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Standard Test Method for Glazing and Glazing Systems Subject to Airblast Loadings[1]

This standard is issued under the fixed designation F1642/F1642M; 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.

INTRODUCTION

Historical records show that fragments from glazing that have failed as the result of intentional or accidental explosions present a serious threat of personal injury. Glazing failure also allows blast pressure to enter the interior of buildings thus resulting in additional threat of personal injury and facility damage. These risks increase in direct proportion to the amount of glazing used on the building facade. This test method addresses only glazing and glazing systems. It assumes that the designer has verified that other structural elements have been adequately designed to resist the anticipated airblast pressures.

1. Scope

1.1 This test method sets forth procedures for the evaluation of hazards of glazing or glazing systems against airblast loadings. The specifying authority shall provide the airblast loading parameters. Glazing systems shall be as defined in Specification F2912.

1.2 The data obtained from testing under this method shall be used to determine the glazing, glazing system, or glazing retrofit system hazard rating using Specification F2912.

1.3 This test method allows for glazing to be tested and rated with or without framing systems.

1.4 This test method is designed to test and rate 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, organic coated glass, and other glazing retrofit systems not directly attached to the glazing or glazing system such as blast curtains, cables, shades, and architectural mesh.

1.5 *Units*—The values stated in either SI units or inch-pound units are to be regarded separately as standard. The values stated in each system may not be exact equivalents; therefore, each system shall be used independently of the other. Combining values from the two systems may result in nonconformance with the standard. For conversion of quantities in various systems of measurements to SI units, see Specification E699.

1.6 *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.* See Section 7 for specific hazards statements.

2. Referenced Documents

2.1 *ASTM Standards:*[2]

E699 Specification for Agencies Involved in Testing, Quality Assurance, and Evaluating of Manufactured Building Components

E997 Test Method for Evaluating Glass Breakage Probability Under the Influence of Uniform Static Loads by Proof Load Testing

F2912 Specification for Glazing and Glazing Systems Subject to Airblast Loadings

2.2 *ISO Standard:*

ISO/IEC International Standard 17025 General Requirements for the Competence of Testing and Calibration Laboratories

2.3 *ANSI Standard:*

SI 10 American National Standard for Use of the International System of Units (SI): The Modern Metric System

3. Terminology

3.1 *Definitions:*

3.1.1 *airblast pressure, n*—pressure increase that a surface experiences due to the detonation of an explosive charge.

[1] This test method is under the jurisdiction of ASTM Committee F12 on Security Systems and Equipmentand is the direct responsibility of Subcommittee F12.10 on Systems Products and Services.

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[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.

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

3.1.2 *ambient temperature, n*—24 ± 11°C [75 ± 20°F].

3.1.3 *blast mat, n*—steel or concrete pad upon which that an explosive may be detonated to reduce the incidence of ejecta.

3.1.4 *effective positive phase duration, T, n*—duration of an idealized triangular positive phase reflected airblast pressure history, having an instantaneous rise to the measured *P*, with a linear decay to ambient, such that the impulse of the idealized pressure history equals *i* of the measured positive phase reflected airblast history.

3.1.4.1 *Discussion*—The idealized triangular airblast wave is considered to provide a standard measure of the positive phase airblast intensity.

3.1.5 *hazard level, n*—rating assigned to the performance of the glazing system based on the amount and location of integral materials expelled from the system under specific blast conditions of the test.

3.1.6 *peak positive pressure, P, n*—maximum measured positive phase airblast pressure, kPa.

3.1.7 *positive phase impulse, i, n*—integral of the measured positive phase reflected airblast pressure history, kPa-ms [psi-ms] (more correctly called the *specific positive phase impulse*).

3.1.8 *simply supported glazing, n*—glazing supported in accordance with Test Method E997 with the edges of the glass extending a minimum of 3 mm [0.125 in.] beyond the neoprene supports.

3.1.9 *test director, n*—individual identified by the independent testing laboratory as being responsible to complete the specified tests as required and to document the results in accordance with this test method.

