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SGCC Quality Assurance and Testing Requirements for 2020



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November 21, 2019

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SGCC Quality Assurance And Production Testing

Thirsty Thursday

November 21st, 2019



John G. Kent

Administrative Management Systems, Inc. (AMS)



After receiving a BS in Engineering from the United States Merchant Marine Academy at Kings Point, NY, John has been involved with product performance testing and certification for over 32 years, 30 of which with involvement in the glass, glazing and fenestration industry.

Prior to starting AMS in 1998, John worked for a leading Independent Testing Laboratory having involvement with over 30 testing and certification processes. He has been responsible for the management of the SGCC (Safety Glazing Certification Council) and IGCC (Insulating Glass Certification Council) certification programs since 1989 and the WDMA (Window and Door Manufacturer's Association) and WDMA/NFRC certification programs since the early 2000's. More recently he has been involved in the development of the NACC (North American Contractor Certification) program for Architectural Glass and Metal Contractors and the AGMT (Architectural Glass and Metal Technician) program. He has also spent many years in close cooperation with NGA/GANA, and IGMA and is currently the chair of the ANSI Z97.1 committee on safety glazing.

AMS focuses on providing management, administrative, auditing, accreditation support and technical services for association sponsored or supported certification and testing processes.



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1. Promote Public Safety by encouraging the highest standards for safety glazing
2. Cooperate in the development of standards
3. Sponsor a certification program for safety glazing



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SGCC Quality Assurance Program Starting 2020

A Quality System Manual – A quality manual **shall** be present that documents, identifies, describes and contains the workings of the quality system, and as a minimum contains the following sections:

- **Designated Person for Quality Assurance**
- **Process Control (Procedures)**
- **Production Testing**
- **Calibration**

Designated Representative for Quality Assurance – The manufacturer **shall designate a person** who is responsible for the quality system function in the manufacturing facility.

Process Control - The individual areas involved in the fabrication of safety glazing **shall be defined**. Each area shall have documented procedures.

Production testing – **Procedures shall describe testing of regular production** and shall include SGCC requirements for safety glazing products. The SGCC auditor shall **1) review historical testing records ensuring procedures were followed if failure occurred 2) witness at least one production test and 3) review the method of evaluation during twice per year visits**. When samples are not available, the manufacturer shall describe to the auditor how production testing is performed. Where ANSI or ASTM test methods are referenced below, other like national or internationally accepted test methods (for example EN 12600) are acceptable. **Records of testing shall be maintained for a minimum of 10 years.**

SGCC Quality Assurance Program Starting 2020

Tempered – ANSI Z97.1 Center Punch and/or Impact¹ Test - As a minimum, testing shall occur on the first of each product thickness per shift. Additional testing may be appropriate.

Laminated – ASTM F3007¹ and/or ANSI Z97.1 Impact¹ Test - During regular production periods, a minimum sample collection shall be performed weekly, and actual testing occur at least monthly. Sample collection must be traceable to specific production runs. For ASTM F3007 testing, sampling and testing shall occur as a minimum on the thinnest product(s) produced. Evaluation shall occur and drop height selection as a minimum shall be in accordance with ASTM F3006.

Products other than Tempered or Laminated - Testing procedures shall be established and accepted by the SGCC Administrator.

Calibration - Test equipment used in the quality inspection process must be working properly and accuracy assured. Equipment shall be 1) identifiable, 2) records of the calibration maintained, and 3) a method shall exist for monitoring at least an annual calibration

Memo sent July 8th, 2019



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Notice of Changes to Certification

To: All SGCC Licensees, Participants, Auditors

From: Safety Glazing Certification Council (SGCC)

Date: July 8, 2019

Subject: IMPORTANT Changes to SGCC's Plant Quality Assurance Requirements

Topics & Summary of Changes:

As approved at the fall 2018 SGCC meeting, SGCC's requirements for a certified plants Quality Assurance Program have been revised. See actual requirements below. **This is a significant revision to the SGCC program and may take significant effort by the plants.** The intent is to implement these changes in 2019 before requiring mandatory compliance on 1/1/2020. These requirements can also be found in the January 2019 *Certified Products Directory* (<https://www.sgcc.org/documents/221.pdf>).

