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An American National Standard

Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Siding[1]

This standard is issued under the fixed designation D 3679; 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 establishes requirements and test methods for the materials, dimensions, warp, shrinkage, impact strength, expansion, appearance, and windload resistance of extruded single-wall siding manufactured from rigid (unplasticized) PVC compound. Methods of indicating compliance with this specification are also provided.

1.2 Rigid PVC recycled plastic may be used in this product in accordance with the requirements in Section 4.

1.3 Nonmandatory color-hold guidelines are provided in Appendix X1 for manufacturer's product development and quality performance use only.

1.4 Rigid (unplasticized) PVC soffit is covered in Specification D 4477.

1.5 Siding produced to this specification shall be installed in accordance with Practice D 4756. Reference shall also be made to the manufacturer's installation instructions for the specific product to be installed.

NOTE 1—Information with regard to siding maintenance shall be obtained from the manufacturer.

NOTE 2—Siding color-hold guidelines are for dark gray-blue, light-gray blue, green, dark beige, light beige, gold, yellow, white, and gray regions. Additional colors will be added and color-hold guidelines refined as weathering program data is developed.[2]

1.6 The values stated in inch-pound units are to be regarded as the standard. The SI units given in parentheses are for information purposes only.

1.7 The following precautionary caveat pertains to the test method portion only, Section 6, of this specification: *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.*

NOTE 3—There are no ISO standards covering the primary subject matter of this specification.

2. Referenced Documents

2.1 *ASTM Standards:*

D 256 Test Methods for Impact Resistance of Plastics and Electrical Insulating Materials[3]

D 374 Test Methods for Thickness of Solid Electrical Insulation[2]

D 523 Test Method for Specular Gloss[3]

D 618 Practice for Conditioning Plastics and Electrical Insulating Materials for Testing[3]

D 635 Test Method for Rate of Burning and/or Extent and Time of Burning of Self-Supporting Plastics in a Horizontal Position[3]

D 696 Test Method for Coefficient of Linear Expansion of Plastics[3]

D 883 Terminology Relating to Plastics[3]

D 1042 Test Method for Linear Dimensional Changes of Plastic[3]

D 1435 Practice for Outdoor Weathering of Plastics[3]

D 1600 Terminology for Abbreviated Terms Relating to Plastics[3]

D 1898 Practice for Sampling of Plastics[3]

D 2244 Test Method for Calculation of Color Differences from Instrumentally Measured Color Coordinates[3]

D 3892 Practice for Packaging/Packing of Plastics[4]

D 4216 Specification for Rigid Poly(Vinyl Chloride) (PVC) and Related Plastic Building Product Compounds[4]

D 4226 Test Methods for Impact Resistance of Rigid Poly-(Vinyl Chloride) (PVC) Building Products[5]

D 4477 Specification for Rigid Poly(Vinyl Chloride) (PVC) Soffit[5]

D 4756 Practice for the Installation of Poly(Vinyl Chloride) (PVC) Siding and Soffit[5]

D 5033 Guide for the Development of Standards Relating to the Proper Use of Recycled Plastics[4]

D 5206 Test Method for the Windload Resistance of Rigid Poly(Vinyl Chloride) (PVC) Siding[5]

E 631 Terminology of Building Construction[6]

E 805 Practice for Identification of Instrumental Methods of Color or Color-Difference Measurement of Materials[6]

2.2 *ASCE Standard:*

[1] This specification is under the jurisdiction of ASTM Committee D-20 on Plastics and is the direct responsibility of Subcommittee D20.24 on Plastic Building Products.

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[2] Refer to ASTM Research Report RR:D20-1144. Available from ASTM Headquarters.

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

[4] *Annual Book of ASTM Standards*, Vol 08.03.

[5] *Annual Book of ASTM Standards*, Vol 08.04.

[6] *Annual Book of ASTM Standards*, Vol 04.07.

***A Summary of Changes section appears at the end of this standard.**

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ASCE 7-88 Minimum Design Loads for Buildings and Other Structures[7]

3. Terminology

3.1 Definitions are in accordance with Terminologies D 883, E 631, and D 1600, unless otherwise specified.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *color-hold guidelines*—predictive target color regions within a three-dimensional model which constitute acceptable appearance retention levels of color change resulting from weathering of a specific product type and color.

