



# Standard Specification for Polypropylene (PP) Siding<sup>1</sup>

This standard is issued under the fixed designation D7254; 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 ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

## 1. Scope\*

1.1 This specification establishes requirements and test methods for materials, impact strength, appearance, surface flame spread, and wind load resistance of siding products manufactured from polypropylene material. Methods of indicating compliance with this specification are also provided.

1.2 The use of polypropylene recycled plastic in this product shall be in accordance with the requirements in Section 4.

1.3 Siding produced to this specification shall be installed in accordance with 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.

1.4 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.

1.5 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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

NOTE 2—There is no known ISO equivalent to this standard.

1.6 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

## 2. Referenced Documents

### 2.1 ASTM Standards:<sup>2</sup>

<sup>1</sup> This specification is under the jurisdiction of ASTM Committee D20 on Plastics and is the direct responsibility of Subcommittee D20.24 on Plastic Building Products.

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<sup>2</sup> For referenced ASTM standards, visit the ASTM website, [www.astm.org](http://www.astm.org), or contact ASTM Customer Service at [service@astm.org](mailto:service@astm.org). For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

- D660 Test Method for Evaluating Degree of Checking of Exterior Paints
- D661 Test Method for Evaluating Degree of Cracking of Exterior Paints
- D662 Test Method for Evaluating Degree of Erosion of Exterior Paints
- D714 Test Method for Evaluating Degree of Blistering of Paints
- D772 Test Method for Evaluating Degree of Flaking (Scaling) of Exterior Paints
- D883 Terminology Relating to Plastics
- D1435 Practice for Outdoor Weathering of Plastics
- D1600 Terminology for Abbreviated Terms Relating to Plastics
- D3359 Test Methods for Rating Adhesion by Tape Test
- D3679 Specification for Rigid Poly(Vinyl Chloride) (PVC) Siding
- D3892 Practice for Packaging/Packing of Plastics
- D4101 Classification System and Basis for Specification for Polypropylene Injection and Extrusion Materials
- D4226 Test Methods for Impact Resistance of Rigid Poly(Vinyl Chloride) (PVC) Building Products
- D5033 Guide for Development of ASTM Standards Relating to Recycling and Use of Recycled Plastics (Withdrawn 2007)<sup>3</sup>
- D5206 Test Method for Windload Resistance of Rigid Plastic Siding
- E84 Test Method for Surface Burning Characteristics of Building Materials
- E631 Terminology of Building Constructions
- G147 Practice for Conditioning and Handling of Nonmetallic Materials for Natural and Artificial Weathering Tests
- 2.2 ASCE Standard:<sup>4</sup>
- ASCE 7-10 Minimum Design Loads for Buildings and Other Structures
- 2.3 International Code Council:<sup>5</sup>
- International Building Code
- International Residential Code

<sup>3</sup> The last approved version of this historical standard is referenced on [www.astm.org](http://www.astm.org).

<sup>4</sup> Available from American Society of Civil Engineers (ASCE), 1801 Alexander Bell Dr., Reston, VA 20191, <http://www.asce.org>.

<sup>5</sup> Available from International Code Council (ICC), 500 New Jersey Ave., NW, 6th Floor, Washington, DC 20001, <http://www.iccsafe.org>.

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

2.4 Vinyl Siding Institute, Inc.<sup>6</sup>

VSI Vinyl Siding Installation Manual (2015)

2.5 Structural Building Components Association.<sup>7</sup>

ANSI/SBCA FS 100-2012 Standard Requirements for Wind Pressure Resistance of Foam Plastic Insulating Sheathing Used in Exterior Wall Covering Assemblies

### 3. Terminology

3.1 Definitions are in accordance with Terminologies **D883**, **D1600**, and **E631**, unless otherwise specified.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *polypropylene siding, n*—a shaped material, made principally from polypropylene homopolymer, or copolymer, which in some cases may contain fillers and/or reinforcements, that is used to clad exterior walls of buildings.

3.2.2 *self-supporting specimen, n*—a specimen that remains in place by its own structural characteristics both before and during the fire test.

3.2.3 *wind load design pressure rating, n*—the maximum wind pressure that a polypropylene siding product is rated to withstand, based on testing under Test Method **D5206**.

3.2.4 *standard wind load design pressure rating, n*—the wind load design pressure rating for a siding product when installed: 1) over a sheathing material designed and attached such that it is capable of resisting 100% of positive and negative wind pressures occurring under design conditions at the building location; and 2) with the standard fastening method specified in building codes, general installation instructions, and the siding manufacturer's instructions.

