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

This standard is issued under the fixed designation E1783/E1783M; 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.

ε1 NOTE—Units information was editorially corrected in September 2013.

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 strip seal is an elastomeric extrusion. This extrusion is either a membrane or tubular having an internal baffle system produced continuously and longitudinally throughout the material. These extrusions are secured in or over a joint by locking rails or an end dam nosing material. The architectural strip seal is compressed and expanded by this mechanical or chemical attachment.

NOTE 1—Movement capability is defined in Test Method E1399/E1399M.

1.2 This specification covers all colors of architectural strip seals.

NOTE 2—The products described in this specification are manufactured from thermoplastic elastomers defined as "fully cured elastomeric alloys" in Test Method D5048.

1.3 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 non-conformance with the standard.

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:*[2]

D395 Test Methods for Rubber Property—Compression Set

D412 Test Methods for Vulcanized Rubber and Thermoplastic Elastomers—Tension

D471 Test Method for Rubber Property—Effect of Liquids

D518 Test Method for Rubber Deterioration—Surface Cracking (Withdrawn 2007)[3]

D573 Test Method for Rubber—Deterioration in an Air Oven

D624 Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers

D746 Test Method for Brittleness Temperature of Plastics and Elastomers by Impact

D792 Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement

D865 Test Method for Rubber—Deterioration by Heating in Air (Test Tube Enclosure)

D1052 Test Method for Measuring Rubber Deterioration—Cut Growth Using Ross Flexing Apparatus

D1149 Test Methods for Rubber Deterioration—Cracking in an Ozone Controlled Environment

D2000 Classification System for Rubber Products in Automotive Applications

D2240 Test Method for Rubber Property—Durometer Hardness

D3183 Practice for Rubber—Preparation of Pieces for Test Purposes from Products

D5048 Test Method for Measuring the Comparative Burning Characteristics and Resistance to Burn-Through of Solid Plastics Using a 125-mm Flame

E577 Guide for Dimensional Coordination of Rectilinear Building Parts and Systems (Withdrawn 2011)[3]

E631 Terminology of Building Constructions

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

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

E1399/E1399M Test Method for Cyclic Movement and Measuring the Minimum and Maximum Joint Widths of Architectural Joint Systems

3. Terminology

3.1 *Definitions:* Terms defined in Terminology E631 will prevail for terms not defined in this document.

3.1.1 *architectural strip seal*—a preformed membrane or tubular extrusion, manufactured from a fully cured elastomeric alloy, having flanges or other means of mechanically or chemically securing it.

3.1.1.1 *Discussion*—Joint is defined in Guide E577.

4. Materials and Manufacture

4.1 The architectural strip seal shall be a preformed extrusion manufactured from a fully cured elastomeric alloy. This alloy shall be classified under Classification D2000.

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 E1399/E1399M.

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 strip seal shall be free of defects in workmanship. Defects in the extrusion 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. Specimen Preparation

8.1 Maintain laboratory at a temperature of 23 ± 2°C [73 ± 4°F].

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

8.3 *Test Plaque Specimens:*

8.3.1 Use equipment in accordance with Annex A1.

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

8.4 *Strip Seal Specimens:*

8.4.1 Cut all test specimens from the architectural strip 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 D3183.

8.4.2 Prepare the test specimens for determining tensile strength and elongation using Die C (Test Methods D412) 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.

8.4.3 The grain or flow pattern for all specimens prepared for tensile strength and elongation testing (Test Methods D412) shall be parallel to the length of the die.

8.4.4 Prepare the test specimens for ozone resistance in accordance with Procedure A of Test Method D518, and wipe them with toluene before testing to remove surface contamination.

8.4.5 The grain or flow pattern for all specimens prepared for tear resistance testing (Test Method D624) shall be perpendicular to the length of the die.

