



## Standard Specification for Rigid (Unplasticized) Poly(Vinyl Chloride) (PVC) Soffit<sup>1</sup>

This standard is issued under the fixed designation D 4477; 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 approval. 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 the materials, dimensions, camber, impact strength, weatherability, expansion, and appearance of extruded single-wall soffit manufactured principally 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 the manufacturer's product development and quality performance use only.

1.4 Rigid (unplasticized) poly(vinyl chloride) (PVC) siding is covered in Specification D 3679.

1.5 Soffit 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 soffit maintenance shall be obtained from the manufacturer.

NOTE 2—Soffit 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.<sup>2</sup>

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

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

1.7 *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 256 Test Methods for Impact Resistance of Plastics and Electrical Insulating Materials<sup>3</sup>

D 374 Test Methods for Thickness of Solid Electrical Insulation<sup>4</sup>

D 523 Test Method for Specular Gloss<sup>3</sup>

D 618 Practice for Conditioning Plastics and Electrical Insulating Materials for Testing<sup>3</sup>

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

D 696 Test Method for Coefficient of Linear Thermal Expansion of Plastics<sup>3</sup>

D 883 Terminology Relating to Plastics<sup>3</sup>

D 1435 Practice for Outdoor Weathering of Plastics<sup>3</sup>

D 1600 Terminology Relating to Abbreviations, Acronyms, and Codes for Terms Relating to Plastics<sup>3</sup>

D 1898 Practice for Sampling of Plastics<sup>3</sup>

D 2244 Test Method for Calculation of Color Differences from Instrumentally Measured Color Coordinates<sup>3</sup>

D 3679 Specification for Rigid (Unplasticized) Poly(Vinyl Chloride) (PVC) Siding<sup>5</sup>

D 3892 Practice for Packaging/Packing of Plastics<sup>6</sup>

D 4216 Specification for Rigid Poly(Vinyl Chloride) (PVC) and Related Plastic Building Product Compounds<sup>6</sup>

D 4226 Test Methods for Impact Resistance of Rigid Poly(Vinyl Chloride) (PVC) Building Products<sup>5</sup>

D 4756 Practice for the Installation of Poly(Vinyl Chloride) (PVC) Siding and Soffit<sup>5</sup>

D 5033 Guide for the Development of Standards Relating to the proper Use of Recycled Plastics<sup>6</sup>

E 631 Terminology of Building Constructions<sup>7</sup>

E 805 Practice for Identification of Instrumental Methods of Color or Color-Difference Measurement of Materials<sup>7</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> Refer to ASTM Research Report RR-D20-1144.

<sup>3</sup> Annual Book of ASTM Standards, Vol 08.01.

<sup>4</sup> Annual Book of ASTM Standards, Vol 10.01.

<sup>5</sup> Annual Book of ASTM Standards, Vol 08.04.

<sup>6</sup> Annual Book of ASTM Standards, Vol 08.03.

<sup>7</sup> Annual Book of ASTM Standards, Vol 04.07.

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

### 3. Terminology

3.1 *Definitions*—Definitions are in accordance with Terminologies D 883, D 1600, and E 631, 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 which 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 soffit*—soffit 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 soffit*—soffit 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 soffit*—soffit 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 soffit*—soffit 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 soffit*—soffit 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 soffit*—soffit 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 soffit*—soffit 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  $100^\circ\text{W}$  longitude and  $37$  to  $45^\circ\text{N}$  latitude.

3.2.11 *vinyl soffit, n*—a shaped material, made principally from rigid poly(vinyl chloride) (PVC) that is used to clad the underside of a roof overhang.

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

3.2.13 *white soffit*—soffit 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 soffit*—soffit 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 soffit, or soffit substrate, in case a capping technique is employed, shall be made principally of poly(vinyl chloride) (PVC) compound prepared from poly(vinyl chloride) (PVC) homopolymer resin that conforms to the requirements for Class 1, 2, or 3 (see Table 1).

