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SGCC Quality Assurance and Testing Requirements for 2020

John Kent
Executive Director
Safety Glazing Certification Council

November 21, 2019

Mitch Majewski
Technical Manager
Safety Glazing Certification Council

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SGCC Quality Assurance And Production Testing

Thirsty Thursday

November 21st, 2019
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.
The Safety Glazing Certification Council (SGCC) is a non-profit corporation, established in 1971 by Manufacturers of safety glazing products, building code officials, and others concerned with public safety. SGCC’s purpose is threefold:

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

www.sgcc.org
SGCC@amscert.com
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.
Tempered – ANSI Z97.1 Center Punch and/or Impactor³ 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 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.

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
Notice of Changes to Certification

Date: July 8, 2019

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

As approved at the fall 2018 SGCC meeting, SGCC’s requirements for a certified plant Quality Assurance Program have been revised. See the changes 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/201.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 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 their inspection visits. When samples are not available, the manufacturer shall document to the auditor how production testing is performed. Where ANSI or ASTM test methods are referenced below, other 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 Z21.1 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 Z21.1 Impactor Test - During regular production periods, a minimum sample collection shall be performed weekly, and actual testing occurs 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 produced. Evaluation shall occur and drop height selection as a minimum shall be in accordance with ASTM F3007.

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, punctum]) are encouraged but the below are mandatory
   a. Tempered – ANSI Z23.1 Impactor Test or Center Punch test (as a minimum) shall be required
   b. Laminated – ANSI Z21.1 Impactor Test or PST 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 ensuring corrective action procedures were followed if failure occurred
2. The SGCC auditor shall witness at least 1 production test
3. The SGCC auditor will review the method of evaluation (production test pass/fail)

The following Resources are provided to assist in this process:

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/14-DynaSteel-Balls-200-Lb-0.1_-2161.html
5. Center Punch Impactor source of supply – It has been shown that the Starrett Model 815 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/meetings-events.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,

Kathrina Stafford
Administrative Manager
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 impactor, 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 Z97.1-2013 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 1 in. (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)

![Diagram of Center Punch testing](image)

- 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):


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 1mm 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 (1”) 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 13.5 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 1 in. (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.
Laminated Glass - What you need to begin testing

- 5 pound (3 ¼” 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”)

![Image of a testing apparatus with a drop height setup]
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
<table>
<thead>
<tr>
<th>ITEM #</th>
<th>DESCRIPTION</th>
<th>QTY</th>
<th>UNIT PRICE</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>Un-Assembled Ball Drop Aparatus</td>
<td></td>
<td>475.00</td>
<td>-</td>
</tr>
<tr>
<td>200</td>
<td>Fully Assembled Ball Drop Aparatus</td>
<td></td>
<td>675.00</td>
<td>-</td>
</tr>
<tr>
<td>201</td>
<td>Lockable Wheels for Kreg Routing Table</td>
<td></td>
<td>52.00</td>
<td>-</td>
</tr>
<tr>
<td>202</td>
<td>Additional Steel Ball (1 Ball Included in Aparatus)</td>
<td></td>
<td>31.00</td>
<td>-</td>
</tr>
<tr>
<td>203</td>
<td>Additional Work Instructions on Assembly</td>
<td></td>
<td>25.00</td>
<td>-</td>
</tr>
</tbody>
</table>

* Note: 10% Aparatus Discount on quantity’s greater than 10 *

Material List

Example: ASTM F3907 Support Frame:

<table>
<thead>
<tr>
<th>Item</th>
<th>Possible Purchase location</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steel Ball</td>
<td>SGCC / Craig Ball Sales</td>
<td><a href="http://www.craigballinc.com/">http://www.craigballinc.com/</a> There is a long lead time if not purchased through SGCC</td>
</tr>
<tr>
<td>PVC 4” Schedule 40</td>
<td>Local Hardware Store</td>
<td>1 x 10” and 1 x 3” lengths</td>
</tr>
<tr>
<td>Kreg Routing Table</td>
<td>Amazon or Home Depot</td>
<td>This will act as the frame for testing</td>
</tr>
<tr>
<td>Frame Support</td>
<td>Local Carpenter</td>
<td>Support for 12x12 specimen</td>
</tr>
<tr>
<td>Rubber Gasket</td>
<td>Zoro</td>
<td>3 mm 50 BHRD</td>
</tr>
<tr>
<td>Wood Dolly</td>
<td>Local Hardware Store</td>
<td>12” x 18”</td>
</tr>
<tr>
<td>Bin for Catching Disengaged Particles</td>
<td>Local Hardware Store</td>
<td>Rubbermaid FG3497GRAY 20” x 15” x 5” Gray Plastic Bus Box</td>
</tr>
</tbody>
</table>
| Misc. Materials | Local Hardware Store | -Board for framing  
-Hinges and Hinge for door  
-Clamps  
-Paint  
-Bolts and Nuts |

Parts List $ 0.00 (Included)
Interactive Information Portal Schema

• Step 1: Testing Preparation
• Step 2: Performing the Test
• Step 3: Evaluating the Results
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
The Safety Glazing Certification Council (SGCC) is a non-profit corporation, established in 1971 by Manufacturers of safety glazing products, building code officials, and others concerned with public safety. SGCC’s purpose is 3 fold:

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AD-572
Revised KS 9/18/2018, Approved KS 9/18/2018