9. Significance and Use

9.1 Architectural strip seals included in this specification shall be those:

9.1.1 Extruded as a membrane,

9.1.2 Extruded as tubular,

9.1.3 With frames,

9.1.4 With flanges mechanically secured,

9.1.5 With flanges chemically secured,

9.1.6 Used in interior or exterior applications, and

9.1.7 Used in any construction of the building.

9.2 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:

9.2.1 The physical properties of the fully cured elastomeric alloy, and

9.2.2 The movement capability in relation to the nominal joint width as defined under Test Method E1399/E1399M.

TABLE 1 Requirements for Fully Cured Elastomeric Alloy Injection Molded Plaques

Property	Requirement						Test Method
	Type I	Type II	Type III	Type IV	Type V	Type VI	
Tensile strength, min, MPa [psi]	13.8 [2000]	9.7 [1400]	7.2 [1050]	6.0 [870]	5.8 [850]	5.8 [850]	D412
Elongation at break, min,%	500	460	380	350	340	340	D412
Hardness, Type A durometer, points (5 s delay)	87 ± 3	80 ± 3	73 ± 3	70 ± 3	67 ± 3	64 ± 3	D2240
Relative density @ 23°C [73°F]	0.95 ± 0.02	0.96 ± 0.02	0.97 ± 0.02	0.97 ± 0.02	0.97 ± 0.02	0.97 ± 0.02	D792
100 % Modulus, min, MPa [psi]	6.1 [890]	3.8 [550]	2.8 [400]	2.2 [320]	1.9 [280]	1.9 [280]	D412
Mass gain, max %, (24 h at 121°C [23°F] ASTM No. 3 Oil)	60	75	80	90	95	95	D471

TABLE 2 Material Requirements for Architectural Strip Seals

Property	Requirement						Test Method
	Type I	Type II	Type III	Type IV	Type V	Type VI	
Tensile strength, min, MPa [psi]	13.8 [2000]	9.7 [1400]	7.2 [1050]	6.0 [870]	5.8 [850]	5.8 [850]	D412
Elongation at break, min,%	500	460	380	350	340	340	D412
Hardness, Type A durometer, points (5 s delay)	87 ± 3	80 ± 3	73 ± 3	70 ± 3	67 ± 3	64 ± 3	D2240
Ozone resistance 1 ppm 100 h at 40°C [104°F] 7× magnification	no cracks	no cracks	no cracks	no cracks	no cracks	no cracks	D792
Compression set, % max, 22 h at 100°C [212°F]	45	40	38	35	35	35	D412
Compression set, % max, 70 h at 100°C [212°F]	50	45	43	40	40	40	D471
Heat aging, 70 h at 100°C [212°F] change in:							D865
Hardness, Shore A, max, points (5 s delay)	3	3	3	3	3	3	
Ultimate tensile strength max, % loss	5	5	5	5	5	5	
Ultimate elongation max, % loss	5	5	5	5	5	5	
Tear resistance, min, N/mm [lb/in.]	45 [257]	30 [171]	20 [114]	20 [114]	20 [114]	20 [114]	D624
Brittleness temperature, min, °C [°F]	−61 [−78]	−62 [−80]	−60 [−76]	−56 [−69]	−63 [−81]	−63 [−81]	D746
Water absorption, max, % loss/gain	5	5	6	6	7	7	D471

9.3 This specification compares similar architectural strip seals but is not intended to reflect the system's application. "Similar" refers to the same type of architectural strip seal within the same subsection under 9.1.

9.4 This specification does not provide information on the following:

9.4.1 Durability of the architectural strip seal under actual service conditions, including the effects of cycled temperature on the strip seal;

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

9.4.3 Shear and rotational movements of the specimen;

9.4.4 Any other attributes of the specimen, such as fire resistance, wear resistance, chemical resistance, air infiltration, watertightness, and so forth; and

NOTE 3—This specification addresses fully cured elastomeric alloys. Test Methods D395, D573, D1052, and D1149 are tests better suited for evaluating thermoset materials.

9.4.5 Testing or compatibility of substrates.

9.5 This specification is intended to be used as only one element in the selection of an architectural strip 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.