3.2.5 *alternative wind load design pressure rating, n*—the wind load design pressure rating for a siding product when installed over a sheathing not designed and attached such that it is capable of resisting 100 % of positive and negative wind pressures occurring under design conditions at the building location, or when the siding is not fastened in the standard way; as specified by the manufacturer

3.2.5.1 *Discussion*—The standard test conditions, configuration, and fastening method used in this Specification are specified in **6.5**, while alternative sheathing and installation conditions are specified by the manufacturer and must be reflected in the product's installation instructions. Alternative ratings apply only when the specified sheathing and fastening conditions are used. See **Annex A1** for information on differences between the standard wind load design pressure rating and alternative wind load design pressure ratings, and how to determine standard and alternative design pressure ratings.

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

### 4. Materials and Manufacture

4.1 The siding shall be made principally of polypropylene compound, prepared from polypropylene homopolymer or copolymer.

4.2 Where polypropylene recycled plastic as defined in Guide **D5033** is used, the siding containing the polypropylene recycled plastic shall meet all the requirements in the sections on Terminology (Section 3), on Materials and Manufacture (Section 4), and on Physical Requirements (Section 5).

4.3 The polypropylene 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 *Impact Resistance*—Siding shall have a minimum impact strength of 35 in.-lbf when tested in accordance with **6.2**.

5.2 *Weathering*—The siding shall be free of any visual surface or structural changes such as checking, cracking, erosion, blistering or flaking, (excluding chalking), when tested in accordance with **6.3**.

5.2.1 For siding having paint or other coating applied to the visible surface, samples with coating shall be weathered and visually evaluated, and shall meet the requirements of **5.2**.

5.3 *Film Adhesion*—Siding having paint or other coating applied to the visible surface shall comply with the following when tested in accordance with **6.4**.

5.3.1 The sum of all 10 ratings must total 38 or greater, with not more than two ratings lower than 3. If any of the 10 ratings is a 1 or 0, the siding is not qualified.

5.4 *Wind Load Resistance*—The siding shall withstand a minimum static test pressure and a standard wind load design pressure rating shall be determined.

5.4.1 *Minimum Test Pressure*—The siding panel(s) shall be able to withstand a minimum static test pressure of 16.2 lbf/ft<sup>2</sup> (776 Pa) when tested in accordance with **6.5**. The average maximum sustained static pressure determined in **6.5** shall be equal to or greater than this value.

NOTE 3—The static pressure of 16.2 lbf/ft<sup>2</sup> (776 Pa) was established to withstand structural loading conditions that occur in wind exposures of approximately 110 mph (177 km/h) ( $V_{ASD}$ ) for mean roof heights of 30 ft (9.1 m) and less in exposure category B, and corresponds to 30.0 lbf/ft<sup>2</sup> (1436 Pa) design pressure, to match the default wind design conditions of Table R703.3(1) in the 2015 International Residential Code.

NOTE 4—Refer to **Annex A1** for an explanation as to how the negative design pressure was established, and for applications where the effective negative design pressure as specified in ASCE 7-10 is different from 30.0 lbf/ft<sup>2</sup> (1436 Pa) (for example, wind-zone areas greater than about 110 mph (177 km/h) ( $V_{ASD}$ ) (225 km/h ( $V_{ULL}$ )) or mean roof height above 30 ft (9.1 m), or exposures other than exposure category B).

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

5.4.2 *Standard Wind Load Design Pressure Rating*—The standard wind load design pressure rating shall be determined from the results of testing in accordance with **6.5**, using the procedures described in **Annex A1**, section **A1.3**.

NOTE 5—The standard design pressure rating is valid for applications where the siding is installed over sheathing and its fastening that are capable of independently resisting both positive and negative wind pressures occurring under design conditions at the building location. For applications over other sheathing, a different design pressure rating is applicable, and is determined in accordance with **Annex A1**, section **A1.3**. Determination of a rating other than the standard design pressure rating is

<sup>6</sup> National Housing Center, 1201 15th Street NW, Suite 220, Washington, DC 20005, <http://www.vinylsiding.org>

<sup>7</sup> 6300 Enterprise Lane, Madison, WI 53719, <http://www.sbcindustry.com>

not required by this section.