3.2.2 *Discussion*—Commercial products that demonstrate weathering behavior within reasonable conformance to these target guidelines during a two-year test period can be anticipated to weather without exhibiting unacceptable color changes.

3.2.3 *dark beige siding*—siding the color of which is defined by the color space falling within the parameters $L_H = 50$ to 75 , $a_H = -3$ to 4 , and $b_H = 5$ to 18 .

3.2.4 *dark gray-blue siding*—siding the color of which is defined by the color space falling within the parameters $L_H = 45$ to 65 , $a_H = -7$ to 0 , and $b_H = -10$ to 0 .

3.2.5 *gold siding*—siding the color of which is defined by the color space falling within the parameters $L_H = 65$ to 100 , $a_H = -5$ to 3 , and $b_H = 18$ to 30 .

3.2.6 *gray siding*—siding the color of which is defined by the color space falling within the parameters $L_H = 65$ to 85 , $a_H = -3$ to 1 , and $b_H = -3$ to 2 .

3.2.7 *green siding*—siding the color of which is defined by the color space falling within the parameters $L_H = 55.6$ to 80.5 , $a_H = -12$ to -3 , and $b_H = 4$ to 13 .

3.2.8 *light beige siding*—siding the color of which is defined by the color space falling within the parameters $L_H = 75$ to 100 , $a_H = -3$ to 4 , and $b_H = 5$ to 18 .

3.2.9 *light gray-blue siding*—siding the color of which is defined by the color space falling within the parameters $L_H = 65$ to 100 , $a_H = -7$ to 0 , and $b_H = -10$ to -3 .

3.2.10 *temperate northern climate— in weather testing,* a North American metropolitan area testing site located within 73 to 100°W longitude and 37 to 45°N latitude.

3.2.11 *vinyl siding*—a shaped material, made principally from rigid poly(vinyl chloride) (PVC), that is used to clad exterior walls of buildings.

3.2.12 *Discussion*—Any exception to a homogeneous rigid PVC compound is present in a coextruded or laminated capstock.

3.2.13 *white siding*—siding the color of which is defined by the color space falling within the parameters $L_H = 85$ to 100 , $a_H = 2$ to -3 , and $b_H = -2$ to 4 .

3.2.14 *yellow siding*—siding the color of which is defined by the color space falling within the parameters $L_H = 65$ to 100 , $a_H = -10$ to -5 , and $b_H = 13$ to 24 .

4. Materials and Manufacture

4.1 The siding shall be made principally of PVC compound prepared from PVC homopolymer resin that conforms to the requirements for Class 1, 2, or 3 (see Table 1).

4.2 Rigid PVC recycled plastic, as defined in Guide D 5033, may be used in this product if all the requirements in the sections on Terminology (Section 3), on Materials and Manufacture (Section 4), and on Physical Requirements (Section 5) are met by the siding containing rigid PVC recycled plastic.

4.3 All specimen-preparation procedures and test conditions shall be the same as indicated in the Specimen Preparation and Test Methods sections of Specification D 4216.

4.4 The compound shall have a minimum Izod impact strength of 0.65 ft·lbf/in. (34.7 J/m) notch at 0°C (32°F) when tested in accordance with Test Method D 256.

4.5 The poly(vinyl chloride) compound, when tested in accordance with Test Method D 635, shall not exceed an average extent of burn of 4 in. (100 mm), with an average time of burn not to exceed 10 s. A sample thickness of 0.040 in. (1 mm) ±10 % is required.

NOTE 4—The flammability testing data, conclusions, and recommendations of Test Method D 635 related solely to the measurement and description of properties for classification of the poly(vinyl chloride) compound in response to flame under controlled laboratory conditions and shall not be used for the description or appraisal of the fire hazard of vinyl siding under actual fire conditions.

4.6 The PVC compound when extruded into siding shall maintain uniform color and be free of any visual surface or structural changes, such as peeling, chipping, cracking, flaking, or pitting.

4.7 The PVC compound shall be compounded so as to provide the heat stability and weather exposure stability required for the siding market application.