SGCC QUALITY ASSURANCE PROGRAM REQUIREMENTS:

- 1) **A Quality System Manual** – A quality manual shall be present that documents, identifies, describes and contains the workings of the quality system, and as a minimum contains the following sections:
 - a. Designated Person for Quality Assurance
 - b. Process Control (Procedures)
 - c. Production Testing
 - d. Calibration
- 2) **Designated Representative for Quality Assurance** – The manufacturer shall designate a person who is responsible for the quality system function in the manufacturing facility.
- 3) **Process Control** - The individual areas involved in the fabrication of safety glazing shall be defined. Each area shall have documented procedures.
- 4) **Production testing** – Procedures shall describe testing of regular production and shall include SGCC requirements for safety glazing products. The SGCC auditor shall 1) review historical testing records ensuring procedures were followed if failure occurred 2) witness at least one production test and 3) review the method of evaluation during twice per year visits. When samples are not available, the manufacturer shall describe to the auditor how production testing is performed. Where ANSI or ASTM test methods are referenced below, other like national or internationally accepted test methods (for example EN 12600) are acceptable. Records of testing shall be maintained for a minimum of 10 years.
 - a. Tempered – ANSI Z97.1 Center Punch and/or Impactor Test - As a minimum, testing shall occur on the first of each product thickness per shift. Additional testing may be appropriate.
 - b. Laminated – ASTM F3007 and/or ANSI Z97.1 Impactor Test - During regular production periods, a minimum sample collection shall be performed weekly, and actual testing occur at least monthly. Sample collection must be traceable to specific production runs. For ASTM F3007 testing, sampling and testing shall occur as a minimum on the thinnest product(s) produced. Evaluation shall occur and drop height selection as a minimum shall be in accordance with ASTM F3006.

c. Products other than Tempered or Laminated - Testing procedures shall be established and accepted by the SGCC Administrator.

- 5) **Calibration** - Test equipment used in the quality inspection process must be working properly and accuracy assured. Equipment shall be 1) identifiable, 2) records of the calibration maintained, and 3) a method shall exist for monitoring at least an annual calibration

What will this mean to certified plants: What has been added/changed?

1. **Quality Manual** - Further definition has been added for the requirements of the quality manual
2. **Process Control** – Procedures for each area involved in safety glazing fabrication will be required
3. **Production testing** (Additional tests (i.e. stress, pummel) are encouraged but the below are mandated)
 - a. Tempered – ANSI Z97.1 impactor test or Center Punch test (as a minimum) shall be required
 - b. Laminated – ANSI Z97.1 impactor test or ASTM F3007 (**The 2019 version**) (ball drop) test (as a minimum) shall be required
4. **Calibration** – Annual calibration of test equipment will be required

What this means for SGCC plant inspections

1. The SGCC auditor shall review historical testing record insuring (corrective action) procedures were followed if failure occurred
2. The SGCC auditor shall witness at least 1 production test
3. The SGCC auditor shall review the method of evaluation (production test pass/fail)

The following Resources are provided to assist in this process:

1. Guidance for the SGCC Quality Assurance Production Testing document (included with this memo and also available at <https://www.sgcc.org/Miscellaneous-Forms-and-Information.aspx>)
2. On-line video of performing the ASTM F3007 ball drop test (available at <https://www.sgcc.org/Miscellaneous-Forms-and-Information.aspx>)
3. On-line tutorial (will be available at www.sgcc.org by July 31st)
4. Laminated glass ball drop test steel ball supply - For companies within the United States and Canada these can be purchased through SGCC, or can be purchased through Craig Ball Sales http://www.craigballsales.com/3-14-Chrome-Steel-Balls-Lot-of-1_p_2161.html
5. Center Punch impactor source of supply – it has been shown that the Starrett Model 818 and 18C works well for performing the Center Punch test. Both can be purchased on Amazon
6. Source of supply for laminated glass ASTM F3007 test apparatus
 - a. A list of materials and suggested design are provided, also included with the Guidance document (item #1)
 - b. If you would prefer to purchase the test apparatus pre-fabricated (<\$500US plus shipping) we have identified a vendor, contact SGCC to place an order.