5.4.3 *Alternative Design Pressure Ratings*—Design pressure ratings other than the standard wind load design pressure rating, for use with different sheathing materials or using different installation or fastening, are permitted to be determined in accordance with testing under 6.5, using the procedures in Annex A1.

5.5 *Surface Flame Spread*—The siding shall exhibit a flame spread index not exceeding 200 when tested in accordance with 6.6.

## 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.

NOTE 6—Each producer who represents its products as conforming to this specification typically uses statistically based sampling plans that are appropriate for each manufacturing process to verify ongoing compliance. Specifications for quality control programs are beyond the scope of this standard specification.

### 6.2 Impact Resistance:

6.2.1 *Conditioning and Test Conditions*—Condition the test specimen in accordance with Specification D4101 and test under those conditions unless otherwise specified herein. Conditioning time for tests shall be at least 4 hours.

6.2.2 *Impact Test*—Test impact resistance of siding in accordance with Test Method D4226, Procedure A, impactor head configuration H.25. Increments of 4 in.-lb (for example, 0.5 in. height increments with an 8 lb falling weight) shall be used. Minimum sample dimensions shall be 1.5 by 1.5 inch. Samples shall be tested with the normally exposed surface facing up.

6.3 *Weatherability*—Expose test specimens with a plywood backing at an angle of 45° South in the northern hemisphere in accordance with Practices D1435 and G147 for two years in at least three widely different climatic areas. Test sites shall be located in a hot, dry climate, such as Phoenix, AZ; a hot, humid climate such as Miami, FL; and a temperate, northern climate such as Cleveland, OH or Louisville, KY.

6.3.1 Specimens shall be a minimum of 2 by 3¾ in. (51 by 95 mm).

6.3.2 Samples shall be representative of the product to be evaluated. Samples shall be taken either from commercial products or from laboratory samples. Laboratory samples shall be produced in the same manner as the commercial products to be evaluated.

NOTE 7—Production of laboratory samples in the same manner includes use of the same method of forming the product. For example, if the

commercial product is extruded, the laboratory specimen shall be extruded; if the commercial product is injection molded, the laboratory specimen shall be injection molded, and so forth.

6.3.2.1 Samples of uncoated, monolayer profiles are permitted to be exposed on either the back or front surface.

NOTE 8—Samples of heavily-textured siding that will also be read by color measurement instruments for purposes of measuring color retention may need to be exposed on the back side to minimize the effect of shadowing on the textured surface.

6.3.2.2 For siding that is coated or painted on the side that is visible after installation, coated or painted samples shall be exposed.

6.3.3 Select a minimum of 4 specimens per sample per test site to allow for 3 test specimens and 1 file specimen for each sample evaluated.

6.3.4 Upon completion of the two-year outdoor exposure, visually evaluate the exposed specimens for structural and surface changes in comparison with the file specimen in accordance with the following Test Methods:

Checking: ASTM D660  
 Cracking: ASTM D661  
 Erosion: ASTM D662  
 Blistering: ASTM D714  
 Flaking (scaling): ASTM D772

Any defects observed but not included in the above: Describe the defect and rate as Mild, Moderate or Severe.

6.4 *Film Adhesion*—Conduct the test in accordance with Method D3359, Procedure A, with the following conditions.

### 6.4.1 Samples:

6.4.1.1 Samples shall be representative of the products evaluated. Samples shall be taken either from commercial products or from laboratory samples. Laboratory samples shall be produced in the same manner as the commercial products to be evaluated.

6.4.1.2 The sample size and number must allow for a total of 10 test replicates. Use of 10 individual specimens with a minimum size of 2 by 3¾ in. (51 by 95 mm) is required. Larger specimens, up to and including a full, uncut panel, are permitted, so long as 10 different test areas on the panel are provided for. Cut specimens shall be obtained from different, randomly-selected portions of the panel.






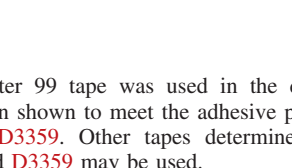
### 6.4.2 Procedure:

6.4.2.1 Select 10 individual specimens or 10 random locations on a panel for testing.

6.4.2.2 Follow the procedure in Method D3359, Procedure A, without making the X-cut or any other incision called for by that procedure in Table 1 using the rating scale (and examples as reference) for each test location.