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

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)

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 soffit containing 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. of notch (34.7 J/m of notch) at 0°C (32°F) when tested in accordance with Test Method D 256 the test specimen shall have a thickness of 0.125 in. (3.17 mm).

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 0.030 in. (0.8 mm) ± 10 % is required.

NOTE 4—**Caution:** The flammability testing data, conclusions, and recommendations of Test Method D 635 relate 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 soffit under actual fire conditions.

4.6 The PVC compound when extruded into soffit 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 soffit market application.

### 5. Physical Requirements

5.1 *Length and Width*—The nominal length and width of the soffit shall be as agreed upon between the purchaser and the seller. The actual length shall be within ±¼ in. (6.4 mm) of the nominal length and the actual width shall be within ±⅓ in. (3.2 mm) of the nominal width when measured in accordance with 6.3 and 6.4.

5.2 *Thickness*—The minimum thickness of the soffit shall be 0.030 in. (0.8 mm) when measured in accordance with 6.5.

5.3 *Camber*—A full length of soffit, typically 10 or 12 ft (3.05 or 3.66 m), will not have a camber greater than 1/8 in. (3.2 mm) when measured in accordance with 6.6.

5.4 *Initial Impact Resistance*—The soffit shall have a minimum impact strength of 45 in.·lbf (5.34 J) when tested in accordance with 6.7.

5.5 *Coefficient of Linear Expansion*—The soffit 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 6.8.

5.6 *Gloss*—This requirement is not applicable to embossed or perforated soffit). The gloss of smooth soffit shall be uniform across the exposed face. Variations in the glossmeter readings shall not be more than  $\pm 10.0\%$  or  $\pm 5.0$  points, when tested in accordance with 6.10.

5.7 Deflection of the soffit shall not exceed  $\pm 1/8$  in. (3.2 mm) when installed flat in a horizontal position over a span of 24 in. (610 mm) without intermittent support when tested in accordance with 6.12.

5.8 *Color*—The color of the soffit shall be within the defined color space parameters (3.2.3 to 3.2.14) for the specific color agreed upon between the purchaser and the manufacturer. The color specified shall be uniform on the surface of the soffit panels, except in the case of multi-colored woodgrain panels.

5.8.1 *Uniformity of Color*—When tested in accordance with 6.11, the total color change,  $E$ , 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 shall not change by more than  $\pm \Delta a = 1.0$  and  $\pm \Delta b = 1.0$ .

#### 5.9 *Weathering:*

5.9.1 The soffit 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 6.9.

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

NOTE 6—Weathering conformance testing requirements are to reflect performance of a “typical” extrusion soffit 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 soffit profiles produced in this color. The lengthy outdoor weatherability testing for new products may be performed concurrently with market development and sales of soffit to existing markets. Completion of weatherability testing prior to marketing of the product is not required.

## 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 soffit 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 soffit.

6.5 *Thickness*—Make a minimum of five equally spaced measurements across the width of the soffit specimen perpendicular to the exposed surface with a micrometre 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). Average the measurements. The average constitutes the thickness of the soffit.

6.6 *Camber*—Place a full length of soffit (typically 10 or 12 ft (3.05 or 3.66 m), on a flat surface alongside a straightedge at least as long as the soffit specimen. Measure the maximum space between the edge of the siding specimen and the straightedge for each edge to the nearest 1/16 in. (1.6 mm).

6.7 *Impact Resistance*—Test impact resistance of soffit in accordance with Test Methods D 4226, Procedure A (use impactor head configuration H.25), except that conditioning time for quality control tests shall be at least 1 h.

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

#### 6.9 *Weatherability:*

6.9.1 Expose extruded specimens (from soffit panels or extruded sheet of typical soffit panel thickness) 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.