10. Sampling

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

10.2 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 in accordance with Test Method E1399/E1399M.

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

10.3.1 A specified mass. Sample each lot.

10.3.2 A cross section. Sample each lot.

10.4 Obtain samples by one of the following methods:

10.4.1 Take samples provided by the producer.

10.4.2 Take samples at random from each shipment.

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

10.5.1 23 kg [50 lb] of the fully cured elastomeric alloy in pellet form.

10.5.2 2.8 m [9 lf] of each specific size and cross section of the finished part.

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 strip 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 tests in accordance with Test Method E1399/E1399M.

12. Acceptance

12.1 The acceptance of the architectural strip 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 Table 1 and Table 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 testing agent 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 strip 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 specification numbers, and date of manufacture.

14. Keywords

14.1 architectural; buildings; joints; parking structures; seals; strip seals

ANNEXES

(Mandatory Information)

A1. EQUIPMENT NECESSARY TO PRODUCE THE TEST PLAQUES

A1.1 *Injection Molder*, with 1330 kN [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 Use the following procedure 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, the cycle timers, and pressures in accordance with Table A2.1 and Table A2.2.

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

TABLE A2.1 Alloy Injection Molding

Conditions	Requirements[A]			
Alloy durometer ranges	60 to 69A	70 to 79A	80 to 85A	86 to 90A
Set rear barrel temperature,° C [°F]	177 [350]	171 [340]	174 [345]	177 [350]
Set front barrel temperature,° C [°F]	179 [355]	171 [340]	174 [345]	177 [350]
Set nozzle temperature, °C [°F]	193 [380]	193 [380]	193 [380]	193 [380]
Expected melt temperature,° C [°F]	193 [380]	185 [365]	191 [375]	202 [395]
Stationary mold set points temperatures, °C [°F]	38 [100]	38 [100]	38 [100]	38 [100]
Moving mold set points temperatures,° C [°F]	16 [60]	16 [60]	16 [60]	16 [60]
Temperature tolerances, ±° C [°F]	10 [15]	10 [15]	10 [15]	10 [15]
Pressure first stage injection at front of screw, MPa [psi]	145 [21 000]	145 [21 000]	145 [21 000]	145 [21 000]

[A] Shore durometer in accordance with Test Method D2240.

TABLE A2.2 Alloy Injection Molding

Conditions	Requirements[A]			
Alloy durometer ranges	60 to 69A	70 to 79A	80 to 85A	86 to 90A
Pressure second stage, MPa [psi]	38 [5525]	38 [5525]	38 [5525]	38 [5525]
Pressure tolerances, ± MPa [psi]	3.8 [550]	3.8 [550]	3.8 [550]	3.8 [550]
Back pressure[B]	0	0	0	0
Sprue break	OFF	OFF	OFF	OFF
Decompress	ON	ON	ON	ON
Screw speed (r/min)	200 to 250	200 to 250	200 to 250	200 to 250
Injection speed cm^3/s [$in.^3/s$]	139 [8.46]	139 [8.46]	139 [8.46]	139 [8.46]
Timers (s), initial injection first stage	0.8	0.75	0.75	0.75
± Timer tolerance	0.1	0.1	0.1	0.1
Timers (s), mold second stage	7	5.5	5.5	5.5
Overall time (s)	35	35	30	30

[A] Shore durometer in accordance with Test Method D2240.
[B] Splay on soft grades will be reduced to an acceptable level by applying minimum back pressure.

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 Table A2.1 and Table 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.

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 12 test plaques. Testing these plaques will produce incorrect or inconsistent data. Discard these first 12 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 the screw and barrel back from the mold and empty them completely of test alloy.

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

A2.20 When not in operation, always 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.

A2.21 *Precision*—The precision of this sample preparation will be determined when experience with its use has grown sufficiently to justify a cooperative study.

A2.22 *Bias*—Since there is no accepted reference material suitable for determining bias, no statement on bias is made.