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An American National Standard

Standard Specification for Preformed Architectural Compression Seals for Buildings and Parking Structures[1]

This standard is issued under the fixed designation E 1612; 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 the physical requirements for the fully cured elastomeric alloy and the movement capabilities of preformed architectural compression seals used for sealing expansion joints in buildings and parking structures. The preformed architectural compression seal is a rectangular elastomeric extrusion, having an internal baffle system produced continuously and longitudinally throughout the material. The architectural compression seal functions under compression and is usually chemically bonded in place with an adhesive.

NOTE 1—Movement capability is defined in Test Method E 1399.

1.2 This specification covers all colors of architectural compression seals.

1.3 The values stated in SI units are to be regarded as the standard. The values given in parentheses are for information only.

1.4 *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:*

D 395 Test Methods for Rubber Property—Compression Set[2]

D 412 Test Methods for Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers—Tension[2]

D 471 Test Method for Rubber Property—Effect of Liquids[2]

D 518 Test Method for Rubber Deterioration—Surface Cracking[2]

D 573 Test Method for Rubber—Deterioration in an Air Oven[2]

D 624 Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers[2]

D 746 Test Method for Brittleness Temperature of Plastics and Elastomers by Impact[3]

D 792 Test Method for Density and Specific Gravity (Relative Density) of Plastics by Displacement[3]

D 865 Test Method for Rubber—Deterioration by Heating in Air (Test Tube Enclosure)[2]

D 1052 Test Method for Rubber Deterioration—Cut Growth Using Ross Flexing Apparatus[2]

D 1149 Test Method for Rubber Deterioration—Surface Ozone Cracking in a Chamber[2]

D 2000 Classification System for Rubber Products in Automotive Applications[4]

D 2240 Test Method for Rubber Property—Durometer Hardness[2]

D 3183 Practice for Rubber—Preparation of Pieces for Test Purposes from Products[2]

E 577 Guide for Dimensional Coordination of Rectilinear Building Parts and Systems[5]

E 631 Terminology of Building Constructions[5]

E 1399 Test Method for Cyclic Movement and Measuring the Minimum and Maximum Joint Widths of Architectural Joint Systems[5]

3. Terminology

3.1 *Definitions*—Terms defined in Terminology E 631 will prevail for terms not defined in this specification.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *architectural compression seal*—a preformed extrusion, manufactured from a fully cured elastomeric alloy, having an internal baffle system produced continuously and longitudinally throughout the material without flanges or means of securing it mechanically.

3.2.2 *architectural joint system*—any filler or cover, except poured or formed in place sealants, used to span, cover, fill, or seal a joint.

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[1] This specification is under the jurisdiction of ASTM Committee E-6 on Performance of Buildings and is the direct responsibility of Subcommittee E06.21 on Serviceability.

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[2] *Annual Book of ASTM Standards*, Vol 09.01.

[3] *Annual Book of ASTM Standards*, Vol 08.01.

[4] *Annual Book of ASTM Standards*, Vol 09.02.

[5] *Annual Book of ASTM Standards*, Vol 04.11.

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NOTE 2—Joint is defined in Guide E 577.

4. Materials and Manufacture

4.1 The architectural compression seal shall be a preformed extrusion manufactured from a fully cured elastomeric alloy. This alloy shall be classified under Classification System D 2000 as either of the following:

4.1.1 M2CE 706 A16B15C12C20F19Z1Z2, or

4.1.2 M2CE 708 A16B15C12C20F19Z1Z2.

4.2 Z1 represents more than 2 000 000 flex cycles as tested under the Ross Flex Test, Test Method D 1052.

4.3 Z2 represents a 40 % maximum compression set as per Test Methods D 395, Method B, 22 h at 125°C (257°F) at 25 % deflection.

5. Physical Requirements

5.1 The fully cured elastomeric alloy supplied in plaque form shall conform to the material requirements prescribed in Table 1.

5.2 The finished architectural joint seal shall conform to the material requirements prescribed in Table 2.

5.3 The movement capabilities shall be established using Test Method E 1399.

6. Dimensions, Mass, and Permissible Variations

6.1 The size, shape, internal structure, and tolerances shall be as agreed upon by the purchaser and the producer or supplier.