4. Summary of Test Method

4.1 This test method prescribes the apparatus, procedures, specimens, and other requirements necessary to execute a physical test for the purpose of determining the hazard rating for a single test specimen, in accordance with Specification F2912, of a glazing or glazing system subjected to an airblast loading.

5. Significance and Use

5.1 This test method provides a structured procedure to establish the hazard rating of glazing, glazing systems, and glazing retrofit systems subjected to an airblast loading. Knowing the hazard rating provides the ability to assess the risk of personal injury and facility damage.

5.2 The hazard rating for a glazing or glazing material does not imply that a single specimen will resist the specific airblast for which it is rated with a probability of 1.0. The probability that a single glazing or glazing construction specimen will resist the specific airblast for which it is rated increases proportionally with the number of test specimens that successfully resist the given level of airblast to the hazard level for which it is rated.

6. Apparatus

6.1 *Test Facility*—Test facilities shall be accredited for this method to the requirements of ISO/IEC 17025 or qualified according to Specification E699. The test facility shall consist of either a shock tube or an open-air arena from which the airblast loading is generated. The test facility shall also consist of a test frame and witness area as described in the following. The test director shall ensure that potential environmental impact issues are determined and resolved before testing. The test director shall ensure that testing is conducted with inboard and outboard surfaces of the test specimen at ambient temperature in accordance with 3.1.2.

6.2 *Airblast Load*—Either a shock tube or an explosive charge shall be used to generate the desired peak pressure and the positive phase impulse on the test specimen. If an explosive charge is used, the charge shall be hemispherical and detonated either at ground level or elevated by placing the explosive on a table. Elevation of the base of the explosive shall be between 60 and 120 cm [24 and 48 in.] above the ground where the explosive will be detonated. Other explosive charge configurations can be used. The effects of using other explosive charge configurations must be accounted for and documented. See Annex A1 for information to be used in calculating pressures, impulses, and durations and for accounting for different types of explosives. Note that the procedures in Annex A1 account for loading from a hemispherical charge imparting load on a large facade and do not address the issues of clearing or other explosive charge shapes.

6.3 *Blast Mat*—If there is a possibility of crater ejecta interfering with the test, the explosive charge shall be placed on a blast mat. The decision to use a blast mat shall be at the discretion of the test director.

6.4 *Test Frame*—A test frame suitable for supporting glazing or glazing systems shall be part of the test facility. Glazing tested without a specific framing system shall be, as a minimum, supported in a simple support subframe that is attached to the test frame. At the request of a test sponsor, other subframe support conditions may be used. If a glazing system is tested, the glazing system shall be mounted to the test frame in a manner that closely models the manner in which it will be mounted in the field. The test frame shall be capable of resisting the airblast loads with deflections that do not exceed *L*/360 along lines of support for the simple support subframe or the glazing system. The area immediately behind the test specimens shall be designated as the witness area. For arena testing, the witness area shall be enclosed to prevent airblast pressure from wrapping behind the test specimens and shall be designed to resist the wrap around pressures.

6.5 *Simple Support Subframe*—A subframe, attachable to the test frame, to support glazing in accordance with Test Method E997.

6.6 *Witness Area*—The witness area shall have the following dimensions. The floor shall be 500 ± 50 mm [20 ± 2 in.]

below the subframe opening used to receive the glazing or glazing system, unless the specifying authority dictates that the glazing or glazing system shall be tested per its position in a building. The ceiling shall be a minimum of 10 cm [4 in.] from the top of the subframe opening used to receive the glazing or glazing system. The sides shall be a minimum of 10 cm [4 in.] from the subframe opening used to receive the glazing or glazing system. The back wall of the witness area shall be 3.0 ± 0.15 m [120 ± 6 in.] from the interior glazing face of the specimen. See Fig. 1 for a cross section through the witness area. Refer to Specification F2912 for discussion on hazard zones shown in Fig. 1.

NOTE 1—For doors, curtain wall, storefront, or window wall systems that may span slab to slab, the witness area shall include a floor at the specified finished floor level for each level. And, the back wall of the witness area shall be 3.0 ± 0.15 m [120 ± 6 in.] from the most interior glazing face of the specimen at all levels.

