 % relative humidity for not less than 40 hours prior to test in accordance with Procedure A of Practice ASTM D618.

5.4.3.1.2.3 Cycle.

Ten (10) complete humid/dry test cycles (480 total hours – not including Conditioning from 5.4.3.1.2.2) where one cycle includes 24 hours at 140°F ± 5°F (60°C ± 3°C) and 88 % relative humidity, followed by 24 hours at 140°F ± 5°F (60°C ± 3°C) in an oven.

[7] Test procedure excerpted from discontinued standard. Reprinted, with permission, from ASTM D756-93 Practice for Determination of Weight and Shape Changes of Plastics Under Accelerated Service Conditions, copyright ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428 (Discontinued 1998)[1]

5.4.3.1.3 Weight and dimensions of specimens.

5.4.3.1.3.1 Weight.

Measure and record the weight within 0.05 % if the specimen weighs 3.4 oz (100 g) or less, and within 0.1 % if the specimen exceeds 3.4 oz (100 g) in weight.

5.4.3.1.3.2 Dimensions of Directionally Formed Specimens.

Measure and record the thickness to 0.001 in (0.025 mm), the plane dimension in the direction of injection or transfer to 0.001 in (0.025 mm), and the plane dimension across the direction of injection or transfer to 0.001 in (0.025 mm).

5.4.3.1.3.3 Dimensions of Compression Molded Specimen.

Measure and record the thickness to 0.001 in (0.025 mm), and the perpendicular dimensions in the plane at right angles to the direction of molding to 0.001 in (0.025 mm).

5.4.3.1.3.4 Conditioning of Specimens for Weight and Dimension

Specimens shall be brought to room temperature in a clean, empty, sealed container, which will require 10 to 30 min. Then the specimen shall be weighed in less than 10 min after exposure to room conditions. The dimensions shall be measured immediately after weighing the specimen.

5.4.3.1.4 Visual Inspection.

Noticeable qualitative changes in surfaces, outline, and general appearance of the test specimen shall be recorded after each stage of the testing procedure. These changes include color, surface irregularities, odor, and splits, in accordance with ASTM D883. Changes shall also be noted as they occur, especially those which alter the shape so that intended dimensions are no longer significant.

5.4.3.1.5 Specimen Exposure.

(1) Prior to exposure, condition the specimen according to section 5.4.3.1.2.2. Weigh, measure and inspect the conditioned specimen in accordance with sections 5.4.3.1.3 and 5.4.3.1.4.

(2) Expose the specimen for 24 h on the shelf of a container maintained at 140 ± 1.8°F (60 ± 1°C) in the oven, and containing a saturated solution of sodium sulfate to maintain a relative humidity of 85 to 89 %.

(3) Remove the specimen from the container, place it in a clean, empty, sealed container, and bring to room temperature in accordance with section 5.4.3.1.3.4.

(4) Wipe the specimen with the absorbent cloth, and then weigh, measure dimensions, and examine visually in accordance with sections 5.4.3.1.3 and 5.4.3.1.4 respectively.

(5) Within 2 hours after completion of the operation described in section 5.4.3.1.5(2), expose the specimen for 24 hours in a dry oven at 140 ± 1.8°F (60 ± 1°C).

(6) Remove the specimen from the oven, place it in a clean, empty, sealed container, and bring to room temperature in accordance with section 5.4.3.1.3.4.

(7) Wipe the specimen with the absorbent cloth, and then weigh, measure dimensions, and examine visually in accordance with sections 5.4.3.1.3 and 5.4.3.1.4 respectively.

(8) Recycle the specimen in accordance with section 5.4.3.1.2.3. Weigh and measure dimensions in accordance with section 5.4.3.1.3 and perform visual inspection in accordance with section 5.4.3.1.4. Continue recycling, weighing and measuring until the total hours of exposure are completed. Weigh and measure specimens at completion of total hours after conditioning according to section 5.4.3.1.2.2.

5.4.3.1.6 Physical Testing.

5.4.3.1.6.1 The specimen shall be subjected to physical tests in accordance with section 5.4.4.

5.4.3.1.6.2 One additional specimen shall be retained unexposed as a control for the effects of the exposure cycling. Then, all specimens shall be tested as described in section 5.4.4.

5.4.3.2 Aging Tests For Organic-Coated Glass used in Interior Applications Only

5.4.3.2.1 Apparatus.
A conditioning chamber of sufficient size to hold up to 34 inch by 76 inch (864 mm x 1930 mm) panels vertically and capable of maintaining conditions of 140°F ± 5°F (60°C ± 3°C), 100°F ± 5°F (38°C ± 3°C) and 95% ± 5% relative humidity, and 0°F ± 5°F (18°C ± 3°C).

5.4.3.2.2 Procedure.
Place four of the organic-coated glass specimens positioned vertically and spaced at least 1 inch (25 mm) apart in the chamber. Raise the temperature to 140°F ± 5°F (60°C ± 5°C) within 3 hours and maintain for 21 hours. Change the chamber conditions to 100°F ± 5°F (38°C ± 3°C) and 95% ± 5% relative humidity in 3 hours and maintain for 21 hours. This represents one complete cycle. Expose the specimens to 10 complete cycles. At the completion of the tenth cycle, change the chamber conditions to 0°F ± 5°F (18°C ± 3°C) in 3 hours and maintain for 21 hours. The fifth specimen shall be retained unexposed as a control for the effects of the exposure cycling. Upon completion of the required number of exposure cycles, all specimens shall be tested as described in section 5.4.4.

5.4.4 Impact Test after Aging for Plastics and Organic-Coated Glass

5.4.4.1 Apparatus.

The apparatus described in section 5.1.1 shall be used.

5.4.4.2 Procedure.

All the specimens exposed as described in section 5.4.3 shall be conditioned as described in section 5.1 and evaluated by the procedure in section 5.1.2.

5.4.4.3 Interpretation of Results.

The exposed specimens shall again satisfactorily complete the impact test in accordance with section 5.1.3. Milkiness may develop but defects other than these shall be cause for rejection.

6 Marking of Safety Glazing Material

After having successfully passed the appropriate tests in this standard, like products and materials produced in the same manner as specimens submitted per test shall be legibly and permanently marked with a label.

6.1 Label Content.

The label shall contain the following information:

(1) Supplier's name, distinctive mark or designation.

(2) The words "American National Standard Z97.1-2009" or the characters "ANSI Z97.1-2009."

(3) Classification of test size (L or U) and drop height class (A, B or C). Plastic glazing does not require drop height.

(4) Place of fabrication (if fabricator has more than one location fabricating the product).

NOTE: Additional details and information, such as thickness and date of manufacture, are permitted.

6.2 Application of Label.

The appropriate party using the following guidelines shall apply the permanent label:

(1) Laminated and fire-resistant wired glass stock sheets (i.e., size produced by the manufacturer) shall be labeled by the manufacturer of the stock sheet.

(2) All glazing products including cut size laminates, fire-resistant wired glass and tempered glass shall be labeled by the company producing the finished cut to size glass product.

(3) The fabricator or manufacturer shall label plastic glazing materials.

(4) The installer of the safety film shall label field-applied organic coatings (films).

6.3 Special Application Labeling.

Certain types of glazing material shall also be marked with additional information as appropriate.

6.3.1 Safety Glazing Materials Used in Indoor Applications Only.

After having successfully passed the appropriate tests (see section 5.4.3), like products and materials produced in the same manner as specimens submitted for testing shall be legibly and permanently marked with the words - "Indoor Use Only".

6.3.2 Organic-Coated Glass Only.

Organic-coated glass materials shall be legibly and permanently marked with the words "Glaze This Side In," to indicate to the installer, inspector, or user which side of the organic-coated glass should be exposed to the elements if there is a specific side that should be exposed.

7 ANNEX

(This Annex is a mandatory part of American National Standard Z97.1-2009e and indicates the publication year of the applicable standard referenced in ANSI Z97.1-2009e.)

ANNEX X

Table X1
ASC Z97.1-2009e
Reference Standards

As listed in ANSI Z97.1-2009e	Location Referenced Section(s)	Current Edition
ASTM C1036	4.2	2006
	5.2.3	
ASTM C1048	3	2004
ASTM C1172	3	2009
ASTM C1349	3	2004
ASTM C1464	4.4	2006
ASTM D618	5.4.3.1.2.2	2008
ASTM D756	5.4.3.1[7]	1993
ASTM D785	4.7.2	2008
	5.1.4(3)	
ASTM D790	4.7.1	2007e1
	5.1.4(3)	
ASTM D883	5.4.3.1.4	2008
ASTM D1003	5.4.2.1.2(1)	2007e1
	5.4.2.1.2(3)	
ASTM D1435	5.4.1.1.1	2005
ASTM D2240	5.1.1(2)	2005
ASTM D2565	5.4.1.2.2	1999(2008)
	5.4.1.2.4	
ASTM D6110	4.6.1 Note	2008
	5.4.2.4.1	
ASTM E308	5.4.2.1.2(4)	2008
ASTM E313	5.4.2.1.2(2)	2005
ASTM G155	5.4.1.2.1	2005a
CPSC 16 CFR Part 1201	1.3.2	1977
ISO 4892.2	5.4.1.2.2	2006

APPENDIX

(This Appendix is not part of American National Standard Z97.1-2009^{e}, but is included for information only.)

Basis of Safety Performance Specifications and Methods of Test

A1. General

One purpose in the development of this standard is to provide a single functional test that will simulate such human contact as normally results in cutting and piercing injuries. The performance of each safety glazing material is evaluated by impacting in the normally installed position. The test should be conducted from the direction that human impact would occur. Only such auxiliary tests as are considered necessary to evaluate the continued performance level, are used in the case of glazing containing organic material.

A2. Safe Performance Criteria (See section 5.1.2)

The performance criteria are directly related to the reduction of cutting and piercing injuries to persons who impact the glazing used in buildings.

The 100-ft. lbf (445 N) and 150-ft. lbf (667 N) energy levels were established as practically related to those situations in which the limited acceleration path precluded, in most cases, the possibility of an individual developing their full kinetic energy (ke) potential (see section 1.3).

The 400-ft. lbf (1779 N) impact level was established for relatively unlimited acceleration paths in which it might be reasonable to expect that an energetic teenager might develop something approaching his or her full impact velocity.

As section A3 of this Appendix indicates, the independent safety experts who considered the matter judged that these values were practical. (See section A3 and **Figure A1**.)

A3. Development of Human Engineering Data Chart

Safety experts indicate that a 100-lb (45 kg) person is representative of glass breakage accident victims. From Figure A1 it is apparent that a 100-lb (45 kg) person running at the rate of a 4-minute mile has about 755 ft. lbf (3358 N) of kinetic energy. The amount of this energy a person might deliver to a glazed opening would depend upon the way the glazed surface was impacted. A "straight-arm" would transmit more energy to the glazing material than an arm that flexes with the impact.

For test purposes, Accredited Standards Committee Z97 decided, after extensive evaluation, to use a readily available leather punching (speed) bag filled with 100 pounds of lead shot to simulate the running (person). The test impact values were selected as representative of energy

levels likely to be delivered by humans in practical situations involving interior doors and patio doors. These test levels were set considerably below the 755-ft. lbf (3358 N) kinetic energy level of the typical victim, since the impact energy delivered to the glazing material - perhaps first by the hands, then by the head, and then by the knees - is much less than the kinetic energy of the running (person). Also, the impact will be at less than normal (90-degree) incident angle in most cases.

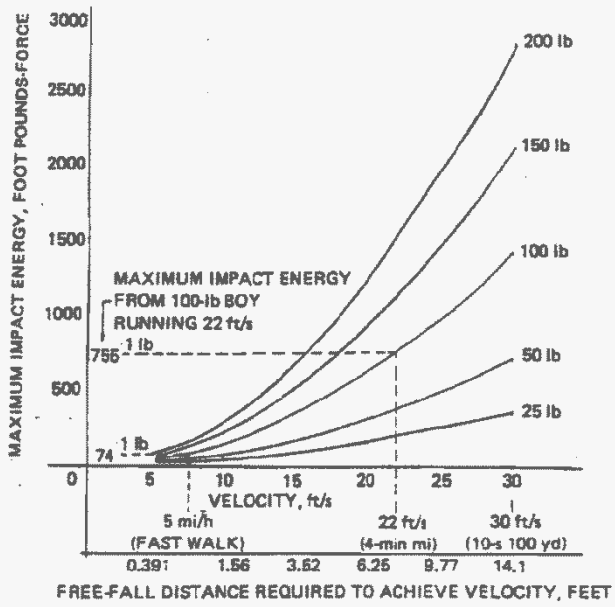

Figure A1: Human Engineering Data

Figure A1 was developed to assist ASC Z97 committee in establishing performance criteria for safety glazing materials subject to human impact. It is based on the following kinetic energy formula:

ke = 1/2mv2

where
ke = kinetic energy in foot pounds-force
m = mass of missile
= weight of missile in pounds/ (32.2 ft/s2)
v = velocity of missile in feet per second

Maximum impact energy equals the kinetic energy of the person in motion at the moment of impact. Actual impact energy (that which the person delivers) is considerably less, except perhaps in the case of a person falling on a non-vertical surface.

A4. Interpretation of Results (See section 5.1.4)

Within the scope of this standard, which has as its objective reducing the frequency of cutting and piercing injuries, it is evident that a material that does not break under impact is safe from these types of injuries.

"Break safe" criteria were developed largely as a matter of judgment based on observation of available glazing materials breaking under the test conditions. It is intended that any material that meets any one of the criteria in section 5.1.4 be considered safe within the scope of this standard.

To allow for practical interpretation of results, which admittedly may appear loosely defined to the uninitiated, rather severe impact levels were selected. The safety experts and the members of the original drafting committee who observed the many tests conducted in developing the standard were confident that laboratory personnel will quickly develop an ability to apply objective judgments using these criteria.

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Overview of the U.S. Standardization System

The American National Standards Institute (ANSI) has served in its capacity as administrator and coordinator of the United States private sector voluntary standardization system for more than 90 years. Founded in 1918 by five engineering societies and three government agencies, the Institute remains a private, nonprofit membership organization supported by a diverse constituency of private and public sector organizations.

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National Standardization

ANSI facilitates the development of American National Standards (ANS) by accrediting the procedures of standards developing organizations (SDOs). These groups work cooperatively to develop voluntary national consensus standards. Accreditation by ANSI signifies that the procedures used by the standards body in connection with the development of American National Standards meet the Institute's essential requirements for openness, balance, consensus and due process.

ANSI is often asked about the total number of standards (and standards setting bodies) in the United States. It is estimated that in the U.S. today there are hundreds of "traditional" standards developing organizations - with the 20 largest SDOs producing 90% of the standards - and hundreds more "non-traditional" standards development bodies, such as consortia. This means that the level of U.S. participation is quite expansive as the groups themselves are comprised of individual committees made up of experts addressing the technical requirements of standards within their specific area of expertise.

At year-end 2006, about 200 of these standards developers were accredited by ANSI; there were more than 10,000 American National Standards (ANS).
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That is why American National Standards are usually referred to as "open" standards. In this sense, "open" refers to a process used by a recognized body for developing and approving a standard. The Institute's definition of openness has many elements, but basically refers to a collaborative, balanced and consensus-based approval process. The content of these standards may relate to products, processes, services, systems or personnel.

