



Designation: **F2912 – 11** ~~F2912 – 17~~

Standard Specification for Glazing and Glazing Systems Subject to Airblast Loadings¹

This standard is issued under the fixed designation F2912; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This specification covers exterior glazing, glazed windows, glazed curtain walls, glazing panels in doors and doors, other glazed protective systems, and non-attached window retrofit systems used in buildings that may be subjected to intentional or accidental explosions.

1.2 This specification addresses only glazing, glazing systems, and glazing retrofit systems. This specification does not address the structural integrity and functionality of door assemblies. It assumes that the designer has verified that other structural elements have been adequately designed or tested to resist the anticipated airblast pressures-loads.

1.3 This specification is designed for all glazing, glazing systems, and glazing retrofit systems including, but not limited to, those fabricated from glass, plastic, glass-clad plastics, laminated glass, glass/plastic glazing materials, and organic coated glass-organic coated glass (filmed), and non-attached glazing retrofit systems such as blast curtains, cables, shades, and architectural mesh.

1.4 This specification does not determine the assessment of a facility nor acceptable hazard ratings. Threat and risk assessment shall have already been performed and the acceptable hazard rating defined. The hazard rating should be selected taking into account the installed position of the glazing. Glazing at higher elevations relative to the floor may require more stringent hazard considerations.

1.5 This specification determines the hazard rating associated with blast tested glazing, glazing systems, and non-attached glazing retrofit systems. In addition to glazing fragments and system components creating hazards, glazing slivers are also included as part of the hazard rating. The inclusion of slivers may cause a worse hazard rating than is predicted when using analytical approaches such as presented in Practice F2248 or in other methods.

1.6 The values stated in SI units are to be regarded as the standard. Values given in parentheses are for information only. For conversion of quantities in various systems of measurements to SI units, see **IEEE/ASTM SI 10**.

1.7 *This standard does 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

2.1 *ASTM Standards:*²

[E631 Terminology of Building Constructions](#)

[F1642 Test Method for Glazing and Glazing Systems Subject to Airblast Loadings](#)

[F2248 Practice for Specifying an Equivalent 3-Second Duration Design Loading for Blast Resistant Glazing Fabricated with Laminated Glass](#)

[IEEE/ASTM SI 10 American National Standard for Metric Practice](#)

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:* Not included in Terminology **E631**.

¹ This specification is under the jurisdiction of ASTM Committee F12 on Security Systems and Equipment and is the direct responsibility of Subcommittee F12.10 on Systems Products and Services.

Current edition approved July 1, 2011; March 1, 2017. Published August 2011; March 2017. Originally approved in 2011. Last previous edition approved in 2011 as F2912 – 11. DOI: [10.1520/F2912-11](#); [10.1520/F2912-17](#).

² For referenced ASTM standards, visit the ASTM website, [www.astm.org](#), or contact ASTM Customer Service at [service@astm.org](#). For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

3.1.1 *fragment*—particle of glazing, window component, or retrofit component with a mass equal to or greater than 1.5 g (0.0033 lbm).

3.1.2 *glazing*—transparent materials used for windows, doors, or other panels.

3.1.3 *glazing dust and slivers*—particles of glazing with a mass less than 1.5 g (0.0033 lbm).

3.1.4 *glazing system*—the assembly comprised of the glazing, its framing system, ~~and anchorage devices~~, anchorage devices, attached trim, operators, and any other components that would be used to install a complete system or non-attached retrofit system.

3.1.5 *glazing pullout*—disengagement of the glazing from the frame member supporting the glazing.

3.1.6 *hazard level*—rating assigned to the performance of the ~~glazing system~~ glazing, glazing system and its components, and non-attached glazing system retrofit system and its components based on the amount and location of integral materials expelled from the system under specific blast conditions of the test.

3.1.7 *peak positive pressure (P)*—the maximum measured positive phase airblast pressure, kPa (psi).

3.1.8 *positive phase impulse (i)*—the integral, over time, of the measured positive phase reflected airblast pressure history, kPa-ms (psi-ms).

3.1.8.1 *Discussion*—

The airblast pressure history, whether reflected or otherwise, as measured at a point on the surface, consists of two separate phases. The positive phase for high explosive detonations is characterized by a nearly instantaneous rise to a maximum pressure followed by an exponential decay to ambient pressure. In the negative phase, which immediately follows the positive phase, the pressure decreases below ambient for a period of time before returning to ambient.

4. Classification

4.1 The classification of airblast resistant glazing is determined by the defined blast load and the performance of the glass or glazing system or glazing retrofit system when subjected to blast testing in accordance with Test Method F1642.

4.1.1 *Hazard Levels*—The hazard levels are identified and described in Table 1. Also, the hazard rating descriptions are shown graphically in Fig. 1 of Test Method F1642.

4.1.2 *Specification*—Specification shall take into account the specified blast loads as defined by pressure (*P*) and impulse (*i*) and the corresponding hazard level (H1 through H4)H5) as determined from Table 1.

5. Performance Requirements

5.1 The performance requirements of glazing or glazing systems are found in Table 2.

5.1.1 *Pre-Defined Blast Load*—Specification format for blast loads that are defined with a pressure and impulse value in Table 2, the following text shall be inserted into the glass and glazing specification or glazing retrofit specification under a security glazing header:

Glazing system or glazing retrofit system (edit as appropriate for the project) shall meet a minimum Specification Level (____(insert specification level from Table 2 ex: K3)) in accordance with ASTM F2912.

5.1.2 *User Defined Blast Load-Specification format—Format*—For blast loads defined by the user, the following text shall be inserted into the glass and glazing specification under a security glazing header:

Glazing system or glazing retrofit system (edit as appropriate for the project) shall meet a minimum Specification Level (__(insert level Z1 through Z4)Z5)) with the following blast loads: P(____) kPa (psi), i(____) kPa-ms (psi-ms) in accordance with ASTM F2912.

Where:

P = indicates blast pressure,
kPa = unit of measure or blast load (may also be indicated as psi)
kPa = unit of measure or blast pressure (may also be indicated as psi),
i = indicates impulse
i = indicates impulse, and
kPa-ms = unit of measure for impulse (may also be indicated as psi-ms)

5.1.2.1 User defined blast loads (charge weight and ~~stand-off~~ stand-off distance or pressure and impulse) shall be determined by a person experienced in blast load calculations.

6. Systems Rating

6.1 For identical test specimens, where three test specimens have the same rating, the hazard level of the three specimens shall be the rating for the system.

6.2 For identical test specimens, where three out of four test specimens have the same rating, the hazard level of the three specimens ~~with the same rating~~ shall be the rating for the system.