7. Workmanship, Color, and Appearance

7.1 The architectural compression seal shall be free of defects in workmanship. Defects in the extrusion shall consist of the following:

7.1.1 Holes,

7.1.2 Air bubbles, and

7.1.3 Parts not conforming to 6.1.

7.2 The cross section of the seal shall be as agreed upon by the purchaser and the producer or supplier.

7.3 The color of the seal shall be as agreed upon by the purchaser and the producer or supplier.

8. Significance and Use

8.1 Architectural compression seals included in this specification shall be those as follows:

8.1.1 Without frames.

8.1.2 Without flanges and nosing material(s).

8.1.3 Used in interior or exterior applications.

8.1.4 Used in any construction of the building.

TABLE 1 Requirements for Fully Cured Elastomeric Alloy Injection Molded Plaques

Property	Requirement	Test Method
Tensile strength, min, MPa (psi)	4.3 (625)	D 412
Elongation at break, min, %	300	D 412
Hardness, Type A durometer, points (5 s delay)	61–76	D 2240
Specific gravity at 23°C (73°F)	0.93–1.13	D 792
100 % modulus, min, MPa (psi)	1.7 (250)	D 412
Weight gain, max, % (24 h at 121°C (73°F) ASTM No. 3 Oil)	95	D 471

TABLE 2 Material Requirements for Architectural Compression Seals

Property	Requirement	Test Method
Tensile strength, min, MPa (psi)	4.3 (625)	D 412
Elongation at break, min, %	300	D 412
Hardness, Type A durometer, points (5 s delay)	68 ± 8	D 2240
Ozone resistance, 1 ppm, 100 h at 40°C (104°F) 7 × magnification	No Cracks	D 1149
Compression set, % max, 22 h at 100°C (212°F)	35	D 395
Compression set, % max, 70 h at 100°C (212°F)	40	D 395
Heat aging, 70 h at 100°C (212°F) change in:		D 865
Hardness, Shore A, max, points (5 s delay)	4	
Ultimate tensile strength, max, % loss	15	
Ultimate elongation, max, % loss	15	
Tear resistance, min, N/mm (lb/in.)	21 (120)	D 624
Brittleness temperature, min, °C (°F)	−48 (−55)	D 746
Water absorption, max, % loss/gain	4	D 471

8.2 This specification will give users, producers, building officials, code authorities, and others a basis for verifying material and performance characteristics of representative specimens under common test conditions. This specification will produce data on the following:

8.2.1 The physical properties of the fully cured elastomeric alloy.

8.2.2 The movement capability in relation to the nominal joint width as defined under Test Method E 1399.

8.3 This specification compares similar architectural compression seals but is not intended to reflect the system's application. "Similar" refers to the same type of architectural compression seal within the same subsection under 8.1.

8.4 This specification does not provide information on the following:

8.4.1 Durability of the architectural compression seal under actual service conditions, including the effects of cycled temperature on the compression seal.

8.4.2 Loading capability of the system and the effects of a load on the functional parameters established by this specification.

8.4.3 Shear and rotational movements of the specimen.

8.4.4 Any other attributes of the specimen, such as fire resistance, wear resistance, chemical resistance, air infiltration, watertightness, etc.

8.4.5 Testing or compatibility of substrates.

8.4.6 Strip seals.

8.4.7 Architectural compression seals used with frames.

8.4.8 Architectural compression seals used with flanges and nosing material(s).

8.5 This specification is intended to be used only as one element in the selection of an architectural compression seal for a particular application. It is not intended as an independent pass or fail acceptance procedure. Other standards shall be used in conjunction with this specification to evaluate the importance of other service conditions such as durability, structural loading, and compatibility.

9. Sampling

9.1 The fully cured elastomeric alloy injection-molded plaques shall be sampled and tested to determine material conformance to Table 1.

9.2 The finished part shall also be sampled and tested to determine whether the part conforms to the material requirements given in Table 2, tolerances, design, and the producer's functional parameters per Test Method E 1399.