In its role as the only accreditor of U.S. voluntary consensus standards developing organizations, ANSI helps to ensure the integrity of the standards developers that use our ANSI Essential Requirements: Due process requirements for American National Standards. A separate process, based on the same principles, determines whether standards meet the necessary criteria to be approved as American National Standards. Our process for approval of these standards (currently numbering approximately 10,000) is intended to verify that the principles of openness and due process have been followed and that a consensus of all interested stakeholder groups has been reached.
The hallmarks of this process include:

- Consensus must be reached by representatives from materially affected and interested parties
- Standards are required to undergo public reviews when any member of the public may submit comments
- Comments from the consensus body and public review commenters must be responded to in good faith
- An appeals process is required

ANSI's use of the terms "open" and "openness" to describe standards is meant to characterize documents that have undergone this kind of consensus-based, transparent process. All ANSI-accredited standards developers follow the Essential Requirements which embrace globally-accepted principles of standardization implemented by well-recognized, international standards bodies such as the International Telecommunication Union (ITU), International Organization for Standardization (ISO), and International Electrotechnical Commission (IEC).

The terms and conditions used in the development of "open standards" should balance the interests of those who will implement the standard with the interests and voluntary cooperation of those who own intellectual property rights that are essential to the standard. Such terms and conditions should readily promote, and not unreasonably burden, accessibility to the standard for the communities of interested implementers. To achieve such balance, the payment of reasonable license fees and/or other reasonable and nondiscriminatory license terms may be required by the intellectual property rights holders.

This balance of licensing rights (rather than waiver thereof) is consistent with an open standard. The word "open" does not imply "free" from monetary compensation or other reasonable and nondiscriminatory license terms. Further, an open standard may involve the payment of a fee to obtain a copy of the standard. Such fees are sometimes used to offset the costs associated with managing open standards development process.
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International Standardization

ANSI promotes the use of U.S. standards internationally, advocates U.S. policy and technical positions in international and regional standards organizations, and encourages the adoption of international standards as national standards where they meet the needs of the user community.

The Institute is the sole U.S. representative and dues-paying member of the two major non-treaty international standards organizations, the International Organization for Standardization (ISO), and, via the U.S. National Committee (USNC), the International Electrotechnical Commission (IEC). As a founding member of the ISO, ANSI plays a strong leadership role in its governing body while U.S. participation, via the USNC, is equally strong in the IEC.

Through ANSI, the U.S. has immediate access to the ISO and IEC standards development processes. ANSI participates in almost the entire technical program of both the ISO and the IEC, and administers many key committees and subgroups. Part of its responsibilities as the U.S. member body to the ISO include accrediting U.S. Technical Advisory Groups (U.S. TAGs), whose primary purpose is to develop and transmit, via ANSI, U.S. positions on activities and ballots of the international Technical Committee. U.S. positions for the IEC are endorsed and closely monitored by the USNC Technical Management Committee (TMC).

In many instances, U.S. standards are taken forward to ISO and IEC, through ANSI or the USNC, where they are adopted in whole or in part as international standards. For this reason, ANSI plays an important part in creating international standards that support the worldwide sale of products, which prevent regions from using local standards to favor local industries. Since volunteers from industry and government, not ANSI staff, carry out the work of the international technical committees, the success of these efforts often is dependent upon the willingness of U.S. industry and government to commit the resources required to ensure strong U.S. technical participation in the international standards process.

Conformity Assessment

Conformity Assessment, the term used to describe steps taken by both manufacturers and independent third parties to determine fulfillment of standards requirements, also remains a high priority for the Institute. ANSI's program for accrediting third-party product certification have experienced significant growth in recent years, and the Institute continues its efforts to obtain worldwide acceptance of accredited certifications performed in the U.S.

One of the best indicators of the strength of the U.S. system is the government's extensive reliance on, and use of, private sector voluntary standards. Pursuant to OMB Circular A119, federal government agencies are required to use voluntary standards for regulatory and procurement purposes when appropriate. State and local governments and agencies have formally adopted thousands of voluntary standards produced by ANSI, and the process appears to be accelerating.

In summary, ANSI continues to be fully involved in its support of the goals of U.S. and global standardization and remains committed to enhancing of the quality of life for all global citizens.

ANSI Z97.1 -2009
Approved by Accredited Standards Committee November 2009

EXHIBIT C

Comparison Chart of CPSC 16 CFR 1201 and ANSI Z97.1

Item	CPSC 16CFR 1201	ANSI Z97.1-2009	Comments
1-Number of Samples Impact Tested	No direction	4.4: Four (4) samples required for testing	CPSC does not specify the number of samples required for testing and this has allowed some to test only 1 sample. ANSI's requirement for 4 samples is a statistically more viable number and adds to the credibility of the test.
2-Categories and Classes	1201.4(c)(2) and (d)(1): test largest size manufactured up to max of 34X76-inch. Category I impacted at 18-inches. Category II impacted at 48 inches.	4.3, 5.1.2.1: Unlimited Size (U) = test of 34X76-inch. Limited Size (L) = largest size produced < 34X76-inch. Class A = 48-inch impact Class B = 18-inch impact Class C = 12-inch impact (apply to wired glass with restrictions, see section1.3.2 and 1.3.6)	CPSC establishes a relationship between size and impact distance. With the U and L and A, B, C designators in ANSI Z97.1, this size impact distance is detailed and communicated more clearly, thus reducing the possibility of testing or market confusion.
3-Center Punch Fragmentation Test	No direction	5.2: All Tempered samples that do not break in the impactor test are required to be center punch tested.	The ANSI test brings all samples to failure, allowing for more complete evaluation of break characteristics. This additional test will screen out some products that might pass CPSC but would be fail an ANSI test.
4-Bent Glass Testing	No direction	4.4: Direction provided for test	Direction provided in the ANSI standard 1) delineates that bent glass is different than flat and must be tested separately and 2) will result in a standardized test for better evaluation of the product. This will improve product evaluation.
5-Laminated glass evaluation after impact	1201.4(e)(1)(i): Horizontally	5.1.4(1): Vertically	Samples are tested vertically and normally would be installed vertically in the market place. The act of moving the sample to a horizontal position as required by CPSC can damage or alter the sample and creates less of an approximation of market place conditions.
6-Weathering requirements for Laminated Glass	No direction	Table 1, 4.6: Weathering tests are required for laminated glass.	By ANSI testing and evaluating laminated glass for weathering, product long term performance and retention of safety characteristic are better able to be evaluated.

7-Details for weathering and aging testing (environmental durability)	1201.4(b)(3)(ii) and (d)(2) Reference to environmental durability test equipment and procedures	5.4 Reference to weathering tests	The references made in CPSC have not been maintained, reference obsolete equipment and standards, and are limited in applicability. By contrast, the ANSI standard has been regularly updated and maintained to reflect current industry practices creating a more appropriate and comprehensive product evaluation.
8-Specific exclusion for non-safety products	1201.1(a) applies the standard only to glazing materials in certain uses; 1201(c) exempts wired glass & certain other products from Part 1201.	1.3.6 provided that certain monolithic glass products including wired glass are not considered safety glazing materials.	ANSI has identified certain products that might comply with testing procedures but are known not to be safety glazing materials. This provides a supplemental assurance of safe products represented by ANSI testing.
9-Guidance, direction, clarity, tolerances	Limited direction	Increased direction	Throughout the ANSI standard, by virtue of regular maintenance and review, guidance and clarity is incorporated that provides increased direction to test operators thus resulting in a more consistent and standardized evaluation of products over CPSC.

TAB B – Federal Register Notice: Request for Comments

Proposed Rules

Federal Register
Vol. 77, No. 169
Thursday, August 30, 2012

This section of the FEDERAL REGISTER contains notices to the public of the proposed issuance of rules and regulations. The purpose of these notices is to give interested persons an opportunity to participate in the rule making prior to the adoption of the final rules.

CONSUMER PRODUCT SAFETY COMMISSION

16 CFR Part 1201

Petition Requesting Rulemaking To Revise Test Procedures for Glazing Materials in Architectural Products

AGENCY: Consumer Product Safety Commission.

ACTION: Comment request.

SUMMARY: The U.S. Consumer Product Safety Commission ("Commission" or "we") has received a petition (CP12–3) requesting that the Commission initiate rulemaking to replace the testing procedures for glazing materials in certain architectural products set forth in our regulations, with those testing procedures contained in ANSI Z97.1, "American National Standard for Safety Glazing Materials Used in Building—Safety Performance Specifications and Methods of Test." We invite written comments concerning the petition.

DATES: The Office of the Secretary must receive comments on the petition by October 29, 2012.

ADDRESSES: You may submit comments, identified by Docket No. CPSC–2012–0049, by any of the following methods:

Electronic Submissions

Submit electronic comments in the following way:

Federal eRulemaking Portal: http://www.regulations.gov. Follow the instructions for submitting comments.

To ensure timely processing of comments, the Commission is no longer accepting comments submitted by electronic mail (email), except through *www.regulations.gov.*

Written Submissions

Submit written submissions in the following way:

Mail/Hand delivery/Courier (for paper, disk, or CD–ROM submissions), preferably in five copies, to: Office of the Secretary, U.S. Consumer Product Safety Commission, Room 820, 4330 East-West Highway, Bethesda, MD 20814; telephone (301) 504–7923.

Instructions: All submissions received must include the agency name and petition number for this rulemaking. All comments received may be posted without change, including any personal identifiers, contact information, or other personal information provided, to: *http://www.regulations.gov.* Do not submit confidential business information, trade secret information, or other sensitive or protected information electronically. Such information should be submitted in writing.

Docket: For access to the docket to read background documents or comments received, go to: *http://www.regulations.gov.* A copy of the petition is available at *http://www.regulations.gov,* under Docket No. CPSC–2012–0049, Supporting and Related Materials.

FOR FURTHER INFORMATION CONTACT: Rochelle Hammond, Office of the Secretary, U.S. Consumer Product Safety Commission, Room 820, 4330 East-West Highway, Bethesda, MD 20814; telephone (301) 504–6833.

SUPPLEMENTARY INFORMATION: The Commission has received a submission from William M. Hannay, Attorney at Law, Counsel for Safety Glazing Certification Council ("petitioner"), dated June 26, 2012, requesting that the Commission initiate a rulemaking to replace the current testing procedures for glazing materials codified at 16 CFR 1201.4, with those contained in ANSI Z97.1, "American National Standard for Safety Glazing Materials Used in Building—Safety Performance Specifications and Methods of Test." The Commission is docketing this request as a petition under the Consumer Product Safety Act (CPSA). 15 U.S.C. 2056 and 2058. The current standard for architectural glazing materials applies to glazing materials used or intended to be used in the architectural products subject to the standard, i.e., storm doors or combination doors, doors, bathtub doors and enclosures, shower doors and enclosures and sliding glass doors. The testing procedures set forth in Section 1201.4 require impact tests and accelerated environment durability tests which are intended to determine if glazing materials used in these architectural products meet safety requirements designed to reduce or eliminate unreasonable risks of death or serious injury to consumers when glazing material is broken by human contact. The testing procedures further describe the testing equipment and apparatus required to be used, and the test result interpretation methodology to be employed in determining if the glazing materials being tested meet the safety requirements of the standard.

Petitioner asserts that consumers and the glazing industry would be better served by replacing the test procedures for glazing materials used in the above-referenced architectural products in 16 CFR 1201.4 with ANSI Z97.1's purportedly more efficient and more modern procedures. Petitioner notes that the testing procedures set forth in Section 1201.4 were promulgated in 1977 and have not been updated or clarified since their original adoption by the Commission. Petitioner points out that the ANSI standard for glazing materials has been updated periodically (in 1984, 1994, 2004 and 2009) since the mandatory standard was promulgated, and that these updates include modifications in testing equipment and procedures that provide better protection for consumers.

Petitioner asserts that the absence of updates to the mandatory standard during a period in which the ANSI standard was revised four times has resulted in different testing methods and qualifying procedures that has created confusion in the industry regarding which test methodology must be used in what circumstance. Petitioner claims that the existence of overlapping but divergent mandatory and voluntary standards has created confusion for manufacturers in determining which standard applies, and resulted in manufacturers being required to pay for dual qualification testing, because different specifying agencies reference one or both standards. Petitioner also includes the proposed language that would replace the current Section 1201.4, directing manufacturers and private labelers of glazing material to test and certify the compliance of their products to the current ANSI standard.

By this notice, we seek comments concerning this petition. Interested parties may obtain a copy of the petition by writing or calling the Office of the Secretary, U.S. Consumer Product Safety Commission, Room 820, 4330

TAB C – Epidemiology Memorandum

UNITED STATES
CONSUMER PRODUCT SAFETY COMMISSION
4330 EAST WEST HIGHWAY
BETHESDA, MARYLAND 20814

Memorandum

Date: March 20, 2013

TO : Brian M. Baker, Mechanical Engineer,
Division of Human Factors

THROUGH : Kathleen Stralka, Associate Executive Director,
Epidemiology Directorate

Stephen Hanway, Division Director
Hazard Analysis Division

FROM : Matthew V. Hnatov, Mathematical Statistician
Hazard Analysis Division

SUBJECT : Injuries and Deaths Associated with Architectural Glazing, 1978 through 2012

U.S. Consumer Product Safety Commission (CPSC) staff searched CPSC databases for incidents related to architectural glazing, in particular, incidents involving glass breakage resulting in death, amputation, laceration, or hemorrhaging. Staff found 324 architectural glazing incidents in which an injury was reported to the CPSC from 1978 through 2012. Ninety-five of these incidents resulted in death. The architectural products presented in this report include:

- Glass or partial glass storm doors,
- Sliding glass doors (*e.g*., patio doors),
- Shower/bath tub doors and enclosures,
- Doors with windows or panes (*e.g*., front entry doors), and
- Doors only specified as "glass doors" in the reports.

Fourteen of the incidents involved injuries to two victims and one incident involved three victims. All but one of these multiple injury incidents involved shower/bath tub doors or enclosures either during installation or removal of the product or during an incident where multiple children were being bathed simultaneously. The other multiple injury incident involved two children and a sliding glass door.

Additionally, based on estimates from the National Electronic Injury Surveillance System (NEISS), staff estimates that there were 46,100 emergency department-treated architectural glass incidents during the 20-year period from 1992 through 2011.

It should be noted that for many cases there was insufficient information to determine definitively that architectural glazing breakage was the cause of the indicated injury. CPSC staff reviewed each of the cases to make a determination of the cause of the injury and, at times, we needed to make assumptions based on the limited description in the reports. This was especially true for NEISS reports because often there is very little descriptive information provided.

Highlights

- Differences exist between incidents reported to CPSC and those collected through NEISS.
    - The estimated number of emergency department-treated injuries has decreased approximately from 18,000 over the 4-year period 1992-1995 to 2,700 over the 2008-2011 time period. In contrast, the number reported CPSC architectural glazing breakage records involving injury seems to have increased slightly from 25 incidents in 1978-1882 to 63 in 2008-2012.
    - Nearly half (47%) of the NEISS cases associated with architectural glazing breakage involved glass or partial glass storm doors while only 20% of the incidents reported to CPSC involved storm doors. In contrast, 53% of reported CPSC architectural glazing breakage records involving injury were associated with shower doors compared to only 22% of NEISS records. It is unclear as to the cause of this discrepancy.
- Though reported injuries associated with architectural glazing breakage incidents reported to CPSC appear to have increased slightly over time, hospitalization and deaths have not.
- An estimated 95% of all emergency department-treated injuries were classified as "treated/examined and released" with another estimated 4% requiring hospitalization.
- An estimated 97% of emergency department-treated architectural glazing breakage injuries were diagnosed as lacerations.
- More than two thirds of the NEISS cases involved injuries to hands or arms as the most severely injured body part.

