Test Method For Determining Argon Concentration In Sealed Insulating Glass Units Using Spark Emission Spectrography[1]

This working document is issued under the fixed designation Pr-GGBPWG-05 in accordance with IGMA procedure P004, Documentation Writing under IGMA's ISO 9000 quality management system

NOTE: This procedure will be superseded by the ASTM test method once approved by the ASTM Main Committee and shall be subject to periodic modifications of the ASTM working document for this test method.

1. Scope

1.1 This test method covers procedures for using an argon gas analyzer to determine the concentration of argon gas in the space between the lites of a sealed insulating glass unit.

1.2 This is a non-destructive test method.

1.3 This method also includes a procedure for verifying the calibration of the test apparatus.

1.4 The values stated in metric (SI) units are to be regarded as the standard. The values given in parentheses are for information only.

1.5 *These guidelines do not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

[1] This procedure is under the jurisdiction of the IGMA GasGlass Best Practices Working Group and is the direct responsibility of this working group and the IGMA Technical Services Committee .

2.1 ASTM Standards:

C 162 Terminology of Glass and Glass Products
C 717 Standard Terminology of Building Seals and Sealants
E 631 Standard Terminology of Building Constructions
C 1036 Specification for Flat Glass

3. Terminology

3.1 For definitions of terms found in this Standard, refer to ASTM Standard Terminology of Building Seals and Sealants, C717, Standard Terminology of Glass and Glass Products, C162 and Standard Terminology of Building Constructions, E631.

3.2 *Definitions:* Description of Terms Specific to this Standard

3.3 Sealed Insulating Glass Unit – an assembled unit, comprising sealed lites of glass separated by dehydrated space (s), normally intended for clear vision areas of buildings.

4. Summary of Test Method

4.1 The argon gas analyzer is placed against the glass surface of a sealed insulating glass unit in a prescribed manner. A high frequency, high voltage, low current spark is applied to the glass surface. This spark creates a plasma from the gas molecules inside the test specimen, which causes light emissions (photons) of characteristic wavelengths. The instrument then collects the photons and analyzes them by spectroscopy. The resulting spectra are compared to calibration data internal to the instrument to determine the concentration of argon inside the unit.

4.2 This test method is intended to provide a means for determining the concentration of argon in sealed insulating glass units.

4.3 This is a non-destructive test method in that the edge seal of the test specimen is not breached in order to determine the argon gas concentration.

4.4 This method may be used to determine the argon gas concentration before, during, or after being subjected to durability tests.

5. Apparatus

5.1 *Argon gas analyzer*:

5.1.1 The analyzer employs a high frequency, high voltage, and low current source.

5.1.2 The head of the analyzer contains an electrode, which is used to apply the voltage to the glass surface of the test specimen. It also contains a light collector, which transmits light emissions to a spectrometer for processing.

6. Hazards

6.1 Warning: The high voltage of the argon gas analyzer used in this method can be harmful. Appropriate protective measures must be observed. Refer to the instrument manufacturer's instruction manual.

7. Test Specimens

7.1 Any sealed insulating glass unit that allows the argon gas analyzer to excite the gas present in the airspace can be tested using this method.

7.2 Test specimens are 355 mm x 505 mm (14 inches x 20 inches) sealed insulating glass units constructed using one lite of 4mm clear uncoated glass, a 12 mm air space, and one lite of 4mm coated low emissivity (E) glass.

8.0 Calibration

8.1 The instrument manufacturer indicates that only the instrument manufacturer or its designated representative can calibrate the instrument. The user shall verify the calibration. See section 9.2.

9.0 Verification

9.1 The user shall perform verification of the instrument calibration.

9.2 Verification Specimens

9.2.1 Typically the verification specimens are constructed using the same sealed insulating glass constructions found in 7.2.

9.3 Three readings shall be taken on each verification specimen following the procedures outlined in the instruction manual of the argon gas analyzer. The average of the 3 readings is recorded as the verification value.

9.4 Acceptance criteria for instrument verification are found in the manufacturer's instruction manual.

9.5 At a minimum, the verification of the instrument calibration shall be run twice within an 8-hour period. These two verifications shall be run before and after the test procedure in Section 11.

9.6 To ensure data validity conduct additional verifications more frequently during the 8-hour period.

10.0 Conditioning

10.1 It takes time for the argon gas to equilibrate in any sealed insulating glass unit. This is particularly important in units using a tubular spacer and in units containing interior components such as tubular muntin bars. Performing this test before a unit has equilibrated could produce results that are measurably different than the actual argon gas concentration.

10.2 Prior to testing, condition the test specimens at a temperature of 24 +/- 3°C (75 +/- 5°F) for not less than 24 h.

11.0 Procedure

11.1 Turn on the instrument and allow it to warm up for at least 30 minutes.

11.2 Orient the test specimen vertically against a non-reflective, dark background. Alternatively, place the test specimen on the stand where the test specimen shall be supported in a vertical or near vertical position.

11.3 For specimens that contain a metallic coating (either low E or reflective), this coated lite shall be placed against the dark background. A non-coated lite must be facing the instrument.

11.4 Note: Sealed insulating glass units with metallic coatings on both lites cannot be tested with this method.

11.5 Orient the sensor head so that the button/switch for the spark is up, at 12 o'clock. This aligns the optical sensor above the electrode in the faceplate of the head.

11.6 Locate the sensor head on the glass surface opposite the black background. The edge of the sensor head shall be at the inside edge of the insulating glass spacer of the test specimen.

11.7 The sensor head shall be pressed evenly against the glass so that the sensor head is perpendicular to the glass surface.

11.8 Press the button on the sensor head to take a reading.

11.9 The following items are essential to observe. If any of these issues occurs during the spark, reject the reading and retest.

11.9.1 Changes in ambient lighting

11.9.2 Movement of the sensor head

11.9.3 Excessive sound from the spark.

11.9.4 Detection of ozone aroma.

11.9.5 Spark does not jump the gap in the test specimen for the duration of the "buzzing" sound from the instrument

11.9.6 For further information on these operational observations see the instrument manufacturer's instruction manual.

11.10 Repeat 11.8 two more times

11.11 Record all three readings.