9.3 A lot of material shall consist of the following quantity for each:

9.3.1 A specified mass as manufactured by the producer. Sample each lot.

9.3.2 A cross section as manufactured by the producer. Sample each lot.

9.4 Obtain samples by one of the following methods:

9.4.1 Take samples provided by the producer.

9.4.2 Take samples at random from each shipment.

9.5 A sample constitutes a minimum, as required, to perform the tests but not less than the following:

9.5.1 23 kg (50 lb) of the fully cured elastomeric alloy in pellet form.

9.5.2 2.8 m (9 lf) of each specific size and cross section of the finished part.

10. Specimen Preparation

10.1 Maintain the laboratory at a temperature of 23 ± 2°C (73 ± 4°F).

10.2 Maintain the laboratory at a relative humidity of 50 % ± 5 %.

10.3 *Test Plaque Specimens*:

10.3.1 Use equipment per Annex A1.

10.3.2 Produce 20 quality assurance test plaques in accordance with Annex A2.

10.4 *Compression Seal Specimens*:

10.4.1 Cut all test specimens from the architectural compression seal sample. Except as otherwise specified in the applicable specifications or test methods given in Table 2, prepare the test specimens in accordance with the requirements of Practice D 3183.

10.4.2 Prepare the test specimens for determining tensile strength and elongation using Die C (Test Methods D 412) or Die D when the flat sections of a seal are too small for Die C. However, the requirements of Table 2 shall apply regardless of the die used.

10.4.3 The grain or flow pattern for all specimens prepared for tensile strength and elongation testing (Test Methods D 412) shall be parallel to the length of the die.

10.4.4 Prepare the test specimens for ozone resistance in accordance with Procedure A of Test Method D 518, and wipe them with toluene before testing to remove surface contamination.

10.4.5 The grain or flow pattern for all specimens prepared for tear resistance testing (Test Method D 624) shall be perpendicular to the length of the die.

11. Test Methods

11.1 Determine compliance of the fully cured elastomeric alloy injection-molded plaques with the requirements of Table 1 by conducting the tests in accordance with the test methods specified.

11.2 Determine compliance of the architectural compression seal material with the requirements of Table 2 by conducting the tests in accordance with the test methods specified.

11.3 Determine compliance with the manufacturer's performance data by conducting the tests in accordance with Test Method E 1399.

12. Acceptance

12.1 The acceptance of the architectural compression seal shall be based on one or more of the following procedures, when specified by the purchaser:

12.1.1 When specified in the purchase order or contract, the purchaser shall be furnished certification that samples representing each lot have been either tested or inspected, or both, as directed in this specification and that the requirements have been met. When specified in the purchase order or contract, a report of the test results from Tables 1 and 2 shall be furnished.

12.1.2 When specified in the purchase order or contract, certified test results shall be provided by an independent testing agent.

12.1.3 Testing by the purchaser of any or all properties shall be in accordance with the provisions of this specification. The results shall be accompanied by a statement from an independent expert witness certifying that the material has been sampled, tested, and inspected in accordance with the provisions of this specification.

13. Product Marking

13.1 The architectural compression seals shall be packaged for shipment in containers or on spools or pallets marked clearly with the name of the producer or supplier, or both, size of the seal, lot number, ASTM standard number, and date of manufacture.

14. Precision and Bias

14.1 *Precision*—The precision of this sample preparation will be determined when experience with its use has grown sufficiently to justify a cooperative study.

14.2 *Bias*—Since there is no accepted reference material suitable for determining bias, no statement on bias is made.

15. Keywords

15.1 architectural; buildings; compression seal; parking structures; seal

ANNEXES

(Mandatory Information)

A1. EQUIPMENT NECESSARY TO PRODUCE THE TEST PLAQUES

A1.1 *Injection Molder*, with 136 metric tons (150 tons) of clamping force, 170 to 225 g (6 to 8 oz) maximum shot size, a 45-mm (1.8-in.) screw diameter, a screw length to diameter (L/D) ratio of 61 to 1 through 19 to 1, a maximum injection pressure of 145 MPa (21 000 psi) minimum, and the capability of setting an initial injection timer to 0.01 s accuracy.

A1.2 *Mold Temperature Control Equipment.*

A1.3 *Two-Cavity Mold*, capable of molding two 120 by 80 by 3-mm (4.625 by 3.25 by 0.125-in.) test plaques simultaneously.