Complete meeting minutes are posted to the SGCC website at <https://www.sgcc.org/MeetingsEvents.aspx>. Thank you for your attention to these matters. If you have any questions, please feel free to contact us any time and as always, thank you for your support of the SGCC Certification process.

Best regards,

Katrina Stafford
Administrative Manager



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Guidance for the SGCC Quality Assurance Production Testing

(Initial 6/3/19)

Summary

SGCC® requires licensees to have a working quality assurance program for the fabrication of safety glazing. Compliance to quality assurance requirements is validated at the first plant inspection after products are certified. Adherence is verified during twice per year plant visits. These requirements were adopted to improve the overall quality and reliability of safety glazing products in the program. These requirements are in addition to the ANSI, CPSC and CAN/CGSB 12.1 compliance testing required by the SGCC® certification program. The intent is to enhance the quality of products produced in the interim production periods between test cycles. Although a quality assurance program is a fundamental element of good fabrication practices, only successful testing to ANSI Z97.1, 16 CFR 1201 or CAN/CGSB 12.1 is valid proof of compliance with these standards.

As of January 1, 2020, a licensee's quality assurance program, as a minimum, must have the following elements (see page 18 of the *January Certified Products Directory* for the full detailed list):

- A Quality System Manual
- Designated Representative for Quality Assurance
- Process Control(s)
- Production testing
- Calibration

This Guidance document is to help further define and provide additional information on SGCCs "Production Testing" requirements. *Note: Where ANSI or ASTM test methods are referenced below, other like national or internationally accepted test methods (for example EN 12600) are acceptable.*

Production Testing – Tempered (Center Punch):

Reference Documents: *ANSI Z97.1 – 2015* For safety glazing materials used in buildings

Equipment: Sharp impactor¹, Specimen support frame (flat base with adjustable horizontal curbs), calibrated scale, calibrated micrometer

Steps for conducting ANSI Center Punch Test (ANSI Z97.1-2015 Section 5.2)

**Note: Review ANSI Z97.1-2015 specifications for details, the intent of this document is to be used as a Guidance tool*

- Specimen size - is at the discretion of the fabricator, **record**
- Specimen weight - specimen must be weighed and the weight of ten square inches determined from the weight, width, length of that specimen, **record**
- Specimen must be from your production process, **record** date and time of specimen production
- Frequency as a minimum, testing shall occur on the first of each product thickness per shift (additional testing may be appropriate).
- Condition the specimen - specimens temperature shall be between 65 - 85°F (18.3 – 29.4°C) prior to testing
- Setup testing – Flat glass: place the specimen on the flat base and place the curb lightly along the specimen edges so the sample can elongate slightly.
- Test the Specimen – strike the test specimen 1in. (25 mm) inboard of the longest edge at its midpoint until fracture occurs. (Figure 8 below can be found in the ANSI Z97.1-2015 Section 5.2.4)

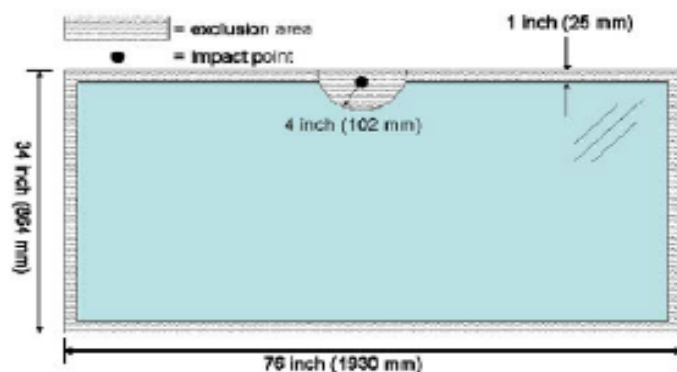


Figure 8: Center Punch Fragmentation

- Interpretation of Results. Following impact/fracturing, within 5 minutes collect and weigh the ten (10) largest crack-free particles. The total weight of the ten (10) largest crack free pieces shall weigh no more than the equivalent weight of 10 square inches of the original test sample. NOTE no one particle shall be longer than 4" (see ANSI Z97.1-2015 Section 5.2.4(2)). **Record** results. See example *Break Test Record Data Sheet*.