6.7 *Instrumentation:*

6.7.1 *Pressure Transducers*—The airblast pressure transducer shall be capable of defining the anticipated airblast pressure history within the linear range of the transducer. The transducers shall have a rise/response time and resolution sufficient to capture the complete event. Limited low frequency response transducers shall have a discharge time constant equal to approximately 30 to 50 times the initial positive phase duration of the anticipated airblast pressure history.

6.7.2 *Data Acquisition System (DAS)*—The DAS shall consist of either an analog or digital recording system with a sufficient number of channels to accommodate the pressure transducers and any other electronic measuring devices. The DAS shall operate at a sufficiently high frequency to record reliably the peak positive pressure. The DAS shall also incorporate filters to preclude alias frequency effects from the data.

6.7.3 *Photographic Equipment*—Photographic equipment shall be available to document the test.

6.7.4 *Temperature Measuring Device (TMD)*—A TMD shall be used to accurately measure glazing surface temperatures.

6.7.5 *Witness Panels*—A witness panel for glazing or glazing systems being tested shall be mounted parallel to and at a distance no greater than 3.0 ± 0.15 m [120 ± 6 in.] from the interior face of the specimens. The witness panel shall cover the entire back wall of the witness area and shall consist of two layers of material. The witness panel shall consist of a rear layer of 25 mm [1 in.] extruded Styrofoam with a density of 24.8 to 32.0 kg/m^3 [1.855 to 2.0 lb/ft^3] and a front layer consisting of 12.5 mm [0.5 in.] rigid foam plastic thermal insulation board composed of polyisocyanurate foam bonded to a durable white-matte non-glare aluminum facer and a reflective reinforced aluminum facer. The reflective surface shall be placed toward the window glazing. The insulation board shall have a density of 32.0 kg/m^3 [2.0 lb/ft^3]. The reflective reinforced facer shall be 0.008 cm [0.003 in.] thick and shall be reinforced through lamination to Kraft paper. To accommodate high-speed photography, a hole no greater than 10 by 10 cm [4 by 4 in.] may be made in the upper or lower one-ninth quadrants of the witness panel.

6.7.6 Other instrumentation such as deflection measuring devices can also be used if requested by the specifying authority.

7. Hazards

7.1 Storage, handling, and detonation of high explosive material shall be conducted in accordance with applicable statutes and regulations by experienced professionals qualified by an appropriate government agency to handle explosives.

7.2 The operation of a shock tube shall be conducted by experienced personnel regularly engaged in the operation of the equipment.