Reported Incidents

Staff searched three CPSC databases: Injury and Potential Injury Incident, In-Depth Investigation, and Death Certificate databases to identify reports to the CPSC involving architectural glazing and glass breakage resulting in death, amputation, laceration, or hemorrhaging. Analysis found 324 unique incidents referencing injuries among those reports. Table 1 shows the incident counts by architectural glazing type and injury status. Fifteen of the architectural glazing breakage incidents reported to CPSC resulted in injuries to multiple victims. All but one of these incidents involved shower/bath tub doors and

enclosures. Most of incidents multiple victim scenarios involved two children bathing or being bathed when a shower/bath tub door or enclosure breakage occurred. In these cases, the most severe incident is used in the summary tables. Two of the incidents are known to have involved wired glass. Shower doors/enclosures accounted for more than one-half of the reported incidents involving injury from breakage of architectural glass and nearly half of the reported hospitalizations.

Table 1: Reported Architectural Glazing Breakage Incidents by Product Type and Injury Status, 1978 - 2012

Product Type	Injury(1)	Hospitalized	Death	Total	Percent
Glass or partial glass storm doors	34	8	23	65	20%
Sliding glass doors	11	6	19	36	11%
Shower/bath tub doors and enclosures	135	15	22	172	53%
Doors with windows or panes, including French doors	6	2	9	17	5%
Doors only specified as "glass doors"	12	0	22	34	10%
Total	198	31	95	324	100%
Percent	61%	10%	29%	100%	

(1) The Injury category includes incidents where injuries that were either self-treated or the patient was treated and released by a medical practitioner at a hospital, emergency room, or physician's office.

(2) Incidents in the Unknown injury status category may or may not have involved an injury as this information was not reported in the CPSC document.

Source: Injury and Potential Injury Incident, In-Depth Investigation, and Death Certificate databases, December 2012

Reporting continues for these databases, and the reported number of incidents may change in the future.

Table 2 presents the non-fatal incident data categorized by architectural glazing type and degree of injury. It should be noted that degree of injury may not always be reflected in the records. For example, injuries listed as "lacerations" actually may have required stitches although this information is not indicated in the record. Similarly, "stitches" or "eye injuries" may have required hospitalizations.

Table 2: Reported Architectural Glazing Breakage Incidents by Product Type and Degree of Non-fatal Injury, 1978-2012

Product Type	Lacera-tion	Stitches	Eye Injury	Hospital-ization	Injury, not specified	Total	Percent
Glass or partial glass storm doors	22	12	0	8	0	42	18%
Sliding glass doors	6	4	0	6	1	17	7%
Shower/bath tub doors and enclosures	103	12	2	15	18	150	66%
Doors with windows or panes, including French doors	4	2	0	2	0	8	3%
Doors only specified as "glass doors"	9	3	0	0	0	12	5%
Total	144	33	2	31	19	229	100%
Percent	63%	14%	1%	14%	8%	100%	

(1) The Injury category includes incidents where injuries were either self-treated or the patient was treated and released by a medical practitioner at a hospital, emergency room, or physician's office.
(2) Incidents in the Unknown injury status category may or may not have involved an injury as this information was not reported in the CPSC document.
Source: Injury and Potential Injury Incident, In-Depth Investigation, and Death Certificate databases, December 2012
Reporting continues for these databases, and the reported number of incidents may change in the future.

Table 3 presents the incident data summarized by injury severity within 5-year time periods. These data do not suggest a trend. The slight increase of reported incidents over the 35-year period may be due to increased usage of the product or an increase cognizance of mechanisms for reporting complaints.

Table 3: Reported Architectural Glazing Breakage Incidents by Five-Year Period, 1978-2012

5-Year Period	Injury(1)	Hospitalized	Death	Total	Percent
1978-1982	9	2	14	25	8%
1983-1987	14	4	20	38	12%
1988-1992	9	7	21	37	11%
1993-1997	40	7	8	55	17%
1998-2002	44	7	6	57	18%
2003-2007	28	2	19	49	15%
2008-2012*	54	2	7	63	19%
Total	198	31	95	324	100%
Percent	61%	10%	29%	100%	

(1) The Injury category includes incidents where injuries were either self-treated or the patient was treated and released by a medical practitioner at a hospital, emergency, room or physician's office.
(2) Incidents in the Unknown injury status category may or may not have involved an injury as this information was not reported in the CPSC document.
Source: Injury and Potential Injury Incident, In-Depth Investigation, and Death Certificate databases, December 2012
** Reporting continues for these databases, and the number of reported incidents may change in the future.*

Emergency Department-Treated Injuries

Staff found 1,266 cases of architectural glass breakage-related incidents in the National Electronic Injury Surveillance System (NEISS) from 1980 through 2011. For the most recent 20 years of available data, 1992 to 2011, staff found 934 such cases. Based on these cases, staff computed a national estimate of 46,100 emergency department-treated injuries, with a coefficient of variance (C.V.) of 13.49 percent. The 95 percent confidence interval for this estimate is 33,900 to 58,300. Over these 20 years, there were an estimated annual average 2,300 emergency department-treated injuries.

For many of the years between 1992 and 2001, yearly estimates for architectural glass breakage-related incidents could not be calculated due to small sample sizes. However, grouping the data into 4-year ranges yielded sufficient data to calculate estimates and confidence intervals. The results are presented in Table 4 below. As can be seen in the table, the estimated number of ED-treated architectural glazing breakage incidents has dropped from 18,000 in the 1992 to 1995 time period, to 2,700 in the most recent time period, from 2008 to 2011, representing an 85 percent drop.

Table 4: NEISS Hospital Estimated Architectural Glazing Breakage Cases Grouped by Four-Year Period, 1992-2011

5-Year Period	NEISS Cases	Estimated Total	Coefficient of Variation	Lower 95% Confidence Bound	Lower 95% Confidence Bound	Estimated Annual Average
1992-1995	307	18,000	0.2588	8,900	27,200	4,500
1996-1999	197	10,100	0.1639	6,800	13,300	2,500
2000-2003	265	11,600	0.1326	8,600	14,600	2,900
2004-2007	93	3,700	0.1934	2,300	5,100	900
2008-2011	72	2,700	0.2338	1,500	3,900	700
Total	934	46,100	0.1349	33,900	58,300	2,300

Source: National Electronic Injury Surveillance System databases, December 2012

Table 5 presents a summary of the architectural glazing breakage-related incidents in the NEISS data records categorized by type of glazed material and treatment received as specified in the NEISS record. The majority of incidents (95 percent) were coded as treated/examined and released. Nearly half of the treated injuries were related to storm door glass breakage.

Table 5: NEISS Hospital Reported Architectural Glazing Breakage Cases by Product Type and Non-fatal Injury Type, 1980*-2011

Product Type	Treated/ examined and released	Treated and transferred to another hospital	Treated and admitted for hospitalization	Left without being seen or against medical advice	Not recorded	Total	Percent
Glass or partial glass storm doors	570	4	17	0	0	591	47%
Sliding glass doors	265	2	12	0	1	280	22%
Shower/bath tub doors and enclosures	261	3	15	2	1	282	22%
Doors with windows or panes	30	0	1	0	0	31	2%
Doors only specified as "glass doors"	76	2	4	0	0	82	6%
Total	1,202	11	49	2	2	1,266	100%
Percent	95%	1%	4%	< 1%	< 1%	100%	

** NEISS data records are only available for electronic retrieval from 1980 onwards.*
Source: National Electronic Injury Surveillance System databases, December 2012.

Table 6 presents a summary of the architectural glazing breakage-related cases in the NEISS data records, categorized by year of incident and treatment received, as specified in the NEISS record. Because of the small sample sizes in the earlier and later years, the data are presented in four-year group summaries. It is unclear why there are fewer cases in the earlier and later years.

Table 6: NEISS Hospital Reported Architectural Glazing Breakage Cases by Year of Treatment and Non-Fatal Injury Type, 1980* - 2011

4-Year Period	Treated / examined and released	Treated and transferred to another hospital	Treated and admitted for hospitalization	Left without being seen or against medical advice	Not recorded	Total	Percent
1980 - 1983	43	3	2	0	0	48	4%
1984 - 1987	80	0	2	0	0	82	6%
1988 - 1991	194	3	5	0	0	202	16%
1992 - 1995	296	0	10	0	1	307	24%
1996 - 1999	186	1	10	0	0	197	16%
2000 - 2003	250	3	10	1	1	265	21%
2004 - 2007	91	0	2	0	0	93	7%
2008 - 2011	62	1	8	1	0	72	6%
Total	1,202	11	49	2	2	1,266	100%
Percent	95%	1%	4%	< 1%	< 1%	100%	

** NEISS data records are only available for electronic retrieval from 1980 onward.*
Source: National Electronic Injury Surveillance System databases, December 2012

Table 7 presents the NEISS data categorized by injury diagnosis as specified in the NEISS data record. It should be noted that when more than one diagnosis appeared on the emergency department record, the diagnosis that appears to be the most severe is the one coded into the electronic record and presented here. The vast majority of cases involved lacerations (97 percent). Table 8 presents the same data, but cross-categorized by year of incident–presented in four-year time periods.

Table 9 presents the NEISS data summarized by body part injured as specified in the NEISS record. Only the injury deemed most severe is listed in the NEISS record. More than two-thirds of all injuries occurred to the hand or arm, in particular, the lower arm and wrist. This seems logical as the hands and arms are used in the act of pushing on the glass to avoid contact if accidentally running/falling into a glass door.

Table 7: NEISS Hospital Reported Architectural Glazing Breakage Cases by Injury Diagnosis+, 1980-2011

Injury Diagnosis	Total	Percent
Lacerations	1,234	97%
Contusions, Abrasions	12	1%
Fracture	8	1%
Internal organ injury	3	< 1%
Foreign body	3	< 1%
Puncture	3	< 1%
Avulsion	2	< 1%
Hematoma	1	< 1%
Total	1,266	100%

+ When more than one diagnosis appeared on the emergency department record, the diagnosis that appears to be the most severe is represented here.
** NEISS data records are only available for electronic retrieval from 1980 onwards.*
Source: National Electronic Injury Surveillance System databases, December 2012.

Table 8: NEISS Hospital Reported Architectural Glazing Breakage Cases by Year of Treatment and Injury Diagnosis, 1980-2011

4-Year Period	Lacerations (59)	Contusions, Abrasions (53)	Fracture (57)	Internal organ injury (62)	Foreign body (56)	Puncture (63)	Avulsion (72)	Hematoma (58)	Total	Percent
1980 - 1983	44	1	0	1	0	1	0	1	48	4%
1984 - 1987	81	1	0	0	0	0	0	0	82	6%
1988 - 1991	197	1	3	0	0	1	0	0	202	16%
1992 - 1995	301	2	3	0	1	0	0	0	307	24%
1996 - 1999	191	3	2	1	0	0	0	0	197	16%
2000 - 2003	259	3	0	0	2	0	1	0	265	21%
2004 - 2007	92	0	0	0	0	0	1	0	93	7%
2008 - 2011	69	1	0	1	0	1	0	0	72	6%
Total	1,234	12	8	3	3	3	2	1	1,266	100%
Percent	97%	1%	1%	< 1%	< 1%	< 1%	< 1%	< 1%	100%	

** NEISS data records are only available for electronic retrieval from 1980 onwards.*
Source: National Electronic Injury Surveillance System databases, December 2012.

Table 9: NEISS Hospital Reported Architectural Glazing Breakage Cases by Part of Body Injured+, 1980-2011

Part of Body Injured	Total	Percent
Head Injuries	**75**	**6%**
Face	*48*	
Head	*18*	
Mouth	*5*	
Ear	*3*	
Eyeball	*1*	
Body Injuries	**57**	**5%**
Lower trunk	*25*	
Upper trunk	*16*	
Shoulder	*9*	
Neck	*7*	
Arm Injuries	**543**	**43%**
Lower arm	*284*	
Upper arm	*34*	
Wrist	*179*	
Elbow	*46*	
Hand Injuries	**313**	**25%**
Hand	*229*	
Finger	*84*	
Leg Injuries	**168**	**13%**
Lower leg	*67*	
Upper leg	*34*	
Knee	*50*	
Ankle	*17*	
Foot Injuries	**64**	**5%**
Foot	*55*	
Toe	*9*	
Multiple body parts	**40**	**3%**
25-50% of body	*39*	
More than 50% of body	*1*	
Not recorded	**6**	**< 1%**
Total	**1,266**	**100%**

+ When more than one body part was injured, in general, the emergency department reported the injury that appeared to be the most severe.
** NEISS data records are only available for electronic retrieval from 1980 onwards.*
Source: National Electronic Injury Surveillance System databases, December 2012.

Methodology

The National Electronic Injury Surveillance System (NEISS) is a probability sample of approximately 100 U.S. hospitals having 24-hour emergency departments (EDs) and more than six beds. Coders in each hospital code consumer product-related data from the ED record, and the data are then transmitted electronically to the CPSC. Because NEISS is a probability sample, each case collected represents a number of cases (the case's *weight*) of the total estimate of injuries in the United States. Different hospitals carry different weights, based on stratification by their annual number of emergency department visits.[8]

Hazard Analysis staff computes estimates and the associated coefficients of variation for the number of architectural glazing breakage injuries. A coefficient of variation (C.V.) is the ratio of the standard error of the estimate (*i.e.*, variability) to the estimate itself. This is generally expressed as a percent. A C.V. of 10 percent means the standard error of the estimate equals 0.1 times the estimate.

CPSC's Injury and Potential Injury Incident File (IPII) is a database containing reports of injuries or potential injuries made to the Commission. These reports come from news clips, consumer complaints received by mail or through the CPSC's telephone hotline or website, Medical Examiners and Coroners Alert Program (MECAP) reports, letters from lawyers, and similar sources. While the IPII database does not constitute a statistical sample, it can provide CPSC staff with guidance or direction in investigating potential hazards.

CPSC purchases death certificates from all 50 states, New York City, the District of Columbia, and some territories. Only certificates in certain E-codes (based on the World Health Organization's International Classification of Diseases ICD-10 system) are purchased. These are then examined for product involvement before being entered into the CPSC's death certificate database. The result is neither a statistical sample, nor a complete count of product-related deaths, nor does it constitute a national estimate. The database provides only counts for product-related deaths from a subset of E-codes. For this reason, these counts tend to be underestimates of the actual numbers of product-related deaths. Death certificate collection from the states also takes time.

All of the above databases were searched on December 28, 2012, for incidents with the following product codes:

[8] (Kessler and Schroeder, 1999).