Production Testing – Laminated (Ball Drop Impact):

Reference Documents: *ASTM F3007-19 Standard Test Method for Ball Drop Impact Resistance of Laminated Architectural Flat Glass & ASTM F3006-19 Standard Specification for Ball Drop Impact Resistance of Laminated Architectural Flat Glazing.*

Hazards: Warning It is the responsibility of the user of the standards listed above and discussed here on out to establish appropriate health and safety practices, and to determine the applicability of regulatory limitations prior to use.

Equipment: 2.3kg (+/- 0.1kg) 83mm diameter smooth solid steel ball, support frame (see Figure 1 ASTM F3007-19), mechanism for ensuring the unimpeded drop of the ball, calibrated micrometer. (See ASTM F3007-19 Section 6 for more details) (see attached Material list for more details)

Steps to setup and conduct the Ball Drop Impact test:

**Note - Frequency as a minimum collection shall be performed weekly and actual testing occur at least monthly*

Step 1: Specimen must be from your production process. Specimen size, as a minimum, 305 +/- 10mm by 305 +/- 10mm (12 +/- 0.4" x 12 +/- 0.4"). **Record** specimen glass configuration, date and time of specimen production.

Step 2: Measure and **record** the thinnest thickness. The thickness of the specimen shall be measured at the midpoint of the four sides within 1in. of the edge.

Step 3: Condition the specimen for approximately 4hrs. at 24 +/- 5°C (between 66 - 84°F). **Record** the glass surface temperature.

Step 4: Specimen weight prior to impact - specimen must be weighed and the weight of ten square inches determined from the weight, width, length of that specimen, **record**

Step 5: Setup testing. Place specimen on the support frame (does not require clamping but recommended so as not to result in a "deemed non-test" if the specimen falls off the frame when impacted See ASTM F3007-13 Table 1 Note 1).

Step 6: Ball Height and Dropping. Using Table 2 ASTM F3006-19 to determine the drop height (note the 1" listed height 0.75m correlates with ANSI Z97.1 Class B). Release the steel ball from an at-rest position and impact the specimen within 25mm (1in.) of the center of the glass. *Note: Recommend testing to what you are currently SGCC certified to (if you are certified to ANSI Z97.1-2015 Class A test drop height of 3.66m or to ANSI Z97.1-2015 Class B test drop height of 0.75m)*

Step 7: Interpretation of Results. Following impact, within a 5 sec interval determine the penetration resistance/retention characteristics of the specimen using ASTM F3007-13 Table 1. **Record** results.

Step 8: Specimen weight following impact – the impacted specimen shall be weighed to determine the weight of material loss from impact. *Specimen is deemed a fail if particles which have detached up to 3 min after impact in total weigh more than 15.5 in² (10,000 mm²) of the original test specimen. See Section 9.7-9.8 of ASTM F3007-19*

Step 9: Repeat this test on at least 2 additional specimens from the same production lot at the same or elevated drop height. **Record** results.

Step 10: Report **results**. See report requirements found in ASTM F3007-19 Section 11.

- Test the Specimen

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

- Interpretation of Results.

- Within 5 minutes collect and weigh the ten (10) largest crack-free particles.
- The total weight shall be no more than the equivalent weight of 10 square inches of the original test sample.