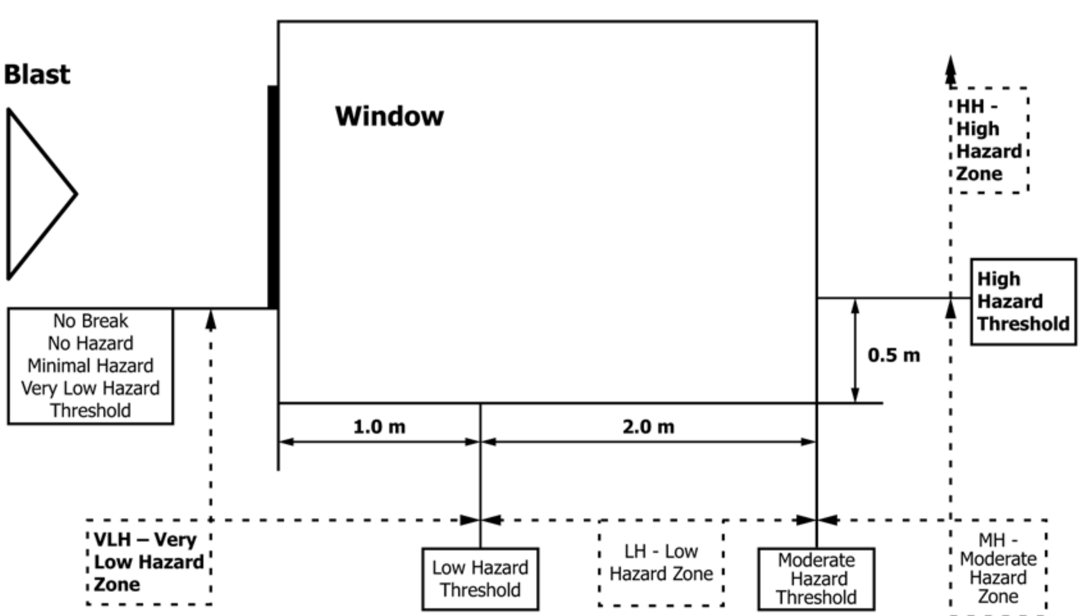

FIG. 1 Cross Section Through Witness Area

8. Specimens

8.1 The test sponsor shall provide the test specimens. In addition, the test sponsor shall provide complete specimen documentation, to include, but not be limited to, drawings and material specifications. In addition, strength certifications for each component used in the load path of the glazing product shall be provided.

8.2 The test director shall ensure that the test specimens are handled and stored in compliance with manufacturer's instructions.

8.3 Each specimen shall be marked indelibly with the manufacturer's model and serial numbers and the date of manufacture.

8.4 Each specimen shall be marked clearly to indicate its proper orientation to the explosive charge.

8.5 Glazing systems shall be installed per manufacturer's instructions.

9. Preparation of Apparatus and Specimens

9.1 *Instrumentation:*

9.1.1 For arena tests, at least three pressure transducers shall be installed on the test frame or on a transducer panel of the same size as the test frame and located and oriented in the same manner as the test frame. The pressure transducers shall be flush with the surface of the test frame or transducer panel. For test frames capable of supporting multiple specimens, the transducers shall be located on the horizontal centerline of the test specimens at a distance from the edge of the test specimens not to exceed one half the shortest dimension of the specimen. For test frames capable of holding only a single specimen, two transducers shall be located on the horizontal centerline of the specimen and one at the top of the vertical centerline of the specimen. The distance from the edge of the test specimen shall not exceed one half the shortest dimension of the specimen.

9.1.2 For shock tube tests, at least two pressure transducers shall be installed on the test frame and one on the sidewall of the shock tube. Two pressure transducers on the test frame shall have one located on the horizontal centerline and one located on the vertical centerline of the shock tube.

9.1.3 For arena tests, at least one free-field pressure transducer shall be used in each test. The free-field pressure transducer shall be located at least 760 cm [25 ft] from any frame at the same distance from the high explosive charge as is the frame.

9.1.4 The pressure transducers shall then be connected to the DAS and tested to verify proper operation before testing.

9.2 *Test Frames:*

9.2.1 The test specimens shall be installed in the test frame. The face of the test frame with the test specimens installed shall be approximately a plane surface. No openings shall exist in this surface through which airblast pressure can infiltrate. The area immediately behind the test specimens shall be enclosed to prevent airblast pressure from wrapping around and loading the back side of the test specimens. A test frame that is not enclosed shall not be used.

9.2.2 Unless specified otherwise, the test frame shall be placed so that the test specimens are oriented perpendicular to a line from the detonation or air release point to the center of the test frame.

9.3 *Specimens:*

9.3.1 The test director shall assign a number, and mark accordingly, each test specimen.

9.3.2 Thickness measurements of the glazing material shall be made at each corner, 25 mm [1 in.] in from the edges, and recorded. Measurements of the lengths of the edges of the specimens shall be made and recorded.

9.3.3 For specimens to be tested, measurements verifying compliance with manufacturer's drawings shall be performed. The measurements shall include, but not be limited to, the edge dimensions of the frame and the glazing material, the cross-sectional dimensions of the frame, and thickness measurements of the glazing material. For glazing retrofit systems being tested, the setup for testing shall be fully documented and include information on materials being used.

9.4 *Photography:*

9.4.1 Before the test, a photographic record that adequately portrays the test specimen, the test frame, and the test configuration shall be made. This photographic record shall consist of still photographs and may include motion pictures or video.