5. Physical Requirements

5.1 *Length and Width*—The nominal length and width of the siding shall be as agreed upon between the purchaser and the seller. The actual length shall not be less than ¼ in. (6.4 mm) of the nominal length and the actual width shall be within ±1⁄16in. (1.6 mm) of the nominal width when measured in accordance with 6.3 and 6.4.

5.2 *Thickness*—The minimum thickness of the siding shall be 0.035 in. (0.9 mm) when measured in accordance with 6.5.

TABLE 1 Class Requirements for Rigid Poly(Vinyl Chloride) Compounds Used for Siding

NOTE 1—The minimum property test value will determine the class number, even though other higher property test values may fall within another class.

Compound Class Number	1	2	3
Izod Impact Strength at 73.4°F (23°C), min:			
ft·lbf/in. of notch	1.5	2.4	9.9
(J/m of notch)	(80.0)	(130.0)	(530)
Tensile Strength, min:			
psi	6970	5800	5510
(MPa)	(48.0)	(40.0)	(38.0)
Modulus of elasticity in tension, min:			
psi	392 000	319 000	290 000
(MPa)	(2700)	(2200)	(2000)
Deflection temperature under load, min:			
°F at 264 psi	158	158	158
(°C at 1.82 MPa)	(70)	(70)	(70)

[7] Available from American Society of Civil Engineers, 345 E. 47th St., New York, NY 10017-2398.

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5.3 *Camber*—A full length of siding (typically 10 or 12 ft (3.05 or 3.61 m)) shall not have a camber greater than ⅛ in. (3.2 mm) when measured in accordance with 6.6.

5.4 *Heat Shrinkage*—The average heat shrinkage shall not exceed 3.0 % when determined by the method described in 6.7.

5.5 *Impact Resistance*—Siding shall have a minimum impact strength of 60 in.·lbf (6.78 J) when tested in accordance with 6.8.

5.6 *Coefficient of Linear Expansion*— The siding shall have a coefficient of linear expansion not greater than 4.5 by 10^{-5} in./in./°F (8.1 by 10^{-5} mm/mm/°C) when tested in accordance with 6.9.

5.7 *Gloss*—The gloss of smooth and embossed siding shall be uniform across the exposed surface. Variations in the glossmeter readings for smooth siding shall not be more than ±10 % or ±5.0 points (whichever is greater). Variations for embossed siding shall not be more than ±20 % or ±10.0 points (whichever is greater). Gloss of smooth and embossed siding shall be tested in accordance with 6.11.

5.8 *Surface Distortion*—The siding shall be free of bulges, waves, and ripples when tested to a minimum temperature of 120°F (49°C) in accordance with the procedure in 6.12. This distortion is called "oil-canning."

5.9 *Color*—The color of the siding shall be within the defined color space parameters for the specific color agreed upon between the purchaser and the manufacturer. The color specified shall be uniform on the surface of the siding panels, except in the case of multicolored woodgrain panels.

5.9.1 *Uniformity of Color*—When tested in accordance with 6.13, the total color change, ΔE, between a production specimen and the appropriate reference specimen or agreed-upon color coordinates shall not vary by more than 1.5, and the chromatic coordinates thereof shall not change by more than $\pm\Delta a_H = 1.0$ and $\pm\Delta b_H = 1.0$.

5.10 *Weathering*:

5.10.1 The siding shall maintain a uniform color and be free of any visual surface or structural changes such as peeling, chipping, cracking, flaking, and pitting when tested in accordance with 6.10.

NOTE 5—It is recommended that manufacturers utilize the color-hold guidelines in Appendix X1 to ensure quality performance and to optimize siding weathering product development studies.

NOTE 6—Weathering-conformance-testing requirements are to reflect performance of a "typical" extrusion siding profile representing a specific color of PVC compound and a specific extrusion technology. In no case is there an implied requirement for testing all the various shaped and sized siding profiles produced in this color. The lengthy outdoor weatherability testing for new products may be performed concurrently with market development and sales of siding to existing markets. Completion of weatherability testing prior to marketing of the product is not required.

5.11 *Windload Resistance*—The siding panel(s) shall be able to withstand a minimum static test pressure of 16.3 lbf/ft^2(780 Pa) when tested in accordance with 6.14.