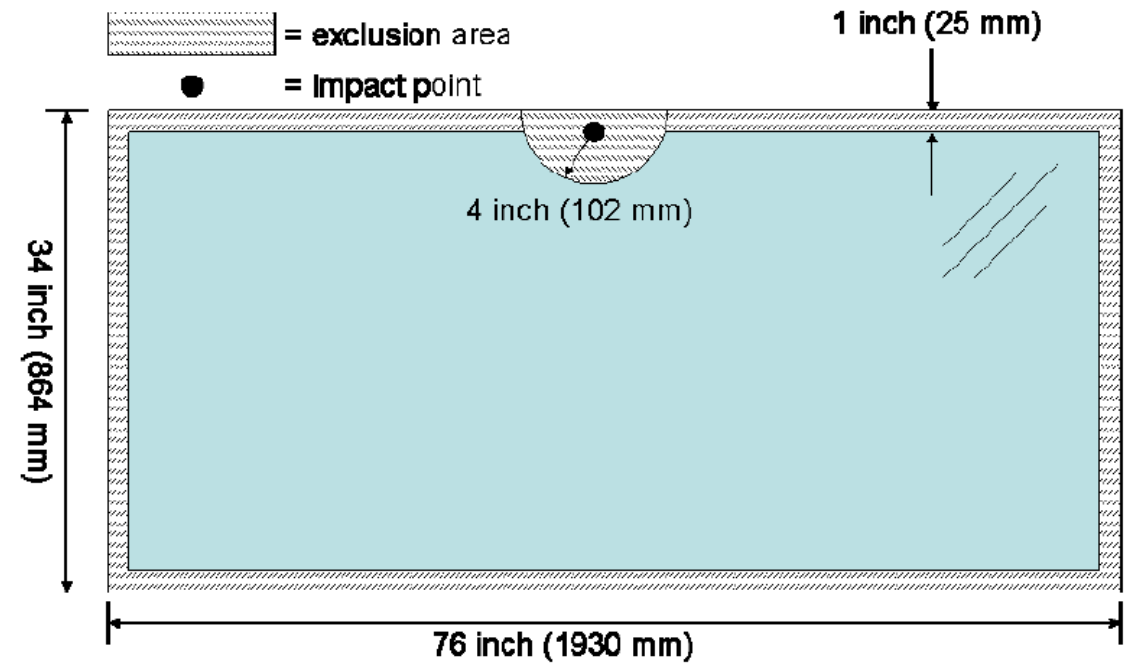


Figure 8: Center Punch Fragmentation



QA Production Testing of Tempered Glass

Laminated Glass - What you need to begin testing

5 pound (3 1/4" diameter) smooth solid steel ball

Mechanism for ensuring the unimpeded drop of the ball

Support Frame



- Specimen Selection
 - 4 production samples
- Conditioning Samples
- Sample Mounting
- Drop Height: Class A & B
- Impact Center (1")



QA Testing of Laminated Glass

Release the steel ball from an at-rest position at selected drop height



Does the ball pass through a tear in the sample within 5 seconds?

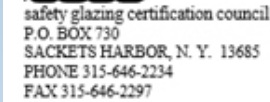
YES

FAIL

NO

PASS

Test Equipment Support



Material List

Example ASTM E3007 Support Frame:

[illegible]

Item	Possible Purchase location	Comment
Steel Ball	SGCC / Craig Ball Sales	http://www.craigballsales.com/ There is a long lead time if not purchased through SGCC
PVC 4" Schedule 40	Local Hardware Store	1 x 10' and 1 x 2' lengths
Kreg Routing Table	Amazon or Home Depot	This will act as the frame for testing
Frame Support	Local Carpenter	Support for 12x12 specimen
Rubber Gasket	Zoro	3 mm 50 IRHD
Wood Dolly	Local Hardware Store	12" x 18"
Bin for Catching Disengaged Particles	Local Hardware Store	Rubbermaid FG334992GRAY 20" x 15" x 5" Gray Plastic Bus Box
Misc. Materials	Local Hardware Store	-Board for framing -Plexiglass -Hinges and Handle for door -Clamps -Paint -Bolts and Nuts

Parts List \$ 0.00 (Included)

Quality System Production Testing Video

<https://www.sgcc.org/Quality-System-Production-Testing-Video.aspx>



Interactive Information Portal Schema

- Step 1: Testing Preparation
- Step 2: Performing the Test
- Step 3: Evaluating the Results

What do I need to perform the Ball Drop Test?