A1.4 *Heat-Resistant Gloves.*

A1.5 *Side Cutters*, to remove runners and sprue.

A2. PLAQUE PROCESSING

A2.1 The following procedure shall be followed when processing plaques.

A2.2 Have the equipment calibrated at least once per year by the equipment manufacturer or its authorized service agent.

A2.3 Set the barrel temperature controllers, cycle timers, and pressures in accordance with Tables A2.1 and A2.2.

A2.4 Perform a check on the safety guard interlocks and emergency stop buttons.

A2.5 Ensure that the hopper is clean and free of all contaminates, that is, previous alloys tested, prior to producing test plaques.

A2.6 If necessary, adjust the equipment until all readings conform to Tables A2.1 and A2.2.

A2.7 Remove all traces of previous test sample alloys and degraded material from the molding equipment prior to producing new test plaques. Move and secure the barrel and screw unit back from the mold, and purge and flush the test sample alloy through the molder unit until the test sample alloy is pure.

A2.8 After the purging and flushing process is completed, switch the equipment to semiautomatic and start the molding cycle.

TABLE A2.1 Alloy Injection Molding

Conditions	Durometer Ranges[A]	
	60 to 69A	70 to 79A
Set rear barrel, °C (°F)	177 (350)	171 (340)
Set front barrel, °C (°F)	179 (355)	171 (340)
Set nozzle, °C (°F)	193 (380)	193 (380)
Expected melt, °C (°F)	193 (380)	185 (365)
Stationary mold set points, °C (°F)	38 (100)	38 (100)
Moving mold set points, °C (°F)	16 (60)	16 (60)
Tolerances, ±°C (°F)	10 (15)	10 (15)
Pressure first stage injection at front of screw MPa (psi)	145 (21 000)	145 (21 000)

[A] Shore durometer per Test Method D 2240.

TABLE A2.2 Alloy Injection Molding

Conditions	Durometer Ranges[A]	
	60 to 69A	70 to 79A
Pressure second stage MPa (psi)	38 (5525)	38 (5525)
Tolerances, ±MPa (psi)	3.8 (550)	3.8 (550)
Back pressure[B]	0	0
Sprue break	off	off
Decompress	on	on
Screw speed (r/min)	200 to 250	200 to 250
Injection speed, cm^3/s ($in.^3/s$)	139 (8.46)	139 (8.46)
Timers (s), initial injection first stage	0.8	0.75
±tolerance (s)	0.1	0.1
Timers (s), hold second stage	7.0	5.5
Overall time (s)	35	35

[A] Shore durometer per Test Method D 2240.

[B] Splay on soft grades will be reduced to an acceptable level by applying minimum back pressure.

A2.9 If no problems are observed with the plaque ejection or other operations, switch the equipment to full automatic operation.

A2.10 The fabrication of the test plaques shall use the following packing technique. Increase the initial inject timer by 0.05 s increments until flash occurs. When flash is obtained, reduce the inject timer in 0.02 s increments until no flash is obtained. Record the final setting.

A2.11 The equipment will be reaching equilibrium during the fabrication of the first twelve test plaques. Testing these plaques will produce incorrect or inconsistent data. Discard these first twelve test plaques; under no circumstances are they to be used for testing.

A2.12 After the equipment has reached equilibrium and the correct fill has been achieved, fabricate 20 test plaques for testing.

A2.13 Cut these test plaques from the sprues and runners with the side snips.

A2.14 Identify these test plaques clearly with the alloy grade and lot number.

A2.15 Store these test plaques at 23 ± 2°C (73 ± 4°F) for 16 h before testing.

A2.16 After the test plaques have been fabricated, set the equipment to manual operation.

A2.17 Empty the hopper completely of excess alloy pellets and wipe it down with a clean dry cloth.

A2.18 Draw back the screw and barrel from the mold, and empty them completely of test alloy.

A2.19 When not in operation, always leave the screw and barrel empty, with the screw in the forward position.

A2.20 When not in operation, leave the mold almost closed but without applying clamping. When not in use for any prolonged period of time, protect the mold by spraying it with a rust preventative.

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