



Standard Performance Requirements for Multipositional Plastic Chairs with Adjustable Backs or Reclining Mechanisms for Outdoor Use¹

This standard is issued under the fixed designation F1858; 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 These performance requirements cover nationally recognized performance requirements for multipositional plastic chairs, with adjustable backs or reclining mechanisms, intended for outdoor use.

1.2 These performance requirements are not applicable to chaise lounges, upholstered chairs, or other types of furniture.

1.3 These performance requirements cover the performance of the product regarding aspects of outdoor weathering, impact, static load for seat and back, and arm testing.

1.4 *Products Manufactured from Recycled Plastics*—Products may be manufactured from recycled plastics as long as the performance requirements are met.

1.5 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

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.*

2. Referenced Documents

2.1 ASTM Standards:²

D638 Test Method for Tensile Properties of Plastics

D2565 Practice for Xenon-Arc Exposure of Plastics Intended for Outdoor Applications

D4329 Practice for Fluorescent Ultraviolet (UV) Lamp Apparatus Exposure of Plastics

G23 Practice for Operating Light-Exposure Apparatus

¹ These performance requirements are under the jurisdiction of ASTM Committee F15 on Consumer Products and are the direct responsibility of Subcommittee F15.33 on Outdoor Plastic Lawn Furniture.

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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.

(Carbon-Arc Type) With and Without Water for Exposure of Nonmetallic Materials (Withdrawn 2000)³

3. Terminology

3.1 Definitions:

3.1.1 *multipositional plastic chair with adjustable back or reclining mechanisms, n*—for the purposes of these provisional performance requirements, a molded, upright piece of furniture with arms, intended for seating one person, having a seat height not less than 15 in. (381 mm) and not greater than 19 in. (483 mm) with the seat and back in the most upright position, and having a seat width not less than 16 in. (406 mm) and not greater than 30 in. (762 mm) (as shown in Fig. 1).

3.1.1.1 *Discussion*—These requirements are applicable to folding chairs with adjustable backs (see Fig. 2), non-folding chairs with adjustable backs (see Fig. 3), and folding chairs with reclining mechanisms (see Fig. 4).

4. Significance and Use

4.1 Tests and criteria as outlined determine the overall usability and stability of chairs in an environment simulating the conditions of use.

4.2 Tests simulate two types of surfaces:

4.2.1 Smooth surfaces, such as linoleum, wet pool decks, etc. The glass testing base (see Fig. 5) is used to simulate this surface.

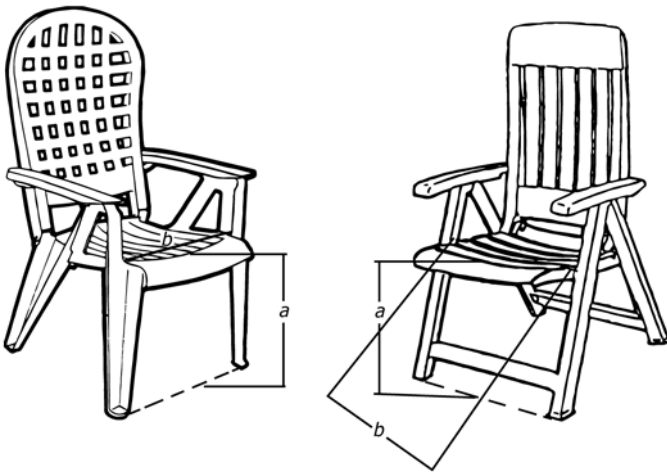
4.2.2 Rough surfaces, such as wooden decks, outdoor natural surfaces, etc. the plywood testing base (see Fig. 6) is used to simulate this surface.

5. Apparatus

5.1 *Multipositional Plastic Chairs with Adjustable Backs or Reclining Mechanisms*, which have been inspected and met a manufacturer's internal quality standards.