9.4.2 If a photographic record of the response of the test specimens during the test is desired, high-speed motion picture cameras or high-speed video cameras or both shall be set up.

9.5 *Witness Panels*—Witness panels shall be put in place to record spalling from the test specimen.

10. Report

10.1 Report the following mandatory information.

10.1.1 *General:*

10.1.1.1 Name and address of testing agency, name and address of test sponsor, date and time of test, and date of report;

10.1.1.2 The name(s) of individual(s) conducting the test and the author of the test report; and

10.1.1.3 Signatures of persons responsible for supervision of the tests and a list of official observers.

10.1.2 *Specimen Description*—Manufacturer, model number, trade name, or other product designation of test specimens; operation type, materials, required material certifications, and other pertinent information of test specimens; description of locking and operating mechanisms, if applicable; connection and anchorage description, glass thickness, type, and method of glazing; weather seal dimensions, type, and material; installed location of specimens relative to witness area.

10.1.3 *Specimen Drawings*—Detailed drawings of the specimen showing dimensioned section profiles, sash dimensions and arrangement, framing location, panel arrangement, installation and spacing of anchorage, details of connections, weather-stripping, locking arrangement, hardware, sealants, glazing details, and any other pertinent construction details. The test director shall verify that these drawings match the tested specimen. Any modification made on the specimen to obtain the reported test values shall be noted.

10.1.4 *Test Parameters:*

10.1.4.1 Ambient temperature measurement no more than 30 min before the test.

10.1.4.2 Temperature of the glazing measured no more than 15 min before the test.

10.1.4.3 Peak positive pressure measured from each airblast pressure transducer on the frames supporting the test specimens.

10.1.4.4 Positive phase duration measured from each airblast pressure transducer on the frame supporting the test specimen.

10.1.4.5 Positive phase impulse, *i*, calculated for each airblast pressure transducer on the frames supporting the test specimens.

10.1.4.6 The recorded airblast pressure history in graphical form from each pressure transducer.

10.1.5 *Results of Testing*—Number of specimens and results of each specimen tested in terms of hazard level in accordance with Specification F2912. The results of each specimen shall be reported, each specimen being properly identified, particularly with respect to distinguishing features or differing adjustments. Any additional data or information considered to be useful to provide a better understanding of the test results, conclusions, or recommendations.

10.1.6 *Compliance Statement*—A statement that the tests were conducted in accordance with this test method or a complete description of any deviation from this test method.

10.2 The test report shall contain the photographic record of the test setup in accordance with 9.4. In addition, the test report shall contain detailed photographs of each test specimen following the test. Each specimen shall be labeled in the post-test photographs to allow for clear identification.

10.3 If any motion picture records are made of the performance of the test specimens, such motion picture records shall become part of the test report.

10.4 The original copy of the test report shall be furnished to the sponsor of the test. The test director shall keep a copy of the test report on file.

11. Precision and Bias

11.1 *Precision and Bias*—No statement is made concerning either the precision or bias of this test method since the result merely states what hazard level rating a glazing, glazing system, or glazing retrofit system can receive for a given airblast loading.

12. Keywords

12.1 airblast rating; effective positive phase duration; explosive; glazing; glazing systems; hazard level rating; peak positive pressure; positive phase impulse

ANNEX

(Mandatory Information)

A1. DETERMINATION OF STANDOFF DISTANCE FOR A SELECTED REFLECTED AIRBLAST PRESSURE, WEIGHT, AND TYPE OF EXPLOSIVE FOR AN ARENA TEST

A1.1 Project a horizontal line across Fig. A1.1 from the values on vertical axes that correspond to the desired peak positive pressure, *P*, in kPa.

A1.2 From the intersection of the horizontal line with the curve labeled *P*, project a vertical line to the horizontal axes.

A1.3 The values on the horizontal axes denote the required scaled range, *Z*, in m/(kg TNT)$^{1/3}$ [ft/lb$_m$TNT$^{1/3}$].