6.4.2.3 Report the rating for each test location or specimen.

TABLE 1 Rating Scale

5 No peeling or removal	
4 Trace peeling or removal at isolated locations, involving very small, discrete flecks	
3 Many small areas of removal	
2 Significant removal of large sections	
1 Removal from most of the area under the tape	
0 Removal beyond the area of the tape	

NOTE 9—Elcometer 99 tape was used in the development of this method and has been shown to meet the adhesive peel strength requirements of Method D3359. Other tapes determined to be equivalent according to Method D3359 may be used.

6.5 *Wind Load Resistance*—Conduct the test on wind load resistance of the finished siding in accordance with Test Method D5206. The average maximum sustained static test pressure determined from this testing is used in 5.4. For purposes of determining compliance with the minimum test pressure and standard design pressure requirements in 5.4, the test structure shall be constructed with vertical studs 16 inches on center, the siding in the test installation shall be installed over wood sheathing with a nominal thickness of 7/16 to 1/2 in., and fastened as follows:

6.5.1 *Fastener Type*—Roofing nail, smooth shank. Unless greater dimensions are specified in the manufacturer’s instructions, 0.120 in. (1/8 in. nominal; 3.2 mm) shank diameter, 5/16 in. (7.9 mm) head diameter, length as necessary to penetrate the thickness of the sheathing plus 1/4 in. (6.4 mm).

6.5.2 *Fastener Spacing*—As specified by the manufacturer’s installation instructions.

6.5.3 Fasteners shall not be driven tightly against the siding. Allow approximately 1/32 in. (0.8 mm) clearance between the fastener head and siding surface.

NOTE 10—The installation details described 6.4 conform to the minimum requirements of the 2015 International Residential Code and polypropylene-specific provisions of the VSI Vinyl Siding Installation Manual. For installation methods that are inherently stronger than the minimum requirements (such as closer fastener spacing, longer or thicker fasteners, or greater penetration), no additional testing should be necessary, and the standard design pressure rating would apply to such installations. If the manufacturer desires a higher design pressure rating using inherently stronger installation, or for installations that are inherently less strong (such as greater fastener spacing or smaller fasteners), additional testing is needed. See 5.4.3.

6.6 *Surface Flame Spread*—Conduct the test on surface flame spread characteristics in accordance with Test Method E84. The test specimen shall either be self-supporting by its own structural characteristics or held in place by added supports along the test specimen surface.

## 7. Packaging and Package Marking

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

7.2 Provisions of Practice D3892 shall apply to this specification.

7.3 To aid identification of polypropylene 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. Use the following statement, or equivalent, when sufficient space is available: “This polypropylene siding conforms to all the requirements established in ASTM Specification D7254 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).”

7.4 Use the following abbreviated statement, or equivalent, when available space on labels is insufficient for the full statement: “Conforms to ASTM Specification D7254-XX (name and address of producer or distributor).”

7.5 The standard wind load design pressure rating determined in accordance with 5.4.2 shall be stated on the product or on the product package by one of the means in 7.5.1 or 7.5.2.

7.5.1 The package shall be marked or labeled with the standard wind load design pressure rating. The marking shall be in the format “Standard Wind Load Design Pressure Rating: ##.# psf (ASD)”.

7.5.2 The standard design pressure rating shall be included on a line imprint or other marking on the front (outward-facing) surface of all siding panels. It is not required that the marking be visible after installation, provided that the marking can be revealed and read by detaching the lower edge lock of an adjacent course, without removal of any fasteners. The standard design pressure marking shall be stated at least once

per panel. The marking shall be in the format “Std Design Pressure Rating: ### psf (ASD)”.

7.5.3 At the option of the manufacturer, additional marking or labeling of the package or product with alternative wind load design pressure ratings determined in accordance with 5.4.3 for use with alternative sheathings, wall configurations or fastening methods is permitted. The marking shall use the format specified in 7.5, shall indicate the type of sheathing or wall

configuration for which it is applicable, and shall refer to the manufacturer’s instructions for more information and any installation requirements.

## 8. Keywords

8.1 plastic building products; polypropylene siding; specification

## ANNEX

### (Mandatory Information)

#### A1. WIND LOAD RESISTANCE TEST DESIGN FACTORS

##### A1.1 Wind Load Criteria:

A1.1.1 ASCE 7-10 is the basis for determining the design pressures used in this specification. Design wind loads are determined on an ASD basis in this specification.