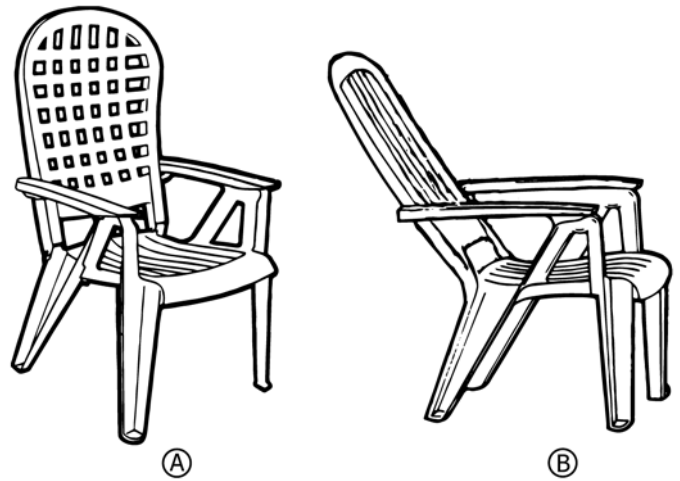
5.2 *One Heavy-Weight Canvas or Leather Bag*, 16 ± 0.2 in. (406 ± 4 mm) in diameter, which shall be measured prior to testing to determine stretching, having a total measurement not to exceed 17.5 in. (445 mm) in diameter when filled with steel

³ The last approved version of this historical standard is referenced on www.astm.org.



NOTE 1—(a) Seat height with the seat and back in the most upright position; and (b) seat width.

FIG. 1 Measurements of a Chair



NOTE 1—(A) Chair with the seat and back in the most upright position; and (B) chair with the back resting the furthest reclining position and arms locked in the furthest reclining position.

FIG. 3 Non-Folding Chair with Adjustable Back



NOTE 1—(A) Chair with the seat and back in the most upright position; and (B) chair with the back resting in the furthest reclining position and arms locked in the furthest reclining position.

FIG. 2 Folding Chair with Adjustable Back



NOTE 1—(A) Chair with the seat and back in the most upright position; and (B) chair with the back resting in the furthest reclining position and arms locked in the furthest reclining position.

FIG. 4 Folding Chair with Reclining Mechanism

or lead shot (0.09 to 0.12 in (2.3 to 3.0 mm) in diameter), to a total weight of 150 ± 1.5 lb (68 ± 0.7 kg). The bag shall be fitted with a safety cable or other means to prevent it from hitting the glass testing base but should not interfere with the test.

5.3 *One Heavy-Weight Canvas or Leather Bag*, identical to the bag in 5.2; however, the weight is increased by addition to the bag of 250 ± 2.5 lb (114 ± 1.1 kg) of either (1) additional steel or lead shot or (2) barbell weights distributed evenly on top of the steel or lead shot, for a total weight of 400 ± 4 lb (182 ± 1.8 kg).

5.4 *Glass Testing Base*, as shown in Fig. 5.

5.5 *Plywood Testing Base*, as shown in Fig. 6.

5.6 *Back Weight Apron*—One heavy-weight canvas or leather apron, 19 ± 0.2 in. (483 ± 4.8 mm) in width and 28 ± 0.3 in. (711 ± 7.1 mm) in length, having six pockets, 6 ± 0.6 in. (152 ± 1.5 mm) in width and 10 ± 0.1 in. (254 ± 2.5 mm)

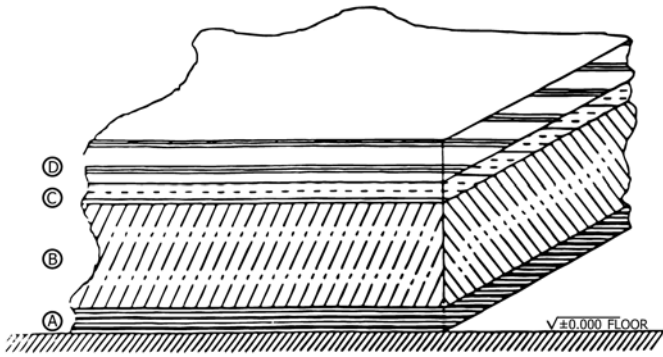
in height, and having appropriate straps, clips, or clamps to hold the apron in place (see Fig. 7).

5.7 *250-lb (114-kg) Arm Testing Block*—One block of suitable material such as wood or metal, 42 ± 0.4 in. (1067 ± 10.7 mm) in length and 7.0 ± 0.7 in. (178 ± 1.8 mm) in height and 4.0 ± 0.4 in. (102 ± 1.0 mm) in width, having additional weights or supporting structure, or both, to obtain a total weight of 250 ± 2.5 lb (114 ± 1.1 kg). The base of the block shall be 12 ± 0.1 in. (305 ± 3.1 mm) at the center, with the sides at a 15° angle (see Fig. 8).

NOTE 1—The 250-lb (114-kg) weight of the arm block may also be achieved by the use of a combination of a block of the dimensions given above and the use of a of the force of an air cylinder to achieve a total applied weight of 250 lb (114 kg).