A1.4 From the intersection point of the vertical line with the curve labeled *i′* (SI units), project a horizontal line to the left vertical axis and read the value of the scaled positive phase impulse, *i′*, in kPa-ms/(kg TNT)$^{1/3}$. From the intersection point of the vertical line with the curve labeled *i′* (US units), project a line to the right vertical axis and read the value of the scaled positive phase impulse in psi-ms/lb$_m$ TNT$^{1/3}$.

A1.5 Use Eq A1.1 to determine the positive phase impulse, *i*, in kPa-ms [psi-ms] for the charge mass, M, of TNT in kg [lb$_m$]:

$$i = (i')M^{(1/3)} \tag{A1.1}$$

A1.6 Use Eq A1.2 to determine the standoff distance, *R*, in m [ft]:

$$R = ZM^{(1/3)} \tag{A1.2}$$

A1.7 When using an explosive other than TNT, Eq A1.3 gives the required mass of explosive, *M′*, in kg [lb$_m$]:

$$M' = \frac{M}{k} \tag{A1.3}$$

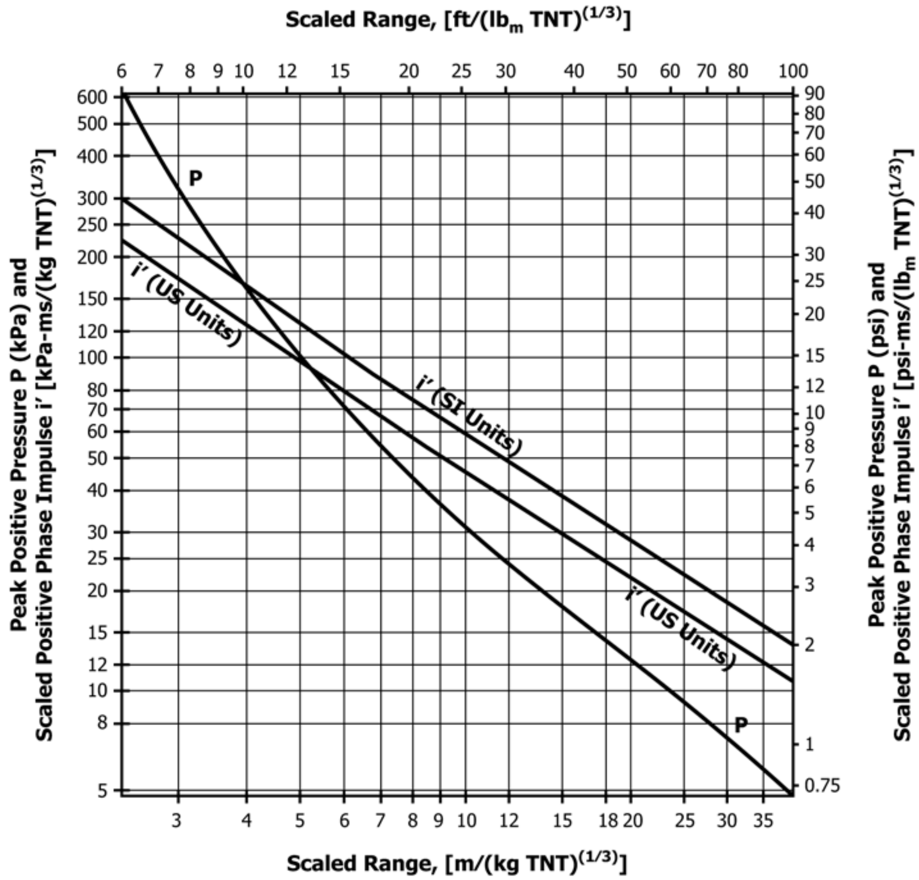

FIG. A1.1 Reflected Airblast Parameters (Hemispherical Surface Detonation)

where:

k = equivalence factor found in Table A1.1. (Tabulated as k_p and k_i, equivalence factors for pressure and impulse, respectively. Either equivalence factor can be used, or the test director can average them at the test director's discretion.)

A1.8 The equivalent weight of an explosive based on blast pressure or impulse varies at different pressure levels. Generally an average value for equivalency provides adequate results.