Rubber Gasket
3 mm with
50 + 5 IRHD

Smooth Solid Steel Ball
Weighing 2.3 KG (5 lb)
83 mm (3.25 in)

Mechanism to ensure
unimpeded drop of the
ball from rest
10 Foot Length of PVC
4" Internal Dimension

Scale to weigh specimen
and detached particles

Tub for particle collection

A support frame such as
a Steel Routing Table
or Similar Design

With Clamping

Without Clamping

Frame to support 12 x 12 sample
Must support a sample that is 11.6" - 12.4"
Must allow a 10" - 10.4" square for the ball to drop into

4 Sec

Observe the amount of time it takes after impact, before the ball penetrates the sample. If the ball doesn't fall through within 5 seconds you move to determining whether failure occurs based on particle weight determination.

Passing Test

Overhead View

Previous Slide

Next Slide

Laminated Glass Evaluation (Ball Drop)

In reference to ASTM F3007-19 section 9.7:
Perform fragment analysis to determine if the laminated glass detached particles dictate a failure. Click and Drag the detached fragments onto the scale to perform fragment analysis to determine if the detached particles dictate a failure.

Original Laminated Glass Specimen
Size: 34 x 76"
Mass: 100lb.

Mass Equivalent of All Particles on Scale:
11.25 in²

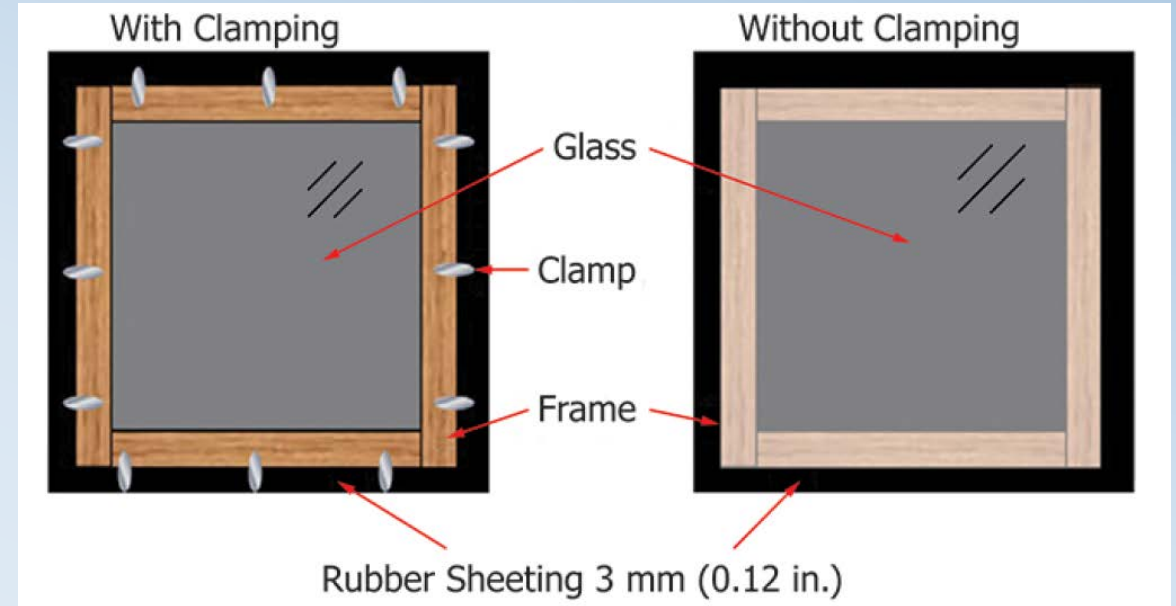
Pass

Fail

79715 B04

Ongoing Development

1. Clamped vs un-clamped
 - Effects of impact
 - Non-Test
 - Push Through
2. Testing to other standards
 - ANSI Z26
3. Testing larger samples
4. Drop Height Tolerances
5. Optimal Release System





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