NEISS Code	Title	Years in use: NEISS*	Years in use: INDP, IPII, DTHS
609	Glass bathtub or shower enclosures	72 - current	72 - current
611	Bathtubs or showers (including fixtures or accessories; excluding enclosures, faucets, spigots and towel racks)	72 - current	72 - current
1823	Storm doors with glass panels	72 - 02	72 - 02
1825	Sliding glass doors or panels	72 - 02	72 - 02
1837	Glass doors, not otherwise specified	72 - 78	72 - 78
1849	Doors, not specified	74 - 02	74 - 02
1850	Doors, with glass panels, not storm doors	74 - 78	74 - 78
1859	Storm doors, not otherwise specified	74 - 78	74 - 78
1882	Other glass doors	78 - 02	78 - 02
1883	Glass doors, not specified	78 - 02	78 - 02
1892	Glass doors or doors with glass panels	03 - current	03 - current
1893	Doors, other or not specified	03 - current	03 - current
4030	Bathtub or shower enclosures, not specified	78 - current	78 - current

* NEISS data is currently available in electronic searchable format from 1980 onward only.

TAB D – Health Sciences Memorandum

UNITED STATES
CONSUMER PRODUCT SAFETY COMMISSION
4330 EAST WEST HIGHWAY
BETHESDA, MARYLAND 20814

Memorandum

Date: March 15, 2013

TO : Brian M. Baker, Project Manager, Petition CP12-3
Division of Mechanical Engineering
Directorate for Laboratory Sciences

THROUGH : Mary Ann Danello, Ph.D., Associate Executive Director,
Directorate for Health Sciences
Jacqueline N. Ferrante, Ph.D., Director,
Division of Pharmacology and Physiology Assessment
Directorate for Health Sciences

FROM : Jason R. Goldsmith, Ph.D., Physiologist,
Division of Pharmacology and Physiology Assessment
Directorate for Health Sciences

SUBJECT : Petition CP12-3

This memorandum responds to Petition CP12-3, which requests that the Commission initiate rulemaking to replace the testing procedures for glazing materials in certain architectural products specified in 16 C.F.R. part 1201, *Safety Standard for Architectural Glazing Materials*, with the procedures specified in ANSI Z97.1, *American National Standard for Safety Glazing Materials Used in Building – Safety Performance Specifications and Methods of Test*.

BACKGROUND:

Consumer Product Safety Act – Safety Standard for Architectural Glazing Materials

In 1977, the Commission issued the *Safety Standard for Architectural Glazing Materials*, 16 C.F.R. § 1201. The standard was issued to reduce the unreasonable risks of injury associated with glazing materials that are used in certain architectural products, providing those glazing materials are broken as a result of accidental impact by a consumer.

The standard prescribes the safety requirements for the following glazing materials and the architectural products incorporating such materials that are intended for consumer use in residential dwellings or in recreational, school, public, or other buildings: (1) storm doors or combination doors, (2) doors, (3) bathtub doors and enclosures, (4) shower doors and enclosures, and (5) sliding glass doors, which are commonly used on patios.

Excluded products, materials, and uses are: (1) wired glass used in doors and other assemblies to retard the spread of fire, (2) louvers of jalousie doors, (3) openings in doors through which a 3-inch diameter sphere is unable to pass, (4) certain carved, dalle, or leaded glass that is used in doors and glazed panels (*e.g*., stained glass decorative panels), (5) glazing materials used as curved glazed panels in revolving doors, and (6) commercial refrigerated cabinet glazed doors.

The prescribed tests are intended to ensure that glazing materials subject to the standard's provisions (*i.e*., safety glazing materials) will either not break when impacted with a specified energy, or will break in a manner that produces fragments that are less likely to present unreasonable risks of injury than glazing materials that do not meet the requirements of the standard.

<u>The Petition and ANSI Voluntary Standard for Architectural Glazing Products</u>

The petition was brought by the Safety Glazing Certification Council (SGCC or petitioner) by and through its counsel, William H. Hannay. The petitioner contends that the ANSI Z97.1 voluntary standard for architectural glazing products specifies a more rigorous testing protocol that uses more efficient and modern test procedures and equipment than the mandatory standard. The petitioner requests that the Commission replace the test procedures in 16 C.F.R. § 1201.4 with the test provisions of ANSI Z97.1. ANSI Z97.1, the petitioner points out, has been updated periodically in the 35 years since the mandatory standard was promulgated in 1977.

In support of this proposal, the petitioner argues that 16 C.F.R. § 1201.4 has not been modified to reflect important issues that have arisen since its adoption, and clarification has not been offered for ambiguities that exist within the standard. The petitioner cites as an example, the guidance included in the voluntary standard for the testing of "bent glass," which the petitioner asserts is a necessary modification that is lacking in the mandatory standard. The petitioner further asserts that the disparities between the mandatory and voluntary standards have led to confusion in the industry and amongst manufacturers about the qualifying procedures that glazing products are subject to, which, in many cases, the petitioner maintains, has resulted in the expense associated with dual qualification testing of architectural glazing products. The petitioner maintains that the procedures specified in ANSI Z97.1 will protect the consumer better by: (1) requiring more than one sample to be tested; (2) requiring a Center Punch Fragmentation test for some products; and (3) building in increased durability test requirements.

The Injury Pattern

The CPSC's Directorate for Epidemiology's Division of Hazard Analysis (HA) staff (M. Hnatov, March 20th, 2013 EPHA memorandum) examined the CPSC databases for injuries and deaths related to architectural glazing products that occurred between 1978 and 2012. Hazard Analysis staff identified 324 incidents involving injury from architectural glazing products, of which 95 resulted in death. The number of reported incidents increased from a low of 25 in the 1978 to 1982 time period, to a high of 63 in the 2008 to 2012 time period. It is unknown whether this reflects an actual increase in injuries.

Staff found 1,266 architectural glazing breakage incidents in the NEISS system during the period from 1980 to 2011. Focusing on the 934 incidents from the last 20-year period (1992 to 2011), staff generated an estimate of 46,100 emergency department-treated injuries for the 20-year period. Staff reported that during this 20-year time period, the estimated number of emergency department-treated architectural glazing breakage incidents dropped from 18,000 in the first 4-year period (1992 to 1995), to 2,700 in the latest 4-year period (2008 to 2011).

DISCUSSION:

Injuries from Non-Safety Architectural Glazing Materials

When subjected to sufficient impact force, architectural glazing materials that do not meet the mandatory safety standard will break into numerous sharp, jagged, fragments, some of which may be retained in the frame of the product. Laceration injuries are the most common injury associated with this product class, and these injuries range in severity from superficial lacerations to more severe lacerations that involve underlying structures, such as tendons, nerves, muscles and/or blood vessels. Sharp fragments may also produce dagger-like puncture or penetration wounds, which can affect the above-named tissues, as well as deeper internal organs. The more severe injuries can require extensive surgery and rehabilitation, and they can result in varying degrees of loss of sensation and motion, disfigurement, and emotional trauma. Fatalities may result in those cases in which blood vessels are severed or internal organs are damaged.

In contrast to non-safety architectural glazing materials, safety glazing materials or "safety glass" (*i.e.*, glass that meets the mandatory standard) is considered safe because it resists breakage; breaks into substantially smaller, less harmful fragments (*i.e.*, tempered glass); or breaks, but is held in place by one or more layers (*i.e.*, laminated glass); and therefore, safety glass does not pose the same laceration, puncture, or penetration hazard as non-safety glazing materials. Injuries from safety glass are likely to be limited to minor lacerations, abrasions, or contusions of the skin only.

The purpose of the mandatory standard was to eliminate or reduce the lacerations, contusions, abrasions, and other injuries or deaths that resulted from (1) walking or running into glazed doors that were believed to be open; or glazed panels that were

mistaken as a means of ingress or egress; or pushing against glazing materials in doors or glazed panels to open a door; (2) accidentally falling into or through glazed doors, sliding glass doors, glazed panels, and bathtub or shower doors and their enclosures; and (3) installing, replacing, storing, or manipulating glazing material in doors, sliding glass doors, glazed panels, and bathtub or shower doors and their enclosures, or the broken glazing material from any of these products.

Prior to enactment of the mandatory standard, there were an estimated 190,000 injuries that were treated in hospital emergency rooms during 1975, which were associated with architectural glazing materials in the architectural products within the scope of the standard.[9] Approximately 2,400 of these injuries required patients to be hospitalized. Children ages 14 and under represented approximately one-half of the injured, despite the group making up less than 30 percent of the population.[10]

Incident Data

The majority of incidents treated in hospital emergency departments during the 1980 to 2011 time period involved laceration injuries. Injury severity ranged from minor lacerations, abrasions, and contusions, to more severe laceration, puncture and penetration injuries. The body parts most often involved in these incidents were the arm (43%), hand (25%), and leg (13%). The incidents captured in NEISS suggest that the most severe injuries (*i.e.*, injuries that necessitated transfer to another hospital or admission to the hospital where emergency room treatment was provided) represented approximately 5 percent of the total.

Although many incidents lacked detailed information about the injury, a review of the incidents from the CPSC databases suggests that many of the injuries and deaths resulted from products that did not meet the mandatory standard; the deep laceration injuries, and puncture and penetration wounds reported in these incidents, some of which were fatal, most likely only would have resulted from the large glass fragments produced by the breakage of non-safety glass.

Hazard Analysis staff estimates that the number of architectural glazing breakage injuries treated in hospital emergency departments has decreased in the last 20 years. A comparison of the 2,700 estimated emergency department treated injuries over the most recent 4-year period examined (2008 to 2011) and the estimated 190,000 for the 1-year period just prior to enactment of the federal standard (1975), indicates even more of a dramatic decrease — to less than 1 percent of the number prior to enactment of the mandatory standard.

[9] United States Consumer Product Safety Commission *CPSC Seeks To Amend Architectural Glazing Safety Standard* Press Release #77-101U.S. CPSC 1977

[10] David, J-A *Hazard Analysis* Memorandum United States Consumer Product Safety Commission 1993.

Although a reduction in injuries is a likely consequence of enacting the mandatory standard in 1977, it is unclear from the data at hand, to what extent anomalies in the NEISS system (*e.g.*, changes in the NEISS hospitals reporting), changes in coding, different statistical methodologies used in analysis, and/or other explanations, may account for the magnitude of the reported reduction.

Review of the Medical Literature

The nature of the injuries resulting from impact with non-safety architectural glazing products has been well documented in the medical literature, and in particular, by the medical community within those countries that lack standards to address the hazard adequately.

In 1981, Jackson examined glass injuries to children that were serious enough to require admission to the Royal Victoria Infirmary (Newcastle upon Tyne, England) during the years 1973 through 1980. Of the 62 incidents meeting the study criteria, 30 were related to architectural glazing in doors or windows[11]; 26 of these occurred in houses. The injured were most often older children, with a peak in the 5 to 9 age group, and male (81 percent). Relative to the injuries suffered as a result of contact with other types of glass, such as broken pieces of glass, bottles, and drinking glasses, Jackson characterized the injuries from architectural glass as the most serious in nature, which in this series included the death of one child. The author found that the children injured by architectural glazing materials were more likely to receive injuries to the trunk or proximal parts of the limbs. The main injuries were to soft tissue (10), arteries (9), nerves (4), tendons (4), and viscera (3).

Maitra and Han (1989) expanded upon the work of Jackson, examining the records of 918 patients of all ages, who visited the emergency department of the Royal Victoria Infirmary during 1985 for glass-related injuries. Forty percent of these patients were found to have received their injuries from architectural glazing materials. The mean age of those in this subgroup was 23.9 years, and males were injured at a rate three times greater than females. The most common injury location was the upper arm and forearm. The authors note that architectural glass caused more severe injuries, involving muscles, tendons, nerves, and blood vessels, and they noted further that a significantly higher proportion of patients received multiple wounds from architectural glass than patients injured by non-architectural glass.

Injuries to the hand resulting from moving through glass were the focus of a prospective study by Irwin et al. (1996), who over a 1-year period identified 87 patients who sought treatment at either Shotley Bridge District General Hospital or Sunderland District General Hospital (England) for such injuries. Of the 87 patients, 74 received their injuries from architectural glass — 40 doors and 34 windows. The mean age of the injured was 21.7 years, and males accounted for 96 percent of the injured. Alcohol was associated with

[11] Note: the glass in windows is not subject to either the mandatory or voluntary standard.

73 percent of the incidents, and deliberate movement through architectural glass was reported in 51 percent of the incidents; 28 patients admitted having deliberately punched at the glass. The 48 patients who claimed that their injuries were the result of accidental contact included all seven of the children in the series. Injuries included damage to the muscles, tendons, nerves, arteries, volar plate (a thick ligament that separates the joint space of the first knuckle of the finger and the underlying flexor tendons), and skin. All but one of the injuries required surgical intervention; 80 percent of the surgical procedures required a general anesthetic; and the mean time in the operating room was 70 minutes. The authors emphasized the economic burden represented by these injuries, both in terms of the necessary treatment (considerable amount of operating time and expertise, and lengthy rehabilitation times) and the hours of work that were lost.

In a retrospective analysis of NEISS data for door-related injuries to children (age 17 or under) during the period 1999 to 2008, Algaze et al. (2012) found that only 7.4 percent of the injuries involved glass doors but that such patients were twice as likely to be admitted to the hospital for serious lacerations as patients injured by non-glass doors. Patients who were admitted were most frequently treated for amputations (32 percent) or lacerations (25 percent). The frequency of the injuries associated with glass doors jumped significantly with increasing age; the opposite was true for doors of other types. The authors attributed the greater injury rate amongst older children on glass doors to a combination of factors that include the children's greater weight, strength (ability to break the glass), and risk-taking behaviors. The authors mention that at least some of the injuries reported about in their study may have involved inebriation and the deliberate punching of the glass panels.

A 2001 study by Karger et al. of fatalities provides significant insight into the serious nature of the injuries that may result from impacting non-safety architectural glazing materials. In this study, the authors retrospectively examined 799 consecutive autopsies of victims of sharp force that were performed between 1967 and 1996 in Munster and Berlin, Germany for cases classified as accidents. Eighteen cases were found, and one additional case meeting the same criteria and occurring at the time the study was performed was included as well. Of the 19 cases, 14 involved impacts with architectural glass.

Many of the victims had multiple scratches, abrasions, and superficial incisions, and at least one deep tear, laceration, or puncture injury. Eight suffered transections of arteries and/or veins; two received puncture wounds of organs (brain and liver); and four died from unspecified incisions to their faces (2) or limbs (2). In some cases, the major wounds were described as clean cut with small tags and notches; and in other cases, the wounds were described as irregular and jagged with abrasions in the margins of the wound. In the majority of cases, death was attributed to exsanguination (the loss of circulating blood).

The fatal wounds were caused by what the authors termed: (1) "large and dagger-like slivers of glass" that produced stabbing-type injury, (2) sharp-edged fragments of glass that remained inside the frame and produced a large, cutting injury, or (3) a fragment of glass that, upon falling, impacted the victim in a manner similar to a guillotine, causing a transection of a body part. In some cases, a tearing component was also present in the

wound, which the authors attributed to the victim's instinctive motions to remove themselves from the glass. As in other studies, inebriation was a common factor in this series, with all but one victim inebriated at the time of the incident; the exception was a 13-year-old male, the youngest in this series. The nature of this young man's incident and the injury he suffered are useful to discuss in greater detail as they illustrate a common injury scenario, response by the victim, injury, and outcome.

While playing with an older brother, the 13-year-old victim attempted to push open a door with a large glass panel by pressing both of his hands against the glass. This caused the glass to shatter, at which time both of his arms continued their forward motion, projecting through the glass. As he immediately attempted to retreat from the shattered glass panel, his right axilla was deeply and cleanly cut by a blade-like fragment of glass that had remained within the door panel. Both his axillary artery and vein were severed, leading to rapid exsanguination. As was the case with this young man, Karger et al. describe the wounding agent in these incidents not as a knife or sharp tool that is in motion, but rather, the motion of the victims themselves. The forces that are imparted by the impact of the victim with the glass are sufficient to shatter the glass and produce the sharp fragments or fragments with cutting edges that the victim's motion then causes to be driven into, through, or across the tissues of their body.