A1.9 At elevations greater than 900 m [3000 ft] above sea level, adjust airblast pressure calculations to account for altitude.

A1.10 *Sample Calculation*—The desired peak positive airblast pressure is 69 kPa [10 psi]. The test site is limited to a maximum charge size of 12 kg [26 lb] TNT. Determine the standoff distance required and the expected positive phase impulse. Fig. A1.2 illustrates the process.

TABLE A1.1 Equivalence Factors for Explosives[A]

Explosive	k_p	k_i	Pressure Range, kPa [psi]
ANFO (94/6 Am Ni/Fuel Oil)	0.82		0–690 [0–100]
Composition A-3	1.09	1.07	35–345 [5–50]
Composition B	1.11	0.98	35–340 [5–50]
Composition C-4	1.37	1.19	69–700 [10–100]
Cyclotol 70/30 (RDX/TNT)	1.14	1.09	35–340 [5–50]
HBX-1	1.17	1.16	35–140 [5–20]
HBX-3	1.14	0.97	35–170 [5–25]
H6	1.38	1.1	35–700 [5–100]
Minol II	1.2	1.11	20–140 [3–20]
70/30 (HMX/TNT)			
Octol	1.06		
75/25 (HMX/TNT)			
PETN	1.27		35–700 [5–100]
Pentolite	1.42	1.00	35–700 [5–100]
	1.38	1.14	35–4200 [5–600]
TNETB	1.36	1.1	35–700 [5–100]
TNT	1	1	standard for pressure ranges shown
Tritonal	1.07	0.96	35–700 [5–100]

[A] Any explosive certified by the Department of Transportation (including explosive number and classification) may be used in this test method. For highly repeatable pressure histories, the following explosives are recommended: Composition C-4, Composition B, Cyclotol 70/30 (RDX/TNT), and TNT.

A1.10.1 *Step 1*—Project a horizontal line across the chart in Fig. A1.2 corresponding to 69 kPa [10 psi] along the vertical axes.

A1.10.2 *Step 2*—Project a vertical line from the intersection of the horizontal line in Step 1 with the curve labeled *P* to the horizontal axes. Read the scaled range, *Z*, from the horizontal axes:

$$Z = 6.12\frac{m}{(kg\ TNT)^{(1/3)}}\left[15.4\frac{ft}{(lb_m\ TNT)^{(1/3)}}\right] \tag{A1.4}$$

A1.10.3 For SI units, project a horizontal line to the left vertical axis from the intersection point between the vertical line and the curve labeled *i'* (SI units). From the left vertical axis read the following scaled impulse:

$$i' = 100\frac{kPa - ms}{(kg\ TNT)^{(1/3)}} \tag{A1.5}$$

For U.S. units, project a horizontal line to the right vertical axis from the intersection point between the vertical line and the line labeled *i'* (US units). From the right vertical axis, read the following scaled impulse:

$$i' = 11.2\frac{psi - ms}{lb_m^{\ (1/3)}} \tag{A1.6}$$

A1.10.4 Calculate the required standoff distance as follows:

$$R = \left(6.12\frac{m}{(kg\ TNT)^{(1/3)}}\right) \times (12\ kg\ TNT)^{(1/3)} = 14.0\ m\left[\left(15.4\frac{ft}{(lb_m\ TNT)^{(1/3)}}\right) \times (26\ lb_m\ TNT)^{(1/3)}\right] = 45.5\ ft \tag{A1.7}$$

A1.10.5 Calculate the expected positive phase impulse as follows:

$$i = \left(100\frac{kPa - ms}{(kg\ TNT)^{(1/3)}}\right) \times (12\ kg\ TNT)^{(1/3)} = 230\ kPa - ms\left[\left(11.2\frac{psi - ms}{(lb_m\ TNT)^{(1/3)}}\right) \times (26\ lb_m\ TNT)^{(1/3)}\right] = 33.2\ psi - ms \tag{A1.8}$$