5.8 *Steel or Lead Shot*⁴—Six 25 ± 0.3 -lb (11 ± 0.1 -kg) bags.

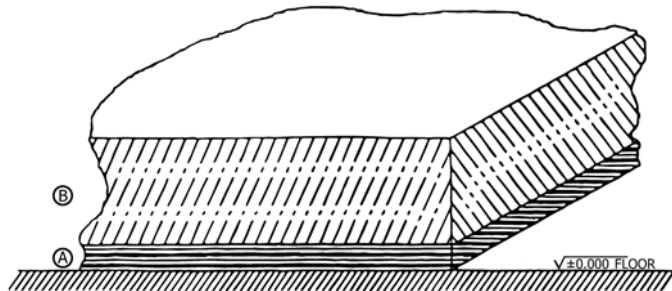
⁴No. 2 to No. 8 shot, as normally purchased at a sporting goods store.



NOTE 1—(A) Poly(methyl methacrylate) sheet, 0.25 ± 0.03 -in. (6 ± 0.1 -mm) thickness; (B) AC exterior glue fir plywood sheet, 0.75 ± 0.08 in. (19 ± 0.2 mm) or greater in thickness; (C) polypropylene microfoam sheet; 0.7 ± 0.01 -lb/ft³ (11 ± 0.2 -kg/m³) density and 0.13 ± 0.01 -in. (3 ± 0.03 -mm) thickness; and (D) glass/tempered sheet, 0.38 ± 0.04 -in. (10 ± 0.1 -mm) thickness.

NOTE 2—(A), (B), (C), and (D) shall be roughly the same dimensions, 48 in. (1219 mm) or greater.

FIG. 5 Glass Testing Base



NOTE 1—(A) Poly(methyl methacrylate) sheet, 0.25 ± 0.03 -in. (6 ± 0.1 -mm) thickness; and (B) AC exterior glue fir plywood sheet, 0.75 ± 0.08 in. (19 ± 0.2 mm) or greater in thickness.

NOTE 2—(A) and (B) shall be roughly the same dimensions, 48 in. (1219 mm) or greater.

FIG. 6 Plywood Testing Base

6. Conditioning

6.1 Precondition all chairs for a minimum of 48 h at 65 to 75°F (18 to 24°C) and a relative humidity of 50 ± 15 %, and test subsequently under the same conditions.

7. General Requirements

7.1 All chairs meeting these performance requirements shall be made from polymeric materials that meet the requirements for outdoor weathering given in Section 8.

7.2 Weatherability Test:

7.2.1 Polymeric material used outdoors shall be exposed for weatherability using accelerated weathering chambers and shall retain at least 70 % of its original tensile strength.

7.2.2 Specimens to be tested shall be normal 0.125 ± 0.01 -in. (3.2 ± 0.03 -mm) thick Type 1 tensile test bars injection molded from the same material used in finished chairs or tensile bars cut from finished parts, as described in Test Method D638.

7.2.3 *Tensile Test*—Test exposed and non-exposed (control samples) tensile bars, in accordance with Test Method D638, at a testing rate of 2 in. (51 mm)/min.