NOTE A1.1—In previous editions of ASCE 7, wind loads were determined using wind speed maps based on a 50-year return period. In ASCE 7-10, maps based on a 700-year return period are used which, for any given location, produce a wind speed approximately 30 % greater than that of the previous maps. This larger magnitude (higher return period) wind speed, referred to as the ultimate wind speed, ( $V_{ULT}$ ), is used directly (with a load factor of 1.0) to determine nominal wind loads on a Strength Design (LRFD) or “ultimate” wind load basis. When Allowable Stress Design (ASD) is used, ASCE 7-10 provides for these ultimate wind loads, determined from the ultimate wind speed map velocities, to be multiplied by a load factor of 0.6. Alternatively, the adjustment can be made directly to the wind velocity, which is the approach taken in this method (see A1.1.2). This procedure produces results consistent with past ASD wind loads.

A1.1.2 It is necessary to determine whether the wind velocity to be used is based on the maps in ASCE 7-10 or on older maps designed for direct application of ASD. Wind velocity,  $V$ , based on ASD is used in this method. Wind speeds determined using the maps in ASCE 7-10, referred to as  $V_{ULT}$ , are converted to ASD wind speeds,  $V_{ASD}$ , by multiplying by the square root of 0.6. Wind speeds based on maps using an ASD basis do not require conversion (see A1.4) Thus:

$$V = V_{ASD} = V_{ULT} \times \sqrt{0.6} \quad (A1.1)$$

The  $V$  determined in this section is used in the following calculations.

A1.1.3 The velocity pressures,  $q$ , used in this test method have been computed using the following equation:

$$q = 0.00256 K_z K_d V^2 I \text{ (lb/ft}^2\text{)} = 0.613 K_z K_d V^2 I \text{ (N/m}^2\text{)} \quad (A1.2)$$

where:

$V$  = wind velocity, mph (km/h). The basic wind speed corresponds to a 3-s gust speed at 33 ft (10.1 m) above ground in exposure category C, as described in ASCE 7-10. A velocity of  $V = V_{ASD} = 110$  mph (177 km/h) was used in this specification. (See Note A1.2 and Note A1.3.)

$I$  = “importance factor” as described in editions of ASCE 7 prior to ASCE 7-10. A value of 1.0 is used. This factor is not used where the wind speed has been determined from a map in ASCE 7-10. (See Note A1.4.)

$K_z$  = “velocity pressure coefficient” as described in ASCE 7-10. A “ $K_z$ ” of 0.70 is used in the wind pressure calculations, which is the value from ASCE 7-10 for a mean roof height of 30 ft (9.1 m) above ground level and Exposure Category B.

$K_d$  = “wind directionality factor” as described in ASCE 7-10. A “ $K_d$ ” of 0.85 is used.

A1.1.4 Thus for the given velocity and factors, the velocity pressure = -18.43 lbf/ft<sup>2</sup> (882 Pa).

NOTE A1.2—As explained in Note A1.1, the wind velocity used in this method is converted from the  $V_{ULT}$  given by wind speed maps in ASCE 7-10 to  $V_{ASD}$  using the equation in A1.1.2. A  $V_{ULT}$  wind speed of approximately 140 mph from the maps is equivalent to a  $V_{ASD}$  of 110 mph, which is the velocity  $V$  used in this specification.

NOTE A1.3—In ASCE 7-10 the default wind speeds are given for exposure category C, and a table is provided to adjust this wind speed for other exposure categories. Since most siding is installed on buildings located in exposure category B, the velocity pressure coefficient,  $K_z$  is included in the equation to make this adjustment.

NOTE A1.4—Editions of ASCE 7 prior to ASCE 7-10 included an importance factor to represent the relative significance of the building and the consequences of its loss. Because most polypropylene siding is installed on residential and light commercial buildings, the importance factor was set at 1.0 by default. ASCE 7-10 has removed the importance factor from the velocity pressure equation, and instead provides a different wind speed map for each of the building importance categories (referred to as risk categories in ASCE 7-10). Thus the importance factor will already have been incorporated into the wind speed determined from the appropriate map, and the importance factor is not used for determining velocity pressure using wind speeds from ASCE 7-10 maps.

A1.1.5 ASCE 7-10 recommends various internal and external pressure coefficients, which include gust response factors. These coefficients vary with the effective area of the cladding component, the location of the cladding component relative to building corners, and the configuration of the building (open versus enclosed). The internal and external pressure coefficients are taken from Table 26.11-1 and Figure 30.4-1 of ASCE 7-10. The effective area is taken as 10 ft<sup>2</sup> (the area of one piece