A1.10.6 To use Composition C-4 in place of TNT, find the required charge mass by computing the average *k* value as follows:

$$(1.37 + 1.19)/2 = 1.28 \tag{A1.9}$$

A1.10.7 The required mass of Composition C-4 is as follows:

$$M' = \frac{12\ kg}{1.28} = 9.37\ \mathrm{kg}\ (20.7\ \mathrm{lb_m}) \tag{A1.10}$$

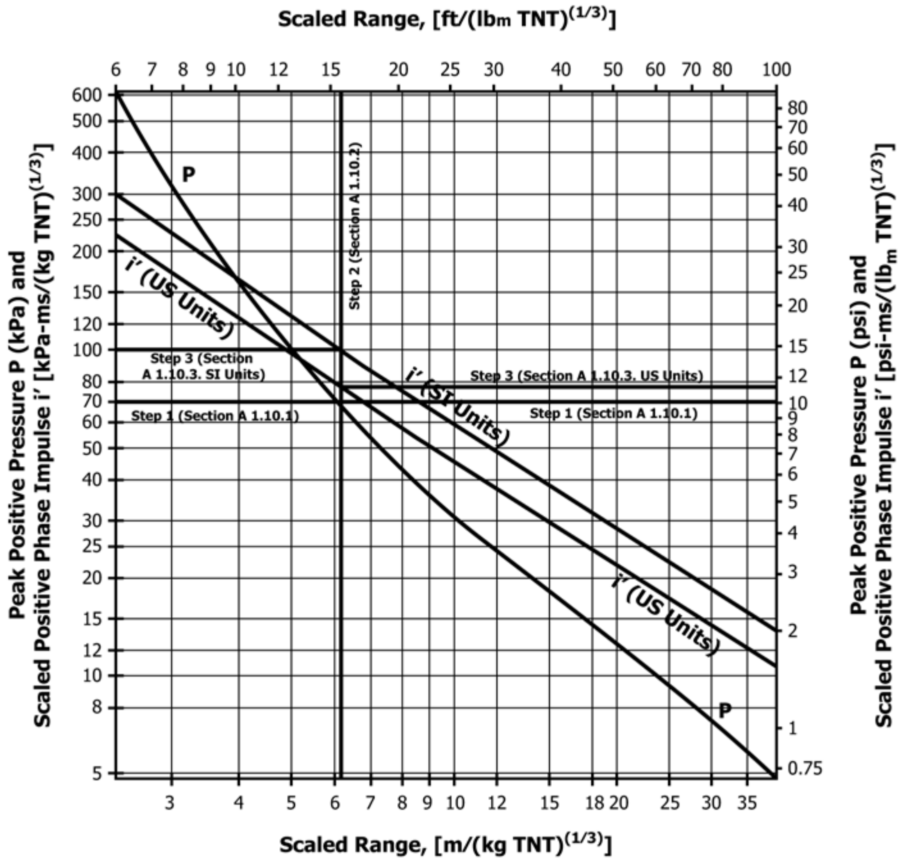

FIG. A1.2 Example Use of Reflected Airblast Parameters (Hemispherical Surface Detonation) Chart

APPENDIXES

(Nonmandatory Information)

X1. STATISTICAL CONSIDERATIONS

X1.1 The use of this test method does not provide absolute assurance that a glazing or glazing construction tested will resist a specific blast. Assume that three specimens are tested and all pass. Based on the assumption that failure of a specimen is a binomial random variable, the following statements can be made:

X1.1.1 With 95 % confidence, the probability that one specimen will survive a blast similar to that used to test it is 36.8 %.

X1.1.2 With 90 % confidence, the probability that one specimen will survive a blast similar to that used to test it is 46.4 %.

X1.1.3 With 50 % confidence, the probability that one specimen will survive a blast similar to that used to test it is 79.4 %.

X1.2 As more specimens than three are tested, the probability of survival increases at a given confidence level.

X2. TEMPERATURE CONSIDERATIONS

X2.1 The strength and behavior of certain glazing materials under uniform loading of constant magnitude have been shown to be affected adversely by large variations in temperature beyond those stated in 3.2. It is possible that large temperature variations might also affect adversely the behavior of such materials under blast loading and their ability to resist blast.