5.11.1 The static test pressure of 16.3 lbf/ft^2 (780 Pa) was established to withstand structural loading conditions that occur in 80-mph (35.6-km/h) wind-zone areas for elevations of 33 ft (10.1 m) and less, that is equivalent to 21.7-lbf/ft^2(1039-Pa) design pressure.

5.11.1.1 The design-pressure values can be negative (suction loads) or positive. The negative values are the largest in magnitude and are the values used in this specification.

NOTE 7—In that the siding is being tested as a weather-resistant exterior product applied to an existing exterior structural wall, forces (negative) working to pull the siding off the wall, fasteners, or disengage locks will be the most important criteria for testing. Positive wind forces test the integrity of the total wall sections, and do not provide a measure of the performance of the siding.

5.11.2 Refer to Annex A1 for an explanation as to how the 21.7-lbf/ft^2(1039-Pa) design pressure was established, and for applications where the effective design pressure as specified in ASCE 7-88 is greater than 21.7 lbf/ft^2(for example, wind-zone areas greater than 80 mph (35.6 km/h) or elevations above 33 ft (10.1 m).

6. Test Methods

6.1 *General*—The inspection and test procedures contained in this section are used to determine the conformance of products to the requirements of this specification. Each producer who represents his products as conforming to this specification may utilize statistically based sampling plans that are appropriate for each manufacturing process, but shall keep the essential records necessary to document, with a high degree of assurance, his claim that all of the requirements of this specification have been met. Additional sampling and testing of the product, as may be agreed upon between the purchaser and the manufacturer, are not precluded by this section.

6.2 *Conditioning and Test Conditions*— Condition the test specimen in accordance with Procedure A of Practice D 618 and test under those conditions, unless otherwise specified herein.

6.3 *Length*—Lay the specimen on a flat surface and measure with a steel tape. Measure the length of a siding panel to the nearest 1/16 in. (1.6 mm) at the center, the butt edge, and the bottom of the top lock. The average of the three measurements is the actual length.

6.4 *Width*—Interlock two 2-ft (610-mm) long specimens in the normal mode for installation. Lay the two specimens on a flat surface. Measure to the nearest 1/16 in. (1.6 mm), the distance between the lowest butt edge of the top specimen and the lowest butt edge of the bottom specimen. Make a measurement at one end of the specimens and at 6-in. (152.4-mm) intervals along the entire length, making sure that the measurement is made perpendicular to the butt edge. Average the measurements. The average constitutes the exposed width of siding.

6.5 *Thickness*—Make a minimum of five equally spaced measurements across the width of the siding specimen perpendicular to the exposed surface with a micrometer similar to that described in Test Method D 374, Method A or B, with the exception that the vernier reading shall be to 0.001 in. (0.0254 mm). The average constitutes the thickness of the siding.

6.6 *Camber*—Place a full length of siding (typically 10 or 12 ft (3.05 or 3.61 m)) on a flat surface alongside a straightedge at least as long as the siding specimen. Measure the maximum space between edge of the siding specimen and the straightedge for each edge to the nearest 1/16 in. (1.6 mm).

6.7 *Heat Shrinkage*:

6.7.1 *Apparatus*:

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6.7.1.1 *Scriber*, similar to that described in Test Method D 1042, with the exception that the needle points shall be separated by 10 ± 0.01 in. (254 ± 0.254 mm).

6.7.1.2 *Test Media*, a controlled-temperature water bath of 5 gal (10 L) or more, equipped with an efficient stirrer that will maintain uniform temperature throughout. Heater and temperature-control devices must maintain the water at 160 ± 1°F (71 ± 0.5°C). Use a wire rack to raise and lower specimens into the water bath. As an alternative to the use of a water bath, the specimens may be heated for 30 min in a uniformly heated forced-air oven maintained at a temperature of 160 ± 1°F (71 ± 0.5°C).

6.7.1.3 Make measurements with any device capable of measuring the distance between two scribe marks to the nearest 0.01 in. (0.254 mm).

6.7.2 *Procedure*:

6.7.2.1 Cut three specimens from the siding panel, each 1 in. (25.4 mm) wide by 12 in. (305 mm) long. Cut one specimen from the center and one from each of the extreme edges of the flat surface. The long axis shall be parallel to the machine direction.