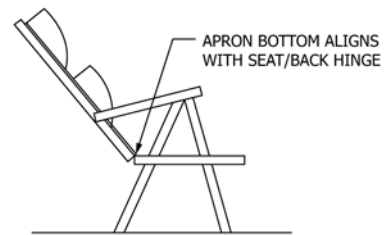
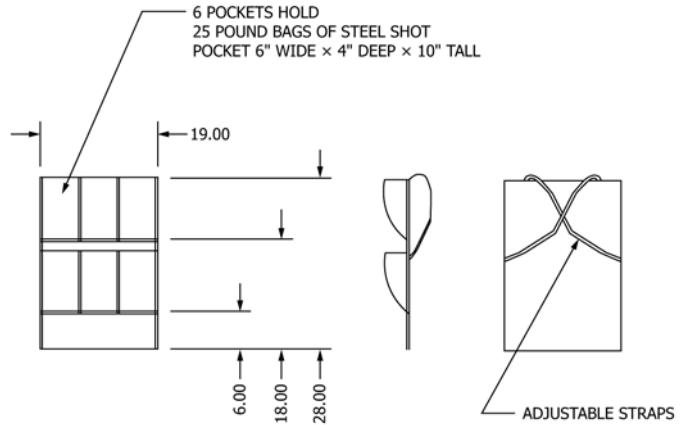
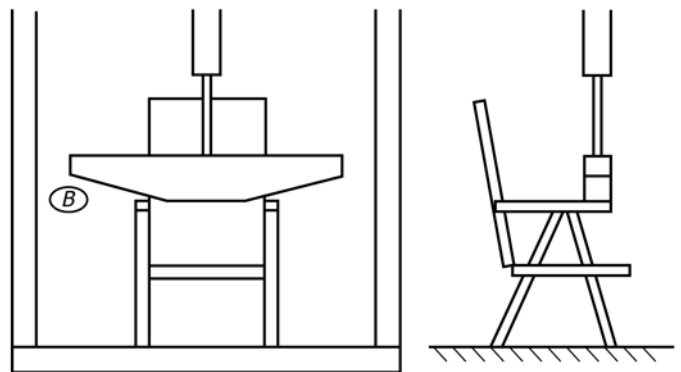
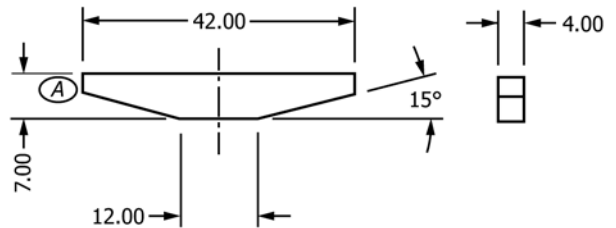


FIG. 7 Back Weight Apron



NOTE 1—(A) = block and (B) = application of block to chair.

FIG. 8 250-lb (114-kg) Arm Testing Block

7.2.4 The specimens are to be exposed according to one of the following procedures: (1) 1000 h in accordance with Procedure B of Practice D2565, using a Type B or BH xenon-arc apparatus; (2) 720 h in accordance with Practice G23, using a Type E carbon-arc weathering device; (3) 1000 h

in accordance with Cycle A of Practice **D4329**, using UVB-313 bulbs; or (4) 2000 h in accordance with Cycle A of Practice **D4329**, using UVA-340 bulbs. For Practice **D2565** or Practice **G23**, the test cycle shall consist of 102 min of light followed by 18 min of light and spray. For Practice **D4329**, the test cycle shall consist of 8 h of light followed by 4 h of dark with condensation. If Practice **G23** is used, the blackbody temperature shall be $145 \pm 5^\circ\text{F}$ ($63 \pm 3^\circ\text{C}$).

8. Test Procedure

8.1 *Initial Inspection*—Inspect each chair thoroughly for breaks, fractures, cracks, or other structural damage prior to testing. Any chairs exhibiting structural damage shall not be tested.

8.2 Separate chairs may be used to conduct the tests listed in **8.3 – 8.10** to comply with **10.1** and **10.2**.

8.3 *Static Load Test No. 1 for Seat:*

8.3.1 Position the chair on the glass testing base (**Fig. 5**) as near as possible to the center of the glass, with the arms and back locked in the most forward position (see **Figs. 2-4**).

8.3.2 Apply the $400 \pm 4\text{-lb}$ ($182 \pm 1.8\text{-kg}$) bag at a speed not to exceed 6 in. (152 mm)/s to the geometrical center of the seat.

8.3.3 Withdraw the weight from the seat after 10 ± 1 s.

8.3.4 Allow 10 ± 1 s of recovery time.

8.3.5 Repeat the steps given in **8.3.2 – 8.3.4** eight additional times.

8.3.6 Repeat the step given in **8.3.2** one time, allowing the weight to remain on the seat for $30\text{ min} \pm 10\text{ s}$, and then withdraw the weight from the seat.

8.3.7 Observe and report any breaks, cracks, fractures, or other structural damage.

8.4 *Static Load Test No. 2 for Seat:*

8.4.1 Position the chair on the plywood testing base (**Fig. 6**) as near as possible to the center of the plywood, with the arms and back locked in the most forward position (see **Figs. 2-4**).

8.4.2 Repeat the steps given in **8.3.2 – 8.3.7**.

8.5 *Static Load Test No. 1 for Back:*

8.5.1 Position the chair on the glass testing base (see **Fig. 5**) as near as possible to the center of the glass, with the back resting in the furthest reclining position and the arms locked in the furthest reclining position (see **Figs. 2-4**).

8.5.2 Apply the $150 \pm 1.5\text{-lb}$ ($68 \pm 0.7\text{-kg}$) bag as a counterbalance load at a speed not to exceed 6 in. (152 mm)/s to the geometrical center of the seat. Allow the weight to remain on the seat for the duration of the static load test for the back.