These studies and others, as well as the CPSC incident data, expose the severe nature of the injuries that can result from non-safety architectural glazing products. Although there may be uncertainty about how the injury rate has changed since enactment of the mandatory standard, it remains clear that there are a significant number of these injuries occurring each year, and, on average, at least three deaths occur per year.

In the majority of cases, it was not possible to determine from the incident data whether the architectural glazing products involved in these incidents may have been manufactured prior to the enactment of the mandatory standard, or subsequent to its enactment, and, if the latter, whether they may have been improperly tested, not tested at all, or were considered exempt from testing. There is also insufficient detail in the incident data to determine the relative contributions the mandatory and voluntary standards may have provided to any change in the injury rate or the types of injuries that have occurred over time.

Given the above, to address this hazard further, it would seem reasonable to consider incorporating any measures that might improve the requirements already provided in the mandatory standard. Whereas, the similarities between the mandatory and voluntary standards are many, the few differences that exist are principally in the form of enhancements contained in the voluntary standard, all of which are consistent with the production of less hazardous architectural glazing products.

The Center Punch Fragmentation test, which is unique to the voluntary standard, builds upon the impact test, by bringing to failure tempered glass samples that did not fracture during the impact test. During this test, a center punch and hammer are used to fracture the samples, after which they are evaluated for conformance to the standard. This test has

the potential to identify false negatives — materials that might have passed all the testing required by the mandatory standard (*i.e.*, did not break), but which break in a non-safe manner during the fragmentation test. Additional enhancements in the voluntary standard include: (1) a revision of the definition of "glazing materials" to include plastic glazing materials; (2) specification of the number of samples to be tested, which would likely increase the reliability of the testing; (3.) inclusion of procedures for testing of bent glass and fire-resistant wired glass; and (4) requirements for weathering tests for laminated glass and environmental durability testing.

To the extent that the majority of architectural glazing manufacturers are not already testing to the voluntary standard, and these enhancements in the testing of architectural glazing materials may lead to an increase in the quality and quantity of safe architectural glazing products on the market and a corresponding reduction in the injury rate from this product class, it would seem prudent to replace the testing procedures specified in the mandatory standard with those in the voluntary standard.

CONCLUSION:

Impact with non-safety architectural glazing materials and the products that incorporate these materials has the potential to produce severe laceration, puncture, and penetration injuries, some of which may prove fatal. The mass and motion of the body are critical determinants in whether the impact with the glass will lead to its shattering. Consequently, individuals receiving injuries from this product class are most often the young (including older children), and they are predominantly males. It has been postulated that the increased mass and risk-taking behavior of older children likely accounts for the greater frequency of these injuries in older children than younger children. Moreover, the increased risk-taking behavior and alcohol consumption may play a role in the preponderance of incidents amongst younger adults.

Subsequent to the shattering of non-safety architectural glazing materials, it is most often the continued momentum of the individual that drives the glass fragments into, through, or across the tissues of the body, producing severe laceration, puncture, or penetration injuries. Such wounds can involve the skin and the underlying muscles, tendons, nerves, and blood vessels, requiring extensive medical treatment, wound management, and long-term rehabilitation; and such wounds may leave the victim disfigured, functionally impaired, and psychologically traumatized.

Whereas, these injuries continue to occur, have the potential to be severe, and are in some cases fatal, it would not be unreasonable to take additional measures to address this hazard. The means to reduce the injury rate from architectural glazing materials may be embodied in some of the provisions contained in the ANSI Z97.1 voluntary standard for this product class. As such, staff believes it may be prudent to incorporate those provisions into the mandatory standard.

Literature Cited

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TAB E – Engineering Sciences Memorandum

UNITED STATES
CONSUMER PRODUCT SAFETY COMMISSION
4330 EAST WEST HIGHWAY
BETHESDA, MARYLAND 20814

Memorandum

Date: March 8, 2013

TO : Brian M. Baker, Mechanical Engineer, Project Manager - Petition CP12-3
Division of Mechanical Engineering
Directorate for Laboratory Sciences

THROUGH : George Borlase, Associate Executive Director
Directorate for Engineering Sciences

Mark Kumagai, Director
Division of Mechanical Engineering
Directorate for Engineering Sciences

FROM : Thomas E. Caton, General Engineer
Division of Mechanical Engineering
Directorate of Engineering Sciences

SUBJECT : Petition CP12-3

Background

On June 26, 2012, the Commission received a request from William M. Hannay, counsel for the Safety Glazing Certification Council (SGCC), asking the Commission to initiate rulemaking to replace the current testing procedures for glazing materials codified at 16 C.F.R. § 1201.4, with those contained in ANSI Z97.1-2009$^{\epsilon}$ "American National Standard (ANSI) for Safety Glazing Materials Used in Buildings-Safety Performance Specifications and Methods of Test." The Office of the General Counsel docketed the request as a petition (CP 12-3), and the Commission published a comment request on August 30, 2012. (77 FR 52635). The petitioner specifically requests that Section 1201.4 and Figures 1–5 be replaced by the Test Specifications and Figures 1, 2, 2.1, 2.2, 3, 4, 4.1, 4.2, 4.3, 4.4, 5, 6, and 7 of ANSI Z97.1-2009$^{\epsilon}$ and by any future revision of the ANSI Z97.1 Test Specifications that may be made.

The petitioner asserts that consumers and the glazing industry would be better served by replacing the test procedures for architectural glazing materials found in section 1201.4 with ANSI Z97.1's purportedly more expansive, comprehensive, and rigorous test procedures. The petitioner points out that ANSI Z97.1 was first developed under the

auspices of the American National Standards Institute in the 1960s and has been regularly updated over the years, noting that ANSI Z97.1-2009$^{\epsilon}$ is the successor to the 2004, 1984 (reaffirmed in 1994), 1975, 1972, and 1966 editions of ANSI Z97.1. The petitioner claims that the updates to test equipment and procedures in the ANSI standard provide better protection for consumers than the equipment and procedures in Section 1201.4, which the petitioner notes, has not been updated in these respects since it was promulgated in 1977.

This memorandum provides a technical comparison of the testing procedures and equipment prescribed in section 1201.4 to ANSI Z97.1-2009$^{\epsilon}$. By way of background, the standard for architectural glazing materials (16 C.F.R. part 1201) prescribes tests to ensure that these products do not break when impacted with a specific force, or break with such characteristics that they are less likely than other glazing materials to present an unreasonable risk of injury. "Glazing materials" are defined in the mandatory standard as "glass, including annealed glass, organic coated glass, tempered glass, laminated glass, wired glass or combination thereof where these are used." 16 C.F.R. §1201.2(a)(11). Plastic glazing materials were originally included in the mandatory standard, but testing of plastic glazing materials was removed from 16 C.F.R. part 1201 by Commission action in 1980 and 1982. The architectural products that are required to use glazing materials that satisfy the testing procedures are identified as "storm doors or combination doors, doors, bathtub doors and enclosures, shower doors and enclosures, and sliding glass doors (patio-type)." 16 C.F.R. §1201.1(a).

Comparison of Test Procedures in 16 C.F.R. Part 1201 and ANSI Z97.1-2009$^{\epsilon}$

CPSC staff compared 16 C.F.R. 1201 and ANSI Z97.1–2009$^{\epsilon}$ (see appendix A). As discussed above, the testing procedures set forth in section 1201.4 have not been modified or updated (aside from the revocation of tests procedures for plastic glazing in the early 1980s) since they were originally promulgated in 1977. In contrast, ANSI Z97.1 has been revised periodically several times since 1977.

In its present form, 16 C.F.R. part 1201 specifies replaced and obsolete ASTM standard practices. The replaced standard practice is ASTM G26-70 - *Practice for Operating Light Exposure Apparatus (Xenon-Arc Type) With and Without Water for Exposure of Nonmetallic Materials*, which was withdrawn by ASTM in 2000, and replaced with ASTM G155 - *Practice for Operating Xenon Arc Light Apparatus for Exposure of Non-Metallic Materials*. The regulation at 16 C.F.R. part 1201 references the obsolete 1970 edition of ASTM D2565-70 - *Practice for Xenon-Arc Exposure of Plastics Intended for Outdoor Applications,* which has been revised over the years; its current edition is ASTM D2565-99(2008).

The use of these withdrawn and obsolete versions of current standards can result in increased costs and duplication of effort if manufactures are required to test to the earlier versions and the current versions of these standard practice test procedures. Furthermore, 16 C.F.R. part 1201 has not been adjusted for the obsolescence of equipment and the replacement of that equipment with currently manufactured test equipment. As such, adoption of the ANSI Z97.1 test procedures in place of the current mandatory standard test

procedures would result in currently manufactured test equipment rather than the obsolete and outdated equipment referenced in section 1201.4 being used in the testing of architectural glazing products.

Even so, the impact tests of 16 C.F.R. part 1201 and ANSI Z97.1-2009$^{\epsilon}$ are similar. The impact test structure/frame is similarly constructed. Figure 1 from 16 C.F.R. 1201 shows a drawing of an Impact Test Structure that is similar to the drawing of the Impact Test Frame drawing in ANSI Z97.1-2009,$^{\epsilon}$ except for differences in the descriptive terms used for naming the parts of the test apparatus, *i.e.*, Main Frame and Sub-Frame in ANSI Z97.1-2009,$^{\epsilon}$ versus 16 C.F.R. part 1201's Impact Test Structure and Test Specimen Mounting Frame. ANSI Z97.1-2009$^{\epsilon}$ provides enlarged drawings of the Impact Test Frame compared to the 16 C.F.R. part 1201 drawings of the Glass Impact Test Structure. Overall, the Glass Impact Test Structure of 16 C.F.R. 1201 appears to be of similar construction to the ANSI Z97.1-2009$^{\epsilon}$ Impact Test Frame, except that ANSI Z97.1-2009$^{\epsilon}$ provides clearer assembly drawings. ANSI Z97.1-2009$^{\epsilon}$ also provides test frame assembly and impact test instructions for bent glass that is not included in 16 C.F.R. part 1201.

The mandatory standard at 16 C.F.R. part 1201 provides two impact categories, 150 foot-pound impact test (Category I) and 400 foot-pound impact test (Category II). Wired glass used in doors or other assemblies to retard the passage of fire is exempt from the testing procedures set forth in section 1201.4. ANSI Z97.1 provides three impact categories, a 400 foot-pound impact test (Class A), a 150 foot-pound impact test (Class B), and a 100 foot-pound impact test (Class C) for fire-resistant wired glass. Section 1201.1(c)(1) provides that "wired glass is used in doors or other assemblies to retard the passage of fire, where such door or assembly, is required by a federal, state, local, or municipal fire ordinance" is exempt from the standard.

ANSI Z97.1-2009$^{\epsilon}$ differs from 16 C.F.R. part 1201 because it contains tests for the impact testing of bent glass, which is not included in 16 C.F.R. part 1201. For flat specimens, both 16 C.F.R. part 1201 and ANSI Z97.1-2009$^{\epsilon}$ provide for use of a 3-inch diameter steel sphere for evaluating any hole remaining in an impact tested specimen after the impact test. However, the standards differ because 16 C.F.R. part 1201 requires that the specimen be evaluated in a horizontal position after the vertical test is completed, while ANSI Z97.1-2009$^{\epsilon}$ requires that the impacted specimen remain in the vertical, upright as-impact tested position while being evaluated with the 3-inch diameter steel sphere. The regulation at 16 C.F.R. part 1201 does not indicate the number of specimens to be impact tested; rather the standard requires only that the largest size and each thickness offered by the manufacturer are to be tested. On the other hand, ANSI Z97.1-2009$^{\epsilon}$ requires that four specimens of each size and thickness are to be impact tested.

ANSI Z97.1-2009$^{\epsilon}$ is more comprehensive for tempered glass specimens than 16 C.F.R. part 1201 because it provides a means for evaluating tempered glass specimens that did not fracture as a result of the Class A impact test. This test is the Center Punch Fragmentation Test that purposely fractures the unbroken, impact-tested tempered glass specimen with a center punch and hammer. The fractured pieces of the tempered glass specimen are evaluated by weighing the 10 largest fragments. A tempered glass specimen

is considered to conform to ANSI Z97.1-2009$^{\epsilon}$ as acceptable for use as safety glazing if the 10 fragments weigh no more than the equivalent of 10 in^2 of the original unbroken specimen, combined with no fragments longer than 4 inches in length. The regulation at 16 C.F.R. part 1201 does not provide an equivalent test to the Center Punch Fragmentation Test.

In addition, 16 C.F.R. part 1201 provides for accelerated environmental durability testing of laminated glass and organic-coated glass but exempts tempered glass, wired glass, and annealed glass. Additionally, 16 C.F.R. part 1201 does not provide for accelerated environmental durability testing of plastic glazing materials because those tests were removed from 16 C.F.R. part 1201 by the Commission in the early 1980s. ANSI Z97.1-2009$^{\epsilon}$ lists organic–coated glass, tempered glass, laminated glazing, plastic glazing, and fire-resistant wired-glass and does not appear to exempt any specific glazing materials as 16 C.F.R. part 1201 does. However, amending the standard as petitioner requests would not alter the scope of the mandatory standard, so products that are exempt from 16 C.F.R part 1201 would continue to be exempt.

While 16 C.F.R. part 1201 refers to architectural glazing materials and specific products where architectural glazing is used, ANSI Z97.1-2009$^{\epsilon}$ refers to safety glazing materials without referring to specific products where safety glazing is used. The voluntary standard indicates that other codes, standards, and manufacturer's information should be consulted for safety glazing product uses. There are other titling differences for the same subject between 16 C.F.R. part 1201 and ANSI Z97.1-2009$^{\epsilon}$, *i.e.*, Glass Impact Test Structure vs. Impact Test Frame, while the dimensions for the structure and frame appear similar.

If the Scope and Definitions of 16 C.F.R. part 1201 are retained with only the Test Specifications of ANSI Z97.1-2009$^{\epsilon}$ replacing the Test Procedures at 16 C.F.R. §1201.4, the result will be a more comprehensive 16 C.F.R. part 1201. A more comprehensive 16 C.F.R. part 1201 would include the Center Punch Fragmentation Test for a tempered glass glazing product. Impact specimens that do not fracture when tested to 400 foot-pounds are considered as conforming by the requirements of 16 C.F.R. part 1201, while ANSI Z97.1-2009$^{\epsilon}$ continues the evaluation with a Center Punch Fragmentation Test to determine if the specimen fractures into sufficiently small pieces to be considered as conforming to the requirements of ANSI Z97.1-2009.$^{\epsilon}$

Recommendations

The ANSI standard provides the most current requirements and modern methodologies, to date, for the materials covered by the CPSC standard. The ANSI standard clearly specifies key testing criteria such as the number of test specimens. The ANSI standard also provides a Center Punch Fragmentation Test that will ensure that safety glazing that does not fracture during the 400 foot-pound impact test will, in fact, fracture into sufficiently small pieces (dice) that are less likely to cause injury to consumers if it should break. Thus, amending the mandatory standard to replace its testing procedures

with those in the voluntary standard will result in a more comprehensive testing procedure which could reduce the likelihood of a consumer being exposed to unsafe glazing materials.