6.7.2.2 Condition specimens at 73.4 ± 3.6°F (23 ± 2°C) and 50 ± 5 % relative humidity for at least 24 h.

6.7.2.3 Make a slight mark with the scribe on each specimen so that a reference point will be clearly visible.

6.7.2.4 Place specimens in the test medium.

6.7.2.5 Remove specimens after 30 min and place on a flat surface until cool.

6.7.2.6 Repeat conditioning in accordance with 6.7.2.2.

6.7.2.7 Make a second mark with the scribe on each specimen, using the same center.

6.7.2.8 Measure the distance, *D*, between the scribe marks to the nearest 0.01 in. (0.254 mm).

6.7.2.9 Calculate the percent shrinkage as (*D*/10) × 100.

6.7.2.10 Report the average shrinkage of the three specimens tested.

6.8 *Impact Resistance*—Test impact resistance of siding in accordance with Test Methods D 4226, Procedure A, impactor head configuration H .25. 4–in. increments (0.5–in. height changes with 8 lb falling weight) shall be used. Conditioning time for quality-control tests shall be at least 1 h.

6.9 *Coefficient of Linear Expansion*— Conduct this test in accordance with Test Method D 696.

6.10 *Weatherability*:

6.10.1 Expose extruded specimens at least 6 in. (150 mm) long for six months, one year, and two years in at least three widely different climatic areas. A hot, dry climate, such as Phoenix, AZ; a hot, humid climate such as Miami, FL; and a temperate, northern climate are suggested sites.

6.10.2 All exposures shall be conducted at an angle of 45° S, plywood backed, in accordance with Practice D 1435.

6.11 *Gloss*:

6.11.1 *Apparatus*—Measure gloss with using a 75° geometry glossmeter; for measuring embossed siding, the glossmeter shall be operated with an "integrating mode."[8]

6.11.2 *Procedure A*:

6.11.2.1 For smooth siding, measure gloss on one piece of siding on at least three widely separated points across the width of the exposed surface. The area tested must be flat.

6.11.2.2 Each reading shall be within the limit specified in 5.7.

6.11.2.3 The average reading of all readings shall be used to represent the gloss of the sample.

6.11.3 *Procedure B:*

6.11.3.1 For embossed siding, measure gloss on one piece of siding on at least three widely separated sections across the width of the exposed surface. The specimen to be tested shall be flat.

6.11.3.2 Using the "integrating measurement mode"; at each section, measure the gloss by sliding the glossmeter longitudinally for approximately 12 in. (305 mm). Take care to ensure a good contact between the glossmeter measuring port and the surface of the sample. When sliding the glossmeter, a steady speed of approximately 6 in./s (150 mm/s) shall be maintained, to coincide with the opening time of the measurement. Use care to ensure that a new surface is used for each reading since instrument contact may leave scratches on the specimen surface.

6.11.3.3 Each reading of gloss shall be within the limit specified in 5.7.

6.11.3.4 Use the average result of all readings to represent the gloss of the sample.

6.12 *Surface Distortion*:

6.12.1 *Test Specimen/Apparatus*:

6.12.1.1 The test specimen shall consist of three courses of siding, a minimum of 6 ft (1.83 m) in length, mounted on a flat rigid frame in accordance with the manufacturer's recommended installation instructions.

6.12.1.2 Heat-sensing elements shall be located at the midpoint of the backside of the second course of siding.

6.12.1.3 *Radiant-Heat Rod*, 600 W for each linear foot (0.31 m), mounted parallel to the middle course and approximately 32 in. (810 mm) away from the surface of the siding.

6.12.1.4 *Temperature-Control Device*, used to regulate the temperature of the radiant-heat rod, shall be able to maintain the conditions specified in 6.12.2.1.

6.12.2 *Procedure*:

6.12.2.1 Heat the test panel (second course of siding) at a rate of 3.0 to 6.0°F/min (1.7 to 3.3°C/min) until a minimum temperature of 120°F (49°C) is achieved as measured by the heat-sensing element on the midpoint of the backside of the second course. During this heating period, observe the test panel for surface distortion.