8.5.3 Attach the back weight apron to the back (see **Fig. 7**). Place a 25-lb (11-kg) bag of steel or lead shot in each of the six pockets, starting from the lower left pocket and ending with the upper right pocket.

8.5.4 Increase the counterbalance load described in **8.5.2**, as needed, to keep the chair from tipping over.

8.5.5 Allow the back weight apron to remain on the back for $60\text{ min} \pm 10\text{ s}$, and then remove the back weight apron from the back and the counterbalance weight from the seat.

8.5.6 Verify that the back still operates. Observe and report any breaks, cracks, fractures, or other structural damage.

8.6 *Static Load Test No. 2 for Back:*

8.6.1 Position the chair on the plywood testing base (**Fig. 6**) as near as possible to the center of the plywood, with the back resting in the furthest reclining position and the arms locked in the furthest reclining position (see **Figs. 2-4**).

8.6.2 Repeat the steps given in **8.5.2 – 8.5.6**.

8.7 *Impact Test No. 1:*

8.7.1 Position the chair on the glass testing base (**Fig. 5**) as near as possible to the center of the glass, with arms and back locked in the most forward position (see **Figs. 2-4**).

8.7.2 Position the $150 \pm 1.5\text{-lb}$ ($68 \pm 0.7\text{-kg}$) bag at a height of 6 ± 0.1 in. (152 ± 2.5 mm) above the center of the chair seat, at rest.

8.7.3 Allow the bag to free-fall onto the center of the chair seat.

8.7.4 Repeat the steps given in **8.7.2** and **8.7.3** nine additional times.

8.7.5 Observe and report any breaks, cracks, fractures, or other structural damage.

8.8 *Impact Test No. 2:*

8.8.1 Position the chair on the plywood testing base (See **Fig. 6**) as near as possible to the center of the plywood, with the arms and back locked in the most forward position (see **Figs. 2-4**).

8.8.2 Repeat the steps given in **8.7.2 – 8.7.5**.

8.9 *Arm Test No. 1:*

8.9.1 Position the chair on the glass testing base (**Fig. 5**) as near as possible the center of the glass, with the arms and back locked in the most forward position (see **Figs. 2-4**).

8.9.2 Apply the arm testing block to the front edge of the arms of the chair, as far forward on the arms as possible without going past the front legs and causing tipping (see **Fig. 8**), at a speed not to exceed 6 in. (152 mm)/s. If necessary, clamps may be used to prevent the weight from rolling forward.

8.9.3 Withdraw the weight from the arm testing block after 60 ± 10 s.

8.9.4 Observe and report any breaks, cracks, fractures, or other structural damage.

8.10 *Arm Test No. 2:*

8.10.1 Position the chair on the plywood testing base (**Fig. 6**) as near as possible to the center of the plywood; with the arms and back locked in the most forward position (see **Figs. 2-4**).

8.10.2 Repeat the steps given in **8.9.2 – 8.9.4**.

9. Report

9.1 Report the following information:

9.1.1 Manufacturer's name and manufacturing lot number, if available.

9.1.2 Model name or model number, or both, if available.

9.1.3 Date tested.

9.1.4 Number of chairs tested.

9.1.5 Initial observations (**6.1**).

9.1.6 Dimensions (see **Fig. 1**).

9.1.7 Observation and noted structural damage, if any.

9.2 Include the results obtained following the weatherability test (7.2), static load Test No. 1 for seat (8.3), static load Test No. 2 for seat (8.4), static load Test No. 1 for back (8.5), static load Test No. 2 for back (8.6), impact Test No. 1 (8.7), impact Test No. 2 (8.8), arm Test No.1 (8.9), and arm Test No. 2 (8.10) in the test report.

10. Performance Criteria

10.1 If any single chair collapses or tips over at any point during the testing procedure, it shall be reported as a failure, regardless of whether it recovers, and no further testing is required.

10.2 There shall be no collapse or any visible evidence of structural damage such as breaks, fractures, or cracks after all of the chairs have been tested with 8.3 through 8.10.

11. Precision and Bias

11.1 Insufficient data are currently available to determine the interlaboratory and intralaboratory reproducibility of these test procedures. Following the publication of these performance requirements, it is expected that sufficient laboratories will become involved and a round robin will be initiated.

12. Keywords

12.1 casual furniture; multipositional plastic chair; out-door furniture; patio furniture; plastic chair; reclining chair

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