References

16 CFR 1201, Safety Standard for Architectural Glazing Materials

16 CFR 1201.1, Scope, application and findings

16 CFR 1201.40, Interpretation concerning bathtub and shower doors and enclosures

45 FR 66002, October 6, 1980

47 FR 27853, June 28, 1982

American National Standards Institute standard ANSI Z97.1-2009$^{\epsilon}$ Safety Glazing Materials Used in
Buildings-Safety Performance Specifications and Methods of Test, 2009, pp.12-36

ASTM Annual Book of ASTM Standards, Section 00, , Volume 00.01 Subject Index; Alphanumeric List, (West Conshohocken, PA: ASTM International, 2012)

16 CFR 1201.1(d), "The Commission's findings apply to the architectural glazing standard as issued at 42 FR 1428, on January 6, 1977. Since that date, the Commission has revoked portions of the standard which prescribed requirements for ''glazed panels'' (45 FR 67383, August 28, 1980); an accelerated environmental durability test for plastic glazing materials intended for outdoor exposure (45 FR 66002, October 6, 1980); and a modulus of elasticity test, a hardness test, and an indoor aging test applicable to plastic glazing materials (47 FR 27856, June 28, 1982)."

UNITED STATES
CONSUMER PRODUCT SAFETY COMMISSION
4330 EAST WEST HIGHWAY
BETHESDA, MARYLAND 20814

Memorandum

Appendix A – Comparison: 16 CFR Part 1201 VS. ANSI Z97.1 – 2009[ε]

General Purpose & Exemptions			
Subject	**16 C.F.R. Part 1201**	**ANSI Z97.1-2009[ε]**	**Staff Comments**
Scope	§1201.1 (a) The Scope lists: 1. "Storm doors or combination doors 2. Doors 3. Bathtub doors and enclosures 4. Shower doors and enclosures 5. [Reserved] 6. Sliding glass doors (patio type)."	1.1 "This standard establishes specifications and methods of test for the safety properties of safety glazing materials. Glazing materials designed to promote safety and reduce the likelihood of cutting and piercing injuries when the glazing materials are broken by human contact) as used for all building and architectural purposes"	**16 C.F.R. Part 1201** lists kinds of architectural glazing and products and **ANSI Z97.1-2009[ε]** lists kinds of glazing and does not say where and when safety glazing should be used
Limitations	§1201.1(a)(1) "The safety requirements are designed to reduce or eliminate unreasonable risks of death or serious injury to consumers when glazing material is broken by human contact."	1.3 "This standard relates to the minimum safety performance property test criteria for safety glazing materials" (Forward) This standard "is not an appraisal of strength, durability, or appearance nor does this standard specify situations in which safety-glazing should be used…does not address installation methods…a condition of conformance of a material is its uniform production so the product will consistently exhibit these safety characteristics"	**16 C.F.R. Part 1201** is intended to reduce injury when broken by human contact and **ANSI Z97.1-2009[ε]** provides minimum safety performance property test criteria

Subject	16 C.F.R. Part 1201	ANSI Z97.1-2009[c]	Staff Comments
Exemptions	§1201.1 (c) Exemptions: 1. "Wired glass used in doors or other assemblies to retard the passage of fire where required by federal, state, local, or municipal fire ordinance. 2. Louvers of jalousie doors; 3. Openings of doors which a 3 inch diameter sphere is unable to pass; 4. Carved glass . . . dalle glass . . . leaded glass . . . used in doors and glazed panels . . . if . . . the coloring, texturing, or other design qualities cannot be removed without destroying the material; the primary purpose is decorative; and the glazing material is conspicuously colored or textured so as to be plainly visible and identifiable as aesthetic or decorative rather than functional…The glazing material is divided into segment by conspicuous and plainly visible lines; 5. Glazing materials used as curved glazed panels in revolving doors; 6. Commercial refrigerator cabinet glazed doors."	No Exemptions:	**16 C.F.R. Part 1201** exempts wired glass and does not test it; **ANSI Z97.1-2009[c]** has no exemptions; has a test for Fire-resistant wired glass indicating it has the lowest impact classification level and that Class C Impact products have "NOT been accepted by all jurisdictions (*e.g.,* CPSC 16 part 1201, building codes, etc.) as "safe performance" for unrestricted human impact accident modes.

Subject	16 C.F.R. Part1201	ANSI Z97.1-2009ϵ	Staff Comments
Types of Glazing impact tested	§1201.2(a)(11) Architectural "**Glazing material** means glass, including annealed glass, tempered glass, organic-coated glass, plastic glazing, and fire-resistant wire-glass" Does not apply to the window in an exterior wall of the building that the shower is in. §1201.1(a)(1)Specific products: 1. "Storm doors or combination doors 2. Doors 3. Bathtub doors and enclosures 4. Shower doors and enclosures 5. [Reserved] 6. Sliding glass doors (patio type)."	3 Definitions -Safety Glazing includes Laminated Glazing, Tempered Glass, Organic-coated Glass, Plastic glazing, Fire–resistant wired glass Four specimens each thickness and size, if specimens are asymmetric then two specimens shall be impacted each side. ANSI Z97.1-2009ϵ "This standard does not recommend where safety glazing should be used or, when it is used, what type of glazing should be used. For this information one should consult other codes, standards and manufacturer's information."	**16 C.F.R. part 1201** provides for specific uses and **ANSI Z97.1-2009ϵ** does not
Glazing materials	§1201.2(a)(11) Architectural Glazing Materials: • annealed glass • organic-coated glass • tempered glass • laminated glass • wired glass • combinations	Table 1 Safety Glazing Materials: • organic-coated glass • tempered glass • laminated glazing • plastic glazing • fire-resistant wired-glass	**16 C.F.R. part 1201** includes annealed glass as architectural glazing and **ANSI Z97.1-2009ϵ** does not include annealed glass as safety glazing

Specimen Handling			
Subject	**16 C.F.R. Part 1201**	**ANSI Z97.1-2009$^{\epsilon}$**	**Staff Comments**
Specimen Size classification of Impact Specimens	§1201.4(c)(2) "**Impact specimens** shall be the largest size manufactured up to a maximum width of 34 inches (86 centimeters) and maximum height of 76 inches (1.9 meters). Specimens shall be tested for each nominal thickness offered by the manufacturer."	4.2 Marked products shall be nominal thickness of products tested 4.3 "**Unlimited size (U)** 34 inches by 76 inches ± 0.125 (1/8) inch (863 mm by 1930 mm ± 3 mm) **Limited size (L)** largest commercially produced size by the manufacturer less than 34 inches by 76 inches ± 0.125 (1/8) inch (863 mm by 1939 mm ± 3 mm)"	**16 C.F.R. part 1201** tests to the largest size and **ANSI Z97.1-2009$^{\epsilon}$** provides for the largest sizes and identifies product that are not made as large as the industry's largest 34 x 76 inch size
Impact test specimens	§1201.4(c)(2) Does not specify the number of Impact test specimens. Indicates that the largest size manufactured up to 34 x 76 inches for each nominal thickness offered is tested	4.4 Specifies that four specimens of thickness and size and backing material are tested for Safety Glazing, Indoor Safety Glazing, Mirror Glazing with either reinforced or non-reinforced organic adhesive backing for each backing material, and for Bent glass for unlimited size with simple arc bend of 40 inches	**16 C.F.R. part 1201** mentions specimen size and thickness but not number Of test specimens **ANSI Z97.1-2009$^{\epsilon}$** mentions specimen size, thickness, and number of test specimens

Testing Equipment			
Subject	**16 C.F.R. Part 1201**	**ANSI Z97.1-2009$^{\epsilon}$**	**Staff Comments**
Impact Test Frame Equipment	§1201.4(b)(1)(i) Impact test – test equipment "The impact test frame shall be constructed to minimize movement and deflection of its members during testing…."	5.1.1(1) "The test apparatus shall consist of a test frame and impactor system. The test frame consists of a main frame mounted on two base beams with stiffening members and a subframe, in which the specimen is held. The impactor system consists of the impactor, traction, release, and suspension devices."	**16 C.F.R. part 1201** and **ANSI Z97.1-2009$^{\epsilon}$** have similar impact test frame and impactor construction drawings but ANSI Z97.1-2009$^{\epsilon}$ drawings are larger and include drawings for impact testing of bent glass
Impactor	§1201.4(b)(2)(i) The **impactor** shall be a leather punching bag . . . filled with No. 7½ lead shot to a total weight . . . of 100 lbs ± 4 ounces (45.35 ± 0.11 kilograms) . . . the exterior shall be completely covered by ½ inch (1.3 centimeters) wide glass filament reinforced pressure sensitive tape…	5.1.1(3) "The **impactor** shall consist of the leather bag described in Figure 7, a commercial punching bag with its bladder left in place, or any other leather bag of nominally identical shape and size. The bag shall be filled with lead shot of 2.4 mm +0.1 mm diameter (nominal USA No. 7½ or European No. 7 lead shot) and taped…the total mass of the impactor assembly shall be 100 lb + 4 oz (45.4 kg + 0.2 kg), excluding traction system attachments." "To reduce bag deformation during testing, the bag shall be rotated about the axis of its suspension device before each specimen or sample set, buy no less than 30 degrees, and by no more than 90 degrees." "To reduce bag damage during testing, a thin homogeneous or non-woven plastic film no more than 0.005 inch (0.13 mm thick or a loosely draped woven cloth towel weighing no more than 0.05 g/cm2 (0.0113 oz. /in2) shall not be attached to the impactor, but rather may be suspended vertically in front of the surface of the specimen at a distance no more than 0.4 inch (10 mm)."	**Similar impactors**

Testing			
Subject	**16 C.F.R. Part 1201**	**ANSI Z97.1-2009$^{\epsilon}$**	**Staff Comments**
100 foot-pound impact	No Category: Tests are not performed at 100 foot pound level.	5.1.2.1 Class C (ANSI only for fire-resistant wired glass): Accomplished with a drop height between 12 inches and 12.5 inches (305 mm and 318 mm) with impactor 100 lb +4 oz (45.4 kg +0.2 kg),	**16 C.F.R. part 1201** no impact test wired glass is exempted and **ANSI Z97.1-2009$^{\epsilon}$** acknowledges that fire-resistant wired glass has a lower impact strength and is not accepted by all jurisdictions
150 foot-pound impact test	§1201.4(d) Category I : Accomplished with a drop height of 18 to 18½ inches (458 to 470 millimeters) with the100 lbs. ± 4 ounces (45.35 ± 0.11 kilograms) impactor	5.1.2.1 Class B: Accomplished with a drop height of 18 to 18½ inches (458 to 470 millimeters) with the100 lbs. ± 4 ounces (45.35 ± 0.11 kilograms) impactor	**16 C.F.R. part 1201** Category I impact test equal to the ANSI **Z97.1-2009$^{\epsilon}$** Class B impact test
400 foot-pound impact test	§1201.4(d) Category II: Accomplished with a drop height of 48 to 48½ inches (1.22 to 1.23 millimeters) with the 100 lbs. ± 4 ounces (45.35 ± 0.11 kilograms).	5.1.2.1 Class A: Accomplished with a drop height of 48 to 48½ inches (1.22 to 1.23 millimeters) with the 100 lbs. ± 4 ounces (45.35 ± 0.11 kilograms).	**16 C.F.R. part 1201** Category II impact test equal to the **ANSI Z97.1-2009$^{\epsilon}$** Class A impact test

Subject	16 C.F.R. Part 1201	ANSI Z97.1-2009[c]	Staff Comments
Interpretation of Impact Test **Size classification of Impact Specimens**	§1201.4(e)(1) "**A glazing material** may be qualified for use in both Category I and Category II products if it meets the impact requirements for Category II. A glazing material shall be judged to pass the impact test if the specimen meets any of the criteria listed… §1201.4(e)(i) When breakage occurs (numerous cracks and fissures) no opening shall develop in the test sample through which a 3 inch (76 millimeter) diameter solid steel sphere weighing 4 pounds ± 3 ounce (1.81 ± 0.8 kilograms), passes when placed (not dropped) in the opening and permitted to remain for a period of one second. For this criterion, the sample after being impacted shall be placed, while remaining in the subframe, in a horizontal, impact side up position with a minimum of 1 foot (31 centimeters) of free space immediately beneath the specimen. §1201.4(e)(ii) When breakage occurs, what appears to be the 10 largest particles shall be selected within 5 minutes subsequent to the test and shall weigh no more than the equivalent weight of 10 square inches (64 square centimeters) of the original specimen. §1201.4(e)(iii) [Reserved] §1201.4(e)(iv) The specimen does not remain in the subframe and no breakage is caused by the impactor. §1201.4(e)(v) The specimen does not break." Material qualified for classification as Category II is deemed to comply for Category I	5.1.4 Provides a formula when breakage occurs for determining this weight based on the glass glazing's original thickness: "The weight in ounces of 10 square inches of glass is equal to 14.5 times the glass thickness in inches. The weight in grams of 10 square inches of glass is equal to 412times the glass thickness in inches (16.18 grams/mm)." Material qualified for classification as Class A is deemed to comply for Class B. When breakage occurs with cracks and fissures the stiffness and hardness of the specimens shall be determined ASTM D790 Modulus of Elasticity ASTM D785 Rockwell Hardness Specimen does not break	**16 C.F.R. part 1201** only provides for weighing the ten largest pieces while **ANSI Z97.1-2009[c]** provides a formula for evaluating the weight of ten largest fractured pieces **16 C.F.R. part 1201** tests to the largest size and **ANSI Z97.1-2009[c]** provides for the largest sizes and identifies product that are not made as large as the industry's largest 34 x 76 inch size

Subject	16 C.F.R. Part 1201	ANSI Z97.1-2009ε	Staff Comments
Center Punch Fragmentation Test for Tempered Glass	No Test Requirement.	**5.2 ANSI Z97.1-2009ε** - center punch test for tempered glass that does not break during impact test The total weight of the 10 (ten) largest crack –free pieces shall weigh no more than the equivalent weight of 10 square inches (6452 mm^2) of the original test sample [in ANSI Z97.1-2009ε2]	**16 C.F.R. part 1201** does not provide a test and **ANSI Z97.1-2009ε** does provide an center punch fragmentation for tempered glass that does not break in impact test
Rockwell Hardness Testing for Plastic Glazing	No hardness test for plastic glazing (Revoked 47 FR 27856, June 28, 1982)	5.1.4(3) Rockwell Hardness testing per **ASTM D785** only for plastic glazing that does not break during impact test	**16 C.F.R. part 1201** does not provide a test and **ANSI Z97.1-2009ε** provides a hardness test for plastic glazing
Modulus of Elasticity test for Plastic Glazing	No modulus of elasticity test for plastic glazing (Revoked 47 FR 27856, June 28, 1982)	5.1.4(4) Plastic glazing stiffness shall be determined by **ASTM D 790** Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials	**16 C.F.R. part 1201** no test and **ANSI Z97.1-2009ε** provides a modulus test ASTM D790
Accelerated Environmental Durability Tests Boil Test	§1201.4(d)(2)(ii) Laminated Glass Organic Coated Glass (Tempered, Wired, Annealed Glass all Exempt)	5.4.1.2 Laminated Glass Organic Coated Glass Plastic Glazing	