6.12.2.2 Failure is defined as the appearance of bulges, waves, or ripples before a temperature of 120°F (49°C) is reached.

6.13 *Color Uniformity*—Calculate the difference between the L_H, a_H, and b_H color coordinates for a production specimen to those of either the appropriate reference specimen or the agreed upon color coordinates for that specific color product in accordance with Test Method D 2244. Calculate the total difference ΔE between the production specimen and the reference specimen in accordance with Test Method D 2244.

[8] Micro-gloss 75, available from BYK-Gardner USA, 2435 Linden Lane, Silver Spring, MD 20910, or equivalent is suitable.

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6.14 *Windload Resistance*—Conduct the test on windload resistance of finished siding in accordance with Test Method D 5206.

7. Product Marking

7.1 In order that purchasers may identify siding conforming to all requirements of this specification, producers and distributors shall include a statement of compliance in conjunction with their name and address on product labels, invoices, sales literature, and the like. The following statement is suggested when sufficient space is available:

This PVC siding conforms to all the requirements established in ASTM Specification D 3679, developed cooperatively with the industry and published by ASTM.

Full responsibility for the conformance of this product to the specification is assumed by (name and address of producer or distributor).

7.2 The following abbreviated statement is suggested when available space on labels is insufficient for the full statement: Conforms to ASTM Specification D 3679 (name and address of producer or distributor).

8. Packing, Packaging, and Package Marking

8.1 The siding shall be packed in such a manner as to provide reasonable protection against damage in ordinary handling, transportation, and storage.

8.2 Provisions of Practice D 3892 shall apply to this specification.

9. Keywords

9.1 plastic building products; plastic weatherability; recycled plastic; rigid PVC siding; specification; weatherability color-hold guidelines

ANNEX

(Mandatory Information)

A1. WINDLOAD RESISTANCE TEST DESIGN FACTORS

A1.1 *Windload Criteria:*

A1.1.1 ASCE 7-88 is the basis for determining the design pressures used in this test method. The velocity pressures, V_P, used in this test method have been computed using the following equation:

$$V_P = 0.00256\, K_z\, (IV)^2$$

where:

V = wind velocity, mph (km/h). The wind velocity values are based on a 50-year mean recurrence interval at an evaluation of 33 ft (10 m) above ground and Exposure Category C as described. A velocity of 80 mph (35.6 km/h) was used in this specification.

I = "importance factor" as described in ASCE 7-88. A value of 1.0 was used.

K_z = "velocity pressure exposure coefficient" as described in ASCE 7-88. A "K" value of 0.98 was used in the wind pressure calculations, which is the value from ASCE 7-88 for an elevation of 33 ft (10 m) above ground level and Exposure Category C.

The velocity pressure = −16.1 lbf/ft^2 (771 Pa).

A1.1.2 ASCE 7-88 recommends various internal and external pressure coefficients, which include gust response factors. These coefficients vary with the area of the walls in the building, ratios of window areas between walls, and other factors. American Architectural Manufacturers Association (AAMA) has recommended for the purposes of this specification, using ASCE 7-88, with the following internal and external pressure coefficients to determine the design pressure as follows:

Internal Pressure Coefficient = ±0.25

External Pressure Coefficient = ±1.00 and −1.10

The design pressure is calculated by multiplying the velocity pressures by the algebraic sum of the internal and external pressure coefficients.

A1.2 *Design Pressure:*

Positive Design Pressure = (16.1)(1.00 + 0.25) = 20.1

Negative Design Pressure = (16.1)(−1.10 − 0.25) = −21.7

A1.2.1 The negative values (suction loads) are the largest in magnitude and are the design values used in this test method. Based on AAMA research work as reported in "Windload Resistance of Residential Siding Products" **(1)**,[9] a certain amount of pressure equalization occurs through residential siding products installed with sheathing under high dynamic pressures. In light of this pressure equalization, the design pressure in the ASCE 7-88 windload standards should be reduced by a factor of 50 %.

A1.2.2 Therefore, the required test pressures may be calculated as follows:

$$P_t = D_p \times 0.5 \times 1.5$$

[9] The boldface numbers in parentheses refer to a list of references at the end of the text.