6.9.2 Make exposures in accordance with Practice D 1435.

6.9.3 Install plywood-backed soffit panels horizontally on a flat, rigid frame, attached to a vertical wall made up of white siding, to simulate actual usage. (Refer to Fig. 1.) The vertical wall shall face south.

6.10 *Gloss*—Measure gloss with a reflection meter<sup>8</sup> in accordance with Test Method D 523, except that a 75° incident angle shall be used.

#### 6.10.1 *Procedure:*

<sup>8</sup> Photovolt reflection meter, Model 610 with search unit 699-7, available from Photovolt Co., 1115 Broadway, New York, NY 10010, or Gardner Portable Glossmeter, Model GG7275A, GG7275B, or GG7275C, available from Byk-Gardner, Inc., 2435-T Linden Lane, Silver Spring, MD 20910, or equivalent, is suitable.

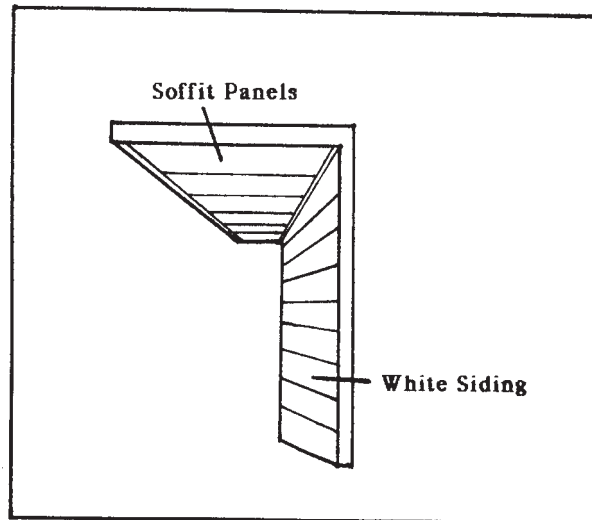


FIG. 1 Soffit Weatherability Test Frame

6.10.1.1 Measure gloss on one piece of soffit on at least three widely separated points across the width of the exposed surface. The area to be tested must be flat.

6.10.1.2 Each reading shall be within the limits specified in 5.6.

6.10.1.3 This test method is not applicable to embossed or perforated soffit.

6.11 *Color Uniformity*—Calculate the difference between the  $L_H$ ,  $a_H$ ,  $b_H$  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,  $E$ , between the production specimen and the reference specimen in accordance with Test Method D 2244.

6.12 *Deflection:*

6.12.1 *Specimen Preparation*—Three pieces of soffit, 30 in. (762 mm) long, are prepared and conditioned at room temperature for 24 h.

6.12.2 *Apparatus*—Two parallel supporting beams, ½ in. (12.7 mm) wide at the same level of elevation and 24 in. (610 mm) apart, are set up with the provision of measuring height distance at the center of the beams.

6.12.3 *Procedure*—Interlock the three pieces of soffit panel with ends being in line. Position the soffit unit across the support beams so that the ends of the unit are equidistant from the outside edges of the beams. The panel center area is compared in height distance to the height of the support beams and any deviation is recorded.

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 Soffit conforms to all the requirements established in ASTM Specification D 4477, developed cooperatively with the industry and published by the American Society for Testing and Materials.

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 4477, (name and address of producer or distributor).”

8. **Packing, Packaging, and Package Marking**

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

8.2 The provisions of Practice D 3892 shall apply to this specification.

9. **Keywords**

9.1 plastic building products; plastic weatherability; recycled plastics; rigid PVC soffit; weatherability color-hold guidelines



**APPENDIX**
**(Nonmandatory Information)**
**X1. COLOR-HOLD GUIDELINES WEATHERABILITY TESTING**
**INTRODUCTION**

Color-hold guideline weatherability testing provides a predictive method for estimating the acceptability of color change in a soffit product over a period of years of service. It has been shown that commercial soffit products which demonstrate weathering behavior within reasonable conformance to these target guidelines during a two-year test program may be anticipated to weather for extended periods of many years without exhibiting unacceptable color changes.

