



Designation: D7856 – 21

Standard Specification for Color and Appearance Retention of Solid and Variegated Color Plastic Siding Products using CIE Lab Color Space¹

This standard is issued under the fixed designation D7856; 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 color and appearance retention of solid and variegated colored plastic siding products.

1.2 Color retention testing provides a method for estimating the acceptability of color change in a plastic siding product over an extended period of service.

NOTE 1—The exposure locations and durations specified in this standard have been shown to provide a good estimation of the color change in vinyl and polypropylene siding products over an extended period of service (see 2.2). It is expected that materials designed for the exposure conditions typical of exterior siding will respond similarly, but the applicability of this standard to other types of plastic siding has not been empirically established.

1.3 This specification is a successor to Specifications D6864 and D7251, which cover solid colors and variegated colors, respectively. This specification combines coverage for both, and has the same scope as those standards.

1.4 Specifications D6864 and D7251 use Hunter Lab color space for measurement of colors and evaluation of color change. These standards require classification of colors into regions based on the L, a, and b coordinates of the color, and evaluation of color changes is done using an ellipsoid value equation having unique coefficients for each color region. This specification uses CIE 1976 L* a* b* color space for measurement and evaluation of color change. Using this method, the need for separate color regions and evaluation equations has been eliminated.

1.5 Provisions for sample selection and preparation, and weathering are the same in this specification as in Specifications D6864 and D7251.

1.6 Characterization of color and appearance for variegated colors is complicated by the presence of multiple colors in a random pattern. The procedure for measuring variegated colors

in this specification is based on using a template to reference six spots for color measurement.

1.7 This standard specifies outdoor weathering in three specific climate zones for a single 24-month exposure, and the color retention performance requirements under these conditions are established to be indicative of acceptable performance over an extended period of service. However, nothing in this standard precludes the use of different or additional climate zones, or different exposure durations, so long as those conditions are clearly specified in any reports.

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

1.9 *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.

1.10 *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:²

- 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

¹ This test method 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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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.

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

- 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
- D2244** Practice for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates
- D4214** Test Methods for Evaluating the Degree of Chalking of Exterior Paint Films
- D6864** Specification for Color and Appearance Retention of Solid Colored Plastic Siding Products (Withdrawn 2018)³
- D7251** Specification for Color and Appearance Retention of Variegated Color Plastic Siding Products (Withdrawn 2018)³
- E29** Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications
- E1331** Test Method for Reflectance Factor and Color by Spectrophotometry Using Hemispherical Geometry
- G147** Practice for Conditioning and Handling of Nonmetallic Materials for Natural and Artificial Weathering Tests

2.2 Other Reference:

- VS2W** Vinyl Siding Institute (VSI) Technical Research Report for Weatherability of Vinyl Siding Products⁴

NOTE 3—The report cited in 2.2 supports the conclusion that commercial vinyl siding products which demonstrate weathering behavior within conformance to these standards during a two year test program are likely to provide acceptable color retention properties over an extended period of service. Unpublished long term weathering study data support a similar conclusion for polypropylene siding (see [Appendix X1](#)).

3. Terminology

3.1 *Definitions*—Definitions are in accordance with Terminologies **D883** and **D1600** unless otherwise noted.

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *polypropylene siding*—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 *temperate northern climate*—in weathering testing, a North American metropolitan area testing site within 73 to 100°W longitude and 37 to 45°N latitude.

3.2.3 *variegated plastic siding*—siding having discrete markings of different colors.

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

4. Significance and Use

4.1 This specification uses two-year outdoor weathering to provide an indication of the long-term color retention properties of plastic siding samples.

4.2 The methodology and procedures prescribed are only applicable to this specification.

4.3 The exposure locations and durations specified in this standard have been shown to provide a good estimation of the color change in vinyl and polypropylene siding products over an extended period of service (see 2.2). It is expected that materials designed for the exposure conditions typical of exterior siding will respond similarly, but the applicability of this standard to other types of plastic siding has not been empirically established.

4.4 The response of siding color samples to outdoor exposure is sensitive to differences in weather, and is subject to variation from year to year. Differences in exposure and weather patterns, including temperature, moisture, total radiant energy, and type and concentration of pollutants, also affect response in different climates. For this reason, samples are weathered in three distinct North American locations. Samples must show acceptable weathering performance at all three locations.

4.5 It has been shown (see 2.2) that most color change occurs during the first two years of outdoor exposure. After approximately two years, the rate of change levels off, and the degree of change observed after two years provides a significant indication of the overall degree of change that will be present through subsequent long-term exposure.

4.6 Studies involving vinyl siding and polypropylene siding support the applicability of the methods and criteria in this standard to plastic siding. As essentially all plastic siding uses either vinyl or polypropylene, no comparable studies of siding using polymers other than these two have been identified.

4.7 No method that is subject to the variables of outdoor weather can be expected to absolutely predict the degree of color change at a specific point in the future. However, the above results show that acceptability of color change measured after two-years of outdoor exposure correlates sufficiently to the long-term acceptability to provide an indication of the commercial viability of a color for long term use on customers' buildings, which is the purpose of this specification.

4.8 Criteria for acceptability were developed by correlating the results of visual evaluation of various colors and color differences to the measured degrees of color difference. Thus the performance requirements in Section 7 represent the human perception of the limits of acceptability of a measured color change.

5. Sampling and Specimen Preparation

5.1 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 4—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.

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

⁴ Available from Vinyl Siding Institute (VSI), National Housing Center, 1201 15th Street NW, Suite 220, Washington, DC 20005, <http://www.vinylsiding.org>.