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where:
P_t = test pressure, lbf/ft^2 (Pa),
D_P = design pressure, lbf/ft^2 (Pa),
0.5 = pressure equalization factor, and
1.5 = safety factor.

A1.2.3 In an 80-mph (35.6-km/h) wind zone area specifying a design pressure of −21.7 lbf/ft^2(1039 Pa) for a building 33 ft (10 m) in height or less, the required siding uniform load test pressure is −16.3 lbf/ft^2(780 Pa). For applications where the effective design pressure is greater than 21.7 lbf/ft^2(1039 Pa) (for example, wind zone areas greater than 80 mph or elevations over 33 ft, refer to ASCE 7-88 for the effective design pressure. The product shall be subjected to a static test pressure determined by the formula in A1.2.2A1.2.2. These loading conditions apply only to siding installed to solid walls, with internal or external sheathing. For applications where the siding is installed over open studding, rapid pressure equalization does not occur. In these applications, the load the siding will see is equal to the total design pressure. The static test pressure required for products used under these conditions is as follows:

$$P_t = 1.5 \times DP$$

where:
P_t = static test pressure, lbf/ft ^{2} (Pa),
D_P = design pressure, lbf/ft^2 (Pa), and
1.5 = safety factor.

A1.3 *Wind Design Pressures:*

A1.3.1 Design wind pressures may be selected for particular geographic locations from wind velocity maps prepared by the National Weather Service. The approach in collecting data for these maps is to measure the fastest average wind during finite time periods within each hour. The finite timeduration is given by the equation $t = 3600/V$, where t is the time span in seconds and V is the wind velocity in miles per hour (kilometres per hour).

A1.3.1.1 Wind velocity maps, therefore, show isotachs that become shorter as the wind velocity increases. For example, a 90-mph (145-km/h) wind is actually the highest sustained average for a 40-s time span, and a 180-mph (290-km/h) wind is actually the highest sustained wind for a 20-s time span. Measurements obtained in this way are known as the fastest area of wind because the procedure is to actually measure the time required for a 1-mile (1.6-km) long sample of air to pass a fixed point.

A1.3.2 The person specifying the test must translate anticipated wind velocities and durations into uniform static pressure differences and durations. Complexities of wind pressures as related to building design, wind intensity, and other factors must be considered. (See Refs **1** through **8**.)

A1.3.2.1 Superimposed on sustained winds are gusting winds that, for short periods of time (from fractions of seconds to a few seconds), may move at considerably higher velocities than the sustained winds. If the 90-mph (145-km/h) wind storm is considered, the average during at least one 40-s time period is 90-mph. Recent studies reveal that there are also 2-s average velocities of 120 mph (193 km/h), 10-s average velocities of 106 mph (171 km/h), and 1-h average velocities of 54 mph (87 km/h) in the same storm. For a 90 mph (145 km/h) fastest wind, it is apparent that there are other velocities that may be considered for the purpose of testing exterior building products. If the 90-mph fastest mile (1.6 km) wind has been selected as appropriate for a specific location, the time duration at 90-mph would be 40 s. This period of time may be considered as the time duration for test at a load equivalent to the design pressure for the 90-mph wind.

A1.3.2.2 The test load and time duration of tests should be related. If a 10-s time duration is used, the test should be conducted at the load equivalent to the design pressure for a 106-mph (171-km/h) wind. The load pressure equivalent for a 106-mph wind is 39 % greater than for a 90-mph (145-km/h) wind. If structural performance under both sustained and gust loads is to be checked, testing should be conducted at both the sustained and gust load static pressure differences and for the time duration appropriate to each.

A1.3.3 The duration of the applied test load may have serious effects on materials used in the test specimen. Most materials have strength or deflection characteristics that are time dependent. For this reason, it is appropriate to test for the time duration to which a product will be exposed to a sustained or gust load, or both, as discussed in A1.3.2. American practice in the past has been generally to require a minimum test period of 10-s for specified loads equal to 1.5 times the design pressure, unless requirements have been otherwise specified. Thus, a safety factor was incorporated in the testing. With higher test loads and longer time durations, the designer must also consider what safety factors are essential, particularly with regard to gust wind loads. Care should be exercised not to specify unnecessarily long duration loads for purposes of testing the adequacy of the product to withstand wind gusts.

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