**X1.1 Scope**

X1.1.1 Color-hold guidelines provide boundary target color regions within a three-dimensional model, which constitutes acceptable appearance retention levels of color change resulting from weathering of a specific soffit product type, formulation, and color. Each color region is defined by the manufacturers of vinyl soffit (nine color regions presently defined) as specific color-hold guidelines.

X1.1.2 Regardless of where a specific color falls within the region, it becomes the control on each of the three graphs plotting color difference of each manufacturer's soffit formulation and color. It should be observed that color-hold guidelines are controlled by specific product application such as soffit, since they are developed using the perspective of the manufacturers of soffit products for that application.

X1.1.3 These predictive tests are designed for a soffit manufacturer's product development and quality performance use only and are not for specification or regulatory use.

**X1.2 Establishing the Soffit Color Regions**

X1.2.1 The soffit manufacturer's color panel uses the following steps to establish the soffit color regions:

(1) All commercial unweathered soffit colors are divided into rational similar color regions representing a visibly definable hue (white, dark grey-blue, light grey-blue, green, dark beige, light beige, gold, yellow, and grey). Each color is then measured in Hunter  $L$ ,  $a$ ,  $b$  units and plotted in color space.

(2) The color region itself was then defined by the extreme Hunter  $L$ ,  $a$ ,  $b$  units within the population of colors. Refer to 3.2.5 to 3.2.14.

(3) Any specific color being evaluated within the color region becomes the control for color-difference studies. Refer to X1.5.

(4) Simulated two-year weathered samples for each color region encompassing areas within that region are prepared.

(5) A visual examination and rating of each simulated weathered sample is conducted by a panel of soffit manufacturers and color specialists to establish a visual average rating of limits of acceptability of color change for the soffit application. After visual examination, the acceptable delta ( $\Delta$ ) limits plotted three dimensionally and considered preliminary limits.

(6) Real world data from two-year weathering studies in Florida, Arizona, and temperate Northern climate test sites

were then plotted in terms of change of Hunter  $L$ ,  $a$ ,  $b$  from the control for each of the colors within that region.

(7) The final reference ellipses of color-hold guidelines for each region are then established by adjustment of the preliminary data by use of the real world data. Refer to X1.5.

(8) Concurrent with development of the color-hold guidelines for each color region, outdoor weathering of all commercial soffit samples is continued in Florida, Arizona, and Northern temperate climate sites in a ten-year program followed each five years by a new study including new soffit colors and formulations representing current commercial products. By use of this program, the relation between two-year predictive color-hold guidelines and real-world longterm weathering can be ensured.

**X1.3 Summary of Procedure for Measuring Weatherability**

X1.3.1 Flat section specimens cut from finished product soffit are exposed in a dry, hot climate such as Phoenix, AZ; a hot, humid climate such as Miami, FL; and a temperate northern climate.

X1.3.2 Color change due to weather exposure at each exposure site is measured after six months, one year, and two years of exposure.

X1.3.3 The acceptability in the change in color resulting from weathering at each test site and exposure frequency is determined by reference to the appropriate color-hold guideline ellipses for that specific color.

**X1.4 Sampling and Specimen Preparation**

X1.4.1 Select samples in conformance with Practice D 1898. The samples shall be representative of the soffit product to be qualified.

X1.4.2 If commercial parts are to be used, they shall be cut into specimens that are flat and are free of any imperfections. Cut sufficient number of specimens to allow removal of a specimen at each weathering time interval specified at each testing site plus retained, unweathered specimens. Alternatively, samples can be washed, measured, and returned to the test site. Samples prepared in the laboratory by a similar process may be used as an alternative to a commercial sample. The laboratory sample must be extruded under similar conditions to those used to prepare the commercial product.