Subject	16 C.F.R. Part 1201	ANSI Z97.1-2009[c]	Staff Comments
Boil Test	**§1201.4(c)(3)(i) Laminated glass** – Three pieces 12 inches by 12 inches "The glass itself may crack in this test, but no bubbles or other defects shall develop more than ½ inch (12 millimeters) from the outer edge of the specimen. Any specimen in which the glass cracks to an extent that confuses the interpretation of the results shall be discarded, and another specimen shall be tested in its stead."	**5.3 Laminated Glass** – three specimens (12 x 12 inch) and nominal thickness "The glass itself may crack in this test, but no bubbles of other defects shall develop more than 0.5 inch (12 mm) from the outer edge of the specimen or from any crack that may develop. Any specimen that cracks to an extent confusing the results shall be discarded and another specimen shall be tested in its place."	Both have a Boil Test for laminated glass and similar requirements

Subject	16 C.F.R. Part 1201	ANSI Z97.1-2009ε	Staff Comments
Weathering Tests	§1201.4(c)(3)(ii) Refers to a replaced and out of date non-current ASTM practices: **ATM G26-70 (Obsolete 2000)** Standard Recommended Practice for Operating Light- and Water-Exposure Apparatus (Xenon-Arc Type) for Exposure of Non-Metallic Materials with Weather-Ometer and a non-current existing ASTM practice: **ASTM D2565-70** Standard Recommended Practice for Operating Xenon-Arc Type (water-cooled) Light- and Water-Exposure of plastic	**5.4 Laminated Glazing, Organic-Coated Glass, Plastic Glazing** **5.4.1.2 Accelerated Exposure ASTM G155 -** Standard Practice for Operating Xenon Arc Light Apparatus for Exposure of Non-Metallic Materials Weathering tests for Laminates, Organic-Coated Glass and Plastics "The purpose of these tests is to determine whether these safety-glazing materials will successfully retain their safety characteristics after expose to weathering conditions for an extended period of time." The weathering methods described in section 5.4.1 shall be used for all materials subjected to exterior exposure." "Organic coated materials intended for interior use only shall be subjected to the requirements of section 5.4.3." A minimum of five specimens for Charpy Impact testing of Plastic glazing material **5.4.1.1 Natural exposure (ASTM D 1435 Practice for Outdoor Weathering of Plastics)** for one year Accelerated exposure in a Xenon-Arc Type Operating Light Apparatus as specified in **ASTM G 155 (replaced ASTM G 26 in 2000)** and cycle per **ASTM D 2565** for 102 minutes irradiation, 18 minutes of irradiation, and water spray) for a 3000 hour exposure For laminated glazing, organic-coated, and plastic glazing but not performed on glazing intended for indoor use only Six specimens: 2 inches by 6 inches (152 mm by 152 mm) Plastic glazing panels shall expose one un-backed plastic glazing panel, three exposed and three kept in darkness. Laminated glass six specimens a minimum of 2 inches by 6 inches (50 mm by 152 mm) Organic-coated glass six specimens a minimum of 2 inches by 6 inches (50 mm by 152 mm).	**16 C.F.R. part 1201** specifies an obsolete practice that was replaced and older pre-revision version of an existing ASTM practice: ASTM G26 (obsolete 2000) ASTM D2565-70 current version is D2565-99 (2008) and does not refer to ASTM D1435 **ANSI Z97.1-2009ε** specifies the ASTM G155 that replaced G26 and **ASTM D1435** and **ASTM D2565** without year designations **ANSI Z97.1-2009ε** says 6 specimens

Subject	16 C.F.R. Part 1201	ANSI Z97.1-2009ε	Staff Comments
Accelerated environmental durability test	§1201.4(d)(B)(2)(i)Laminated Glass Organic Coated Glass Tempered Glass Exempt Wired Glass Exempt Annealed Glass Exempt Plastic Glazing Revoked in 1980	5.4.1.2.1 Plastic Glazing Organic-coated glass	**16 C.F.R. part 1201** and **ANSI Z97.1-2009ε** both have tests for Organic coated glass but only **ANSI Z97.1-2009ε** has a test for Plastic Glazing
Simulated Weathering Tests for Organic-Coated Materials	§1201.4(d)(B)(1)Accelerated exposure with Xenon arc (water cooled) Weather-Ometer rated at 6500 watts (ASTM G26 obsolete in 2000)Expose for 1200 ± 1 hours and exposed to a radiant flux of 50 microwatts per square centimeter) while monitoring at a wavelength of 340 nanometers	5.4.1.1.1 Weathering tests for Laminates, Organic-Coated Glass and Plastics 5.4.1.2.1 Natural exposure (ASTM D 1435) for one year Accelerated exposure in a Xenon-Arc Type Operating Light Apparatus as specified in ASTM G 155 (replaced ASTM G 26) and cycle per ASTM D 2565 for 102 minutes irradiation, 18 minutes of irradiation, and water spray) for a 3000 hour exposure For laminated glazing, organic-coated, and plastic glazing but not performed on glazing intended for indoor use only Six specimens:2 inches by 6 inches (152 mm by 152 mm) Plastic glazing panels shall expose one un-backed plastic glazing panel, three exposed and three kept in darkness Laminated glass six specimens a minimum of 2 inches by 6 inches (50 mm by 152 mm) Organic-coated glass six specimens a minimum of 2 inches by 6 inches (50 mm by 152 mm)	**16 C.F.R. part 1201** has year designations which locks it into a particular version of the ASTM standard and **ANSI Z97.1-2009ε** does not use year designations for ASTM practices so the current version can easily be used without having to rewrite **ANSI Z97.1-2009ε**

Subject	16 C.F.R. Part 1201	ANSI Z97.1-2009ε	Staff Comments
Tests after Weathering Test/ASTM Standards	§1201.4(b)(3)(ii) ASTM G 26-70 (non-metallic materials) obsolete in 2000 replaced by ASTM G 155 and specifies a non-current version of ASTM D 2565-70 (plastics). Specifies 6 specimens.	5.4.1.2.1 ASTM G 155 replaced ASTM G26-96 (obsolete) "When compared to control (unexposed) samples, no weathered specimen shall exhibit more than the allowable change, as specified, for the following properties:" Evaluates: "**Visible Light Transmittance** change not greater than 5 percentage units (e.g.: 91% control ± 5% = 96% or 86%) as measured according to ASTM D 1003; Standard Test Method for Haze and Luminous Transmittance of Transparent Plastics." **Yellowness Index** (for clear products only) change not greater than 0.5 Yl units (e.g.: 0.70 YI control ± 5 = 1.20 or 0.20) as according to ASTM E313; Standard Practice for Calculating Yellowness and Whiteness Indices from Instrumentally Measured Color Coordinates." **Haze** change not greater than 0.5 percentage units (e.g.: 0.70 control ± 1.20 or 0.20) as measured according to ASTM D 1003; Standard Test method for Haze and luminous Transmittance of Transparent Plastics." **Delta E** less than or equal to 5 units as measured according to **ASTM E 308; Practice for Computing the Colors of Objects by Using the CIE System."**	**16 C.F.R. part 1201** refers to ASTM G26-70 an obsolete standard which was replaced by ASTM G155 and **ANSI Z97.1-2009ε** refers to ASTM G155 and ASTM D2565 without a year designations
Accelerated environmental durability test plastic glazing materials	Revoked in 1980	5.4.3 "The purpose of (5.4.3) these tests is to determine whether plastic and organic-coated glass for indoor use only will successfully retain their safety characteristics after exposure to simulated aging conditions for an extended period of time. The specimens described in 4.4 for impact test after aging shall be used."	**16 C.F.R. part 1201** no test and **ANSI Z97.1-2009ε** has a test

Subject	16 C.F.R. Part 1201	ANSI Z97.1-2009ε	Staff Comments
Tests After Weathering for Laminated Glass Materials	Weathering test Organic-coated glass Six specimens 2 inches by 6 inches (5 centimeters by 15 centimeters) by nominal thickness identical to those submitted for impact testing Three specimens oriented indoors toward radiation and three specimens kept in darkness at 73° F (23° C)	5.4.1 "The weathering methods described in section 5.4.1 shall be used for all materials subjected to exterior exposure" and follows ASTM D1435. The specimens may be cleaned after exposure. Both unexposed and exposed specimens shall be conditioned before examination for a minimum of 48 hours at 71° to 75° F (22° to 24° C) and 50% ± 2% relative humidity Exposed specimens shall be compared to unexposed specimens Any improvement in clarity or discoloration is acceptable. When examined after ultraviolet exposure, each specimen shall be substantially free of noticeable decomposition, no bubbles or delamination visible more than 0.4 inch (10 mm) from any outer edge, no crazing or cracking, otherwise unacceptable glazing material shall be reported as visually blemished when compared to the control specimens	**16 C.F.R. part 1201** provides for weathering test and **ANSI Z97.1-2009ε** provides for a weathering test
Tests after Weathering for Laminated glass materials only	Weathering test Organic-coated glass Six specimens 2 inches by 6 inches (5 centimeters by 15 centimeters) by nominal thickness identical to those submitted for impact testing Three specimens oriented indoors toward radiation and three specimens kept in darkness at 73° F (23° C)	5.4.1 "The weathering methods described in section 5.4.1 shall be used for all materials subjected to exterior exposure." "The weathering test natural exposure follows ASTM D1435.	Both provide for weathering tests of organic coated glass materials

Subject	16 C.F.R. Part 1201	ANSI Z97.1-2009ε	Staff Comments
Adhesion Test for Organic-coated Glass	**§1201.4(d)(B)(1) Adhesion test for organic-coated glass only** A tensile tester of constant-rate-of-extension (CRE) with a moving cross head set to move at 12 inches (305 mm) per minute "The organic-coated glass adhesion shall be judged satisfactory if the average pull force for the weathered specimens is no less than 90 percent of the average pull force for the control specimens.	**5.4.2.2.1 Adhesion test** A tensile tester of constant-rate-of-extension (CRE) with a moving cross head set to move at 12 inches (305 mm) per minute. Six specimens, (nominally 2 inch by 6 inch (52 mm by 152 mm)) The organic coating shall be judged satisfactory if the average tensile vale of the three exposed specimens is no less than 75% of the average tensile values of three control specimens.	**16 C.F.R. part 1201** has an adhesion test for organic coated glass and **ANSI Z97.1-2009ε** has a test for organic coated glass
Tensile strength test for Organic-coated Glass	**§1201.4(d)(B)(1) Organic-coated glass only** CRE tensile tester shall be used with a moving cross-head set to move at 2 inches per minute (0.8 millimeter per second) A razor blade shall be used to cut ½ inch (12 millimeter) wide specimens of organic coating on glass The organic coating shall be judged satisfactory if the average tensile value of the weathered specimens is no less than 75 percent of the average of the control specimens	**5.4.2.2.2 Organic Coated Glass and** Same specimens used for adhesion test A tensile tester of constant-rate-of-extension (CRE) with a moving cross head set to move at 2 inches (305 mm) per minute **5.4.2.2.2** Six specimens, (nominally 2 inch by 6 inch (52 mm by 152 mm)) The organic coating shall be judged satisfactory if the average tensile vale of the three exposed specimens is no less than 75% of the average tensile values of three control specimens.	**16 C.F.R. part 1201** has a test and **ANSI Z97.1-2009ε** has a test for organic coated glass
Tests after weathering for Plastics	No Test due to revocations during the 1980-1982 period	**5.4.2.4.1 ASTM D6110** Charpy Impact Test method B	Only **ANSI Z97.1-2009ε** provides for testing Plastic Glazing

Subject	16 C.F.R. Part 1201	ANSI Z97.1-2009[c]	Staff Comments
Outdoor Eexposure Weathering Tests for Plastics	Requirements for accelerated environmental durability test for plastic glazing materials intended for outdoor exposure Revoked 45 FR 66002, October 6, 1980	**5.4.2.4.1** Specimens evaluated before and after exposure per ASTM D 6100, Charpy Impact Test, Method B with the following exceptions: specimens not notched, specimens tested with exposed surface in tension, specimens exposed and tested flatwise, the span reduced to 2 inches (52 mm) for thin material, the average of five samples shall be reported The plastic material is acceptable if the impact strength is not reduced by more than 25% as a result of natural or accelerated exposure	**16 C.F.R. part 1201** no test and **ANSI Z97.1-2009[c]** specifies ASTM D6100
Tests After Weathering for Organic Coated Glazing Materials for Indoor Service	§1201.4(c)(B)(2)(iii) Organic-coated glass, Provides for four additional impact testing size samples for indoor service	**5.4.3** After exposure the specimens may be cleaned Organic coated materials intended for interior use only shall be subjected to the requirements of section 5.4.3."**5.4.3.2** Aging tests for organic-coated glass used in interior applications only Four specimens up to 34 inch by 76 inch 140°F ± 5°F within 3 hours and hold for 21 hours Impact test after aging	Both **16 C.F.R. part 1201** and **ANSI Z97.1-2009[c]** provide for impact testing of weathered organic coated glazing materials for indoor service

Subject	16 C.F.R. Part 1201	ANSI Z97.1-2009ε	Staff Comments
Indoor Aging Tests for Plastic Glazing	revoked (47 FR 27856, June 28, 1982)	**5.4.3** Aging tests for plastics used in indoor applications only. Impact test after aging **5.4.4** Impact tests after aging for plastics	**16 C.F.R. part 1201** test was revoked and **ANSI Z97.1-2009ε** has a test for plastic glazing for indoor use
Impact Test after Aging for Organic-coated Glass	§1201.4(c)(ii)(B)(2)(iii)(d) Four additional samples identical to those submitted for the impact test when used for indoor service	5.4.4 Impact tests after aging for organic-coated glass used in interior applications	**16 C.F.R. part 1201** when used for indoor service and **ANSI Z97.1-2009ε** when used for indoor service testing

TAB F – Economic Impact Memorandum

UNITED STATES
CONSUMER PRODUCT SAFETY COMMISSION
BETHESDA, MD 20814

Memorandum

Date: March 13, 2013

TO : Brian M. Baker, Project Manager, Petition CP12-3
Division of Mechanical Engineering
Directorate for Laboratory Sciences

THROUGH : Gregory B. Rodgers, Ph.D., Associate Executive Director,
Directorate for Economic Analysis
Deborah V. Aiken, Ph.D., Senior Staff Coordinator,
Directorate for Economic Analysis

FROM : Robert Squibb, Economist
Directorate for Economic Analysis

SUBJECT : Economic Analysis of Petition CP12-3 to Update 16 C.F.R. Part 1201 to Reflect ANSI Z97.1-2009€2

Background

The U. S. Consumer Product Safety Commission (CPSC or Commission) staff is considering a petition from the Safety Glazing Certification Council (SGCC) to amend 16 C.F.R. part 1201, Safety Standard for Architectural Glazing Materials, to replace section 1201.4 with the corresponding sections of the current American National Standards Institute (ANSI) safety glazing standard, ANSI Z97.1-2009€2. This memorandum provides a preliminary description of the differences in the relevant standards for architectural glazing, provides information on the market for architectural glazing, and describes the possible economic impact of the petitioner's requested change in regulation.

Differences between ANSI Z97.1-2009€2 and 16 C.F.R. Part 1201

Current federal regulations (16 C.F.R. part 1201) require the testing of architectural glazing materials used in storm or combination doors, bathtub and shower doors and enclosures, and sliding glass doors. There are several differences between the 16 C.F.R. part 1201 and the current voluntary standard (ANSI Z97.1-2009€2). In contrast to the mandatory requirements, the ANSI standard requires testing bent glass, includes weathering tests for laminated products, does not exempt wired glass, and requires a center-punch test to bring all samples to failure. The ANSI standard also requires impact testing for four specimens of each thickness and size while the mandatory standard requires impact testing for only one specimen. The federal standard covers only specific consumer products referenced in the standard while ANSI Z97.1-2009€2 covers all glazing products as used for building and architectural purposes, with some exemptions. While 16 C.F.R. part 1201 references environmental and weathering factors affecting glass, it

provides no instructions for testing those effects. In contrast, the voluntary standard provides instructions for weathering glazing samples and testing for the effects of weathering. In addition, some of the equipment and standard practices referenced in 16 C.F.R. part 1201 are, according to the petitioner, out of date.

Market for Architectural Glazing

Architectural glazing is a type of glass building material typically strengthened through one of several processes including, but not limited to, annealing, laminating, tempering, toughening, heat strengthening, and chemical strengthening. Glazing products are commonly used as a type of structural glass, thereby making such products suitable for use in storm doors, bathtub and shower doors, and sliding glass doors, among other uses.

Estimating the size of the architectural glazing market is difficult. Architectural glazing manufacturing does not have its own North American Industry Classification System (NAICS) code and is included with other, non-architectural, flat glass manufacturing. The petitioner, SGCC, estimates that they manage the certification testing for approximately 70 percent of the industry, and certify 1,726 individual products from 262 participating plant locations. The SGCC estimates imply a total market size of about 375 manufacturing facilities and about 2,500 individual products, assuming those manufacturers certified by SGCC are representative of the market. The Glass Association of North America (GANA) estimated in a comment on a separate notice of proposed rulemaking in 2011 that there were around 400 glass manufacturers in the architectural glazing market, consistent with the estimate from SGCC.[12]

Compliance with ANSI Z97.1-2009€2 and 16 C.F.R. Part 1201

Of the products certified through SGCC, 98 percent or 1,695 products were certified to both ANSI Z97.1-2009€2 and 16 C.F.R. part 1201. Only 13 products (0.8%) were certified solely to ANSI Z97.1-2009€2, and 18 products (1%) were certified solely to 16 C.F.R. part 1201. It is unknown how common it is to certify exclusively to 16 C.F.R. part 1201. However, if SGCC's customers are representative of the whole, the practice would appear to be rare.

In correspondence with CPSC, SGCC pointed out that different industrial codes often reference different standards that finished products must meet. For example, elevator codes reference ANSI Z97.1-2009€2, while building codes[13] often reference 16 C.F.R. part 1201. International codes are not consistent in the standards they reference. Since manufacturers do not necessarily fabricate flat glass panels for a specific end-use, it is prudent practice for them to test and certify to both standards. In addition, an examination

[12] Public comment from the Glass Association of North America submitted in response to the notice of proposed rulemaking on the testing and certification rule (16 C.F.R. part 1107).
[13] International Code Council- International Building Code.
http://archive.org/stream/gov.law.icc.ibc.2012/icc.ibc.2012#page/n555/mode/2up

of websites for manufacturers supports the petitioner's claim that most manufacturers certify to both standards: the vast majority of websites that discuss certification to architectural glazing standards discuss their certification to both.

Preliminary Discussion of Possible Impact

Staff has collected extensive data on injuries from glazing products. However, the injury data does not illuminate the potential impacts of adopting ANSI Z97.1-2009€2. Staff was unable to find instances of injuries caused by glazing products that meet 16 C.F.R. part 1201 but would fail ANSI Z97.1-2009€2. While we are unable to predict any change in injuries from granting the petition, careful comparison of ANSI Z97.1-2009€2 and 16 C.F.R. part 1201 shows the ANSI standard to be more rigorous in its methodology and requirements, and could reasonably be expected to result in the use of architectural glazing products that are at least as safe as, if not safer than those tested only to the requirements of 16 C.F.R. part 1201. Thus, it is not likely that the adoption of ANSI Z97.1-2009€2 would result in an increase in injuries.

One of the points raised in the petition is that adoption of the voluntary standard as mandatory would reduce the costs of certification for manufacturers. Manufacturers currently testing to both the voluntary and the federal standards would experience a decrease in testing and certification costs because they would only need to test to one standard. The SGCC estimates that its customers would each save an average of $1,284 annually or a total of $336,400 for all plants. These estimates include glass and shipping costs in addition to certification fees.

The impact on manufacturers that do not certify through SGCC is less certain. It is unknown at this time how many of those firms test to one or both standards. Since manufacturers do not always know which standard will apply to a given piece of glass, they have strong incentive to test to both standards. Of manufacturers outside SGCC's membership, those which currently test to both standards will also likely see cost savings. However, to the extent they conduct in-house testing, cost savings may be lower since they are not currently incurring shipping costs as high as SGCC customers. Costs to manufacturers testing only to the ANSI standard would be unchanged. Costs to manufacturers currently testing to only 16 C.F.R. part 1201 would increase due to the heavier testing requirements in the ANSI standard.

The petitioner also argues that there is confusion in the market created by having two different standards, and that there will be benefits in terms of cost reduction achieved by eliminating the distinctions. However, such cost savings is uncertain and is difficult to quantify.

TAB G – Public Comments

ADRIAN SMITH + GORDON GILL
ARCHITECTURE

October 17, 2012

Todd A. Stevenson
Office of the
Secretary
U.S. Consumer
Product Safety
Commission
4330 East-West
Highway
Room 820
Bethesda, MD 20814

Re: Comment in Support of SGCC's Petition to Amend 16 CFR 1201
Docket No. CPSC-2012-0049

Dear Mr. Stevenson:

I am writing in support of the Petition to Amend 16 CFR 1201 in Docket No. CPSC-2012-0049.

I am a registered Architect and a Director with the firm of Adrian Smith + Gordon Gill Architecture, here in Chicago. I have served as a Public Interest Member of the Safety Glazing Certification Council (SGCC) Board of Directors for the past eight years and am the current Board President. As you may know, the SGCC was established in 1971 by manufacturers of safety glazing products, building code officials and others outside the industry concerned with public safety for the purpose of maintaining a program of independent third party testing of safety glazing materials. In order to prevent industry dominance of SGCC actions, half the voting power of the Board resides in the Public Interest. Our role is ensure that the interests of consumers of glazing materials and other members of the general public who may be injured by unsafe breakage of glazing materials are kept in mind and protected by SGCC in its deliberations and operations.

As a result of my professional architectural practice and my service on the SGCC Board, I have become familiar with both the current version of ANSI Z97.1 and CPSC's 16 CFR 1201. It is my belief that Part 1201.4's test procedures (which have not been changed since 1977) should be replaced with ANSI Z97.1's more efficient and modern procedures. In my opinion, this change would protect consumers better than 16 CFR's out of date procedures and would also benefit the glazing industry as well as consumers by eliminating the duplication of having to test to two different procedures. Furthermore, ANSI 97.1 is a supported Standard. By that I mean to say that there is a standing ANSI Accredited Committee that continually reviews and updates the Standard so as to maintain its relevance. Finally, the use of a single test method and qualification

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procedure would simplify things and allow for greater understanding by consumers, specifiers (such as architects), building code officials, as well as the industry and the test labs.

In conclusion, I urge you to grant the SGCC's petition and adopt ANSI Z97.1 as the test methodology for Part 1201.

Regards,

Peter A. Weismantle FAIA, RIBA
Director of Supertall Building Technology
Adrian Smith + Gordon Gill Architecture

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Quality Accuracy Assurance

Fenestration Testing Laboratory, Inc.

8148 N.W. 74th Avenue Medley, FL 33166 Phone: (305) 885-3328 Fax: (305) 885-3329 (888) 819-7877
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October 22, 2012

Todd A. Stevenson
Office of the Secretary
U.S. Consumer Product Safety Commission
4330 East-West Highway, Room 820
Bethesda, MD 20814

Re: Comment in Support of SGCC's Petition to Amend 16 CFR 1201
Docket No. CPSC-2012-0049

Dear Mr. Stevenson:

I am writing in support of SGCC's Petition to Amend 16 CFR 1201 in Docket No. CPSC-2012-0049.

I am owner and CEO of Fenestration Testing Laboratory, Inc. and have served as a Public Interest Member of the SGCC Board of Directors since 1984.

As a result of laboratory testing experience, I have become familiar with both the current version of ANSI Z97.1 and CPSC's 16 CFR 1201.

It is my belief that Part 1201.4's test procedures (which have not changed since 1977) should be replaced with ANSI Z97.1's more efficient and more modern procedures. This change would protect consumers better than 16 CFR's older procedures and would also benefit the glazing industry and in turn consumers by eliminating the duplication of having to test to two different procedures. ANSI Z97.1 is a more rigorous test standard than Section 1201.4 and will thus better protect the consumer. The use of a single test method and qualification procedure would allow greater understanding by consumers, specifiers, building code officials, as well as the industry and the test labs.

I urge you to grant the SGCC's petition and adopt ANSI Z97.1 as the test methodology for Part 1201.

Sincerely,

Fenestration Testing Laboratory, Inc.

Manny Sanchez
Chief Executive Officer

MS:lbs

The Voice of the Glazing Industry

October 25, 2012

Chairman Inez Tenenbaum
Office of the Secretary
U.S. Consumer Product Safety Commission
4330 East-West Highway
Bethesda, MD 20814

Re: Docket No. CPSC-2012-0049, Comments of the Glass Association of North America

Dear Chairman Tenenbaum:

The Safety Glazing Certification Council ("SGCC") has petitioned CPSC to initiate a rulemaking proceeding to amend 16 CFR Part 1201, requesting deletion of the test procedures prescribed in 16 CFR § 1201.4, replacing them with those found in the glass and glazing industry's voluntary standard, ANSI Z97.1-2009. CPSC published notice of this petition in the *Federal Register* of August 30, 2012, 77 *Fed. Reg.* 52,265 (Aug. 30, 2012), soliciting public comment. The Glass Association of North America ("GANA") submits this comment in support of SGCC's request.

GANA is a trade association comprised of more than 300 glass and glazing manufacturers, fabricators, and installers operating facilities throughout the United States, Canada, and Mexico. Its members fabricate safety glazing materials, including laminated and tempered glass, for installation in defined hazardous locations. These hazardous locations include those remaining under the jurisdiction of CPSC. Many GANA members are members of and participants in SGCC, subjecting their safety glazing materials to SGCC's testing and certification program.

The SGCC petition has merit. GANA agrees with SGCC that the testing protocol of 16 CFR Part 1201, specifically that of 16 CFR §1201.4, has never been maintained, is materially out of date, and should be replaced by the most recent edition of ANSI Z97.1. The inadequacies of 16 CFR § 1201.4 harm the glass and glazing industry beyond the simple reach of safety glazing products falling within the limited jurisdiction of CPSC. The model building codes, referenced in virtually all state and local building codes throughout the country, require safety glazing materials to comply with the testing protocol of 16 CFR Part 1201 as a condition to their installation in all hazardous locations, not just doors and shower-and-tub enclosures.

GANA urges CPSC to grant the SGCC petition, publish notice of proposed rulemaking in the *Federal Register* proposing to delete § 1201.4 from 16 CFR Part 1201 and replace it with the most current edition of ANSI Z97.1, and solicit public comment on its proposal.

Sincerely,

Bill Yanek
GANA Executive Vice President

800 SW Jackson Street, Suite 1500, Topeka, KS 66612-1200
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KEVIN B. OLAH
Director, Office of Homologation
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October 19, 2012

Todd A. Stevenson
Office of the Secretary
U.S. Consumer Product Safety Commission
4330 East-West Highway, Room 820
Bethesda, MD 20814

Re: Comment in Support of SGCC's Petition to Amend 16 CFR 1201
Docket No. CPSC-2012-0049

Dear Mr. Stevenson:

This letter is submitted in support of SGCC's Petition to Amend 16 CFR 1201, Docket No. CPSC-2012-0049.

I am employed by Guardian Industries Corp. ("Guardian"), which is a manufacturer and fabricator of safety glazing materials. In my position with the company as Director, Office of Homologation, my duties involve regulatory product compliance and quality assurance. I have supervised both in-plant testing of the products of my company and testing at test labs to ensure compliance with both ANSI Z97.1 and 16 CFR 1201.

I am currently a business community member of the SGCC Board of Directors and have served in that capacity, at various times, for a total of six years.

I am also the Chairman of the ASC Z97 Committee, and have been for the past six years. In that capacity, I have actively participated in the development of the most current version of the ANSI Z97.1 testing methodology.

As a result of my work for Guardian, my service on the SGCC Board and participation with the ASC Z97 Committee, I have become familiar with the application of both ANSI Z97.1 and CPSC's 16 CFR 1201.

It is my belief that Part 1201.4's test procedures (which have not changed since 1977) should be replaced with ANSI Z97.1 because the latter is more efficient and modern. This change would benefit the glazing industry and its customers by eliminating the duplication of having to test two different procedures. Consumers and the general public will also be better protected because ANSI Z97.1 is a more rigorous test standard than Section 1201.4. The use of a single test method and qualification procedure would allow greater understanding by consumers, specifiers (such as architects), building code officials, as well as the industry and the test labs.

KEVIN B. OLAH
Director, Office of Homologation
Direct Dial: (248) 340-2141
Email: kolah@guardian.com

I urge you to grant the SGCC's petition and adopt ANSI Z97.1 as the test methodology for Part 1201.

Sincerely yours,

Kevin B. Olah
Director, Office of Homologation

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October 25, 2012

Mr. Todd A. Stevenson
Office of the Secretary
U.S. Consumer Product Safety Commission
4330 East-West Highway, Room 820
Bethesda, MD 20814

Re: Comment in Support of SGCC's Petition to Amend 16 CFR 1201
Docket No. CPSC-2012-0049

Dear Mr. A. Stevenson:

I am writing in support of SGCC's Petition to Amend 16 CFR 1201 in Docket No. CPSC-2012-0049.

I am a structural engineer employed by Wiss, Janney, Elstner Associates, Inc., a firm of consulting engineers, architects, and materials scientists. I have served as a Public Interest Director of the SGCC Board for more than 20 years. Public interest directors may not be involved in the manufacture or sale of architectural glazing materials. Our role is to help ensure that the interests of the consumers of glazing materials and other members of the general public, who may be injured by unsafe breakage of glazing materials, are kept in mind and protected by the SGCC in its deliberations and operations.

As a result of my consulting work and my service on the SGCC Board, I have become very familiar with both ANSI Z97.1 and CPSC 16 CFR 1201. It is my strong belief that Part 1201.4's test procedures (which have not changed since 1977) should be replaced with ANSI Z97.1's more rigorous and modern procedures, which are updated on a regular basis (currently about every five years.) Since ANSI Z97.1 is a more rigorous test standard, this change would protect the public as well as or better than is currently the case without the duplication of effort and cost that is now required by the existence of two different procedures with the same purpose. I also believe that the use of a single test method would result in a clearer understanding of the procedure by manufacturers, architectural specifiers, building code officials, testing laboratories, and consumers.

Based on the above, I urge you to grant the SGCC's petition and adopt ANSI Z97.1 as the test methodology for Part 1201.4.

Sincerely,

William J. Nugent
President & Senior Principal