X1.4.3 The thickness of any test specimen must be the same thickness as the commercial product and must differ from the average test specimen by no more than 10 %.

**X1.5 Weathering Practice**

X1.5.1 Prepare test specimens in accordance with X1.4.

X1.5.2 Mark each specimen permanently so as to ensure retention of identity during and after weathering.

X1.5.3 Measure in replicate the original tristimulus X, Y, and Z values for each specimen using 2° observer and Illuminant C, specular components included, in accordance with Practice E 805. Calculate the Hunter  $L_H$ ,  $a_H$ , and  $b_H$  units in accordance with the equations in the section on Hunter L, a, and b Color Space and Color-Difference Equation in Test Method D 2244. Use the average of the replicate measurements and record them in a permanent record.

X1.5.4 Weather specimens at an angle of 45°S, plywood backed in accordance with Practice D 1435 in a hot, dry climate, such as Phoenix, AZ; a hot, humid climate, such as Miami, FL; and in a temperate northern climate. Remove specimens for testing after six months, one year, and two years of exposure.

X1.5.5 It is recommended that exposed specimens be evaluated for color characterization at the test site. If this practice is not possible, use an expedient shipping procedure to minimize time between exposure and testing. Color measurement shall be completed within seven days after removal from the exposure rack.

X1.5.6 Wash the exposed specimens gently with cheesecloth in warm deionized or distilled water, unless the dirt pickup is a variable being studied.

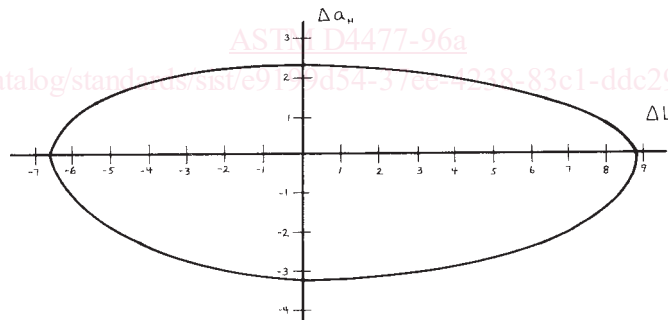
X1.5.7 Measure and record color of the exposed specimens in accordance with X1.5.3 after each exposure frequency.

X1.5.8 Calculate and record the change in  $L_H$ ,  $a_H$ , and  $b_H$  color coordinates for each specimen exposure frequency by reference to the original color (X1.5.3) and the exposed color (X1.5.7).

X1.5.9 Note and record any nonuniform change in color on any specimen.

X1.5.10 Determine the acceptability of the change in color resulting from weathering at each test site and exposure frequency by reference to the appropriate series of color-hold guideline ellipses for that specific color. The target three-dimension color space is plotted as guideline ellipses for each color ( $\Delta a_H$  versus  $\Delta b_H$ ), ( $\Delta a_H$  versus  $\Delta L_H$ ), and ( $\Delta b_H$  versus  $\Delta L_H$ ) in Figs. X1.1-X1.27. For example, in the case of dark gray-blue siding, use Fig. X1.1, Fig. X1.2, and Fig. X1.3. Plot the specific change in the color coordinates when compared to the unweathered specimen color coordinates (X1.5.3) by plotting on each of the guideline ellipses for that color. To meet the color-hold guidelines, the plotted change in color for  $\Delta a_H$ ,  $\Delta b_H$ , and  $\Delta L_H$  must fall essentially within the acceptance regions in all three color ellipses.

X1.5.11 Report any deviation and extent of deviation from the target guideline ellipses by  $\Delta a_H$ ,  $\Delta b_H$ , and  $\Delta L_H$  for any test site and exposure frequency. Report any deviation from uniform color change in any specimen. Report any other appearance change in any specimen.



**FIG. X1.1 Dark Gray-Blue Siding ( $\Delta a_H$ -  $\Delta b_H$ ) Color-Hold Guidelines**