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FOREWORD

This seventh edition of ASTM Standards on Color and Appearance Measurement continues the series as originally conceived by Richard S. Hunter, (former Chairman, Committee E-12). It includes all revisions to existing standards made since the publication of the sixth edition as well as a number of new standards. This publication was compiled by the ASTM Technical Committee E-12 on Color and Appearance. It is intended to provide guidance in the instrumental and visual appraisal of the appearance of materials, to include specific measurement instruments and techniques for their use. Appearance appraisal involves standard illuminants and observers, as well as actual light sources and human observers. Materials include those which reflect and transmit light, and which are self-luminous. 113 ASTM standards are included, most of which relate to a variety of materials. Titles only of 146 additional ASTM standards are given where applicable to only one class of materials or where appearance is only a small part of the overall standard.

The Introduction and accompanying tables continue to provide a basic overview of the science of appearance. While it is not intended to be an all encompassing reference, the important distinctions between the various optical properties of materials are covered along with the appropriate standard test methods. Several U.S. industry specific organizations also have standards for the analysis of appearance of materials. For the purpose of identification, the applicable methods of three of these industries are listed in the tables. Table 4 lists titles of 26 TAPPI (Technical Association of the Pulp and Paper Industry) standards that are applicable to paper products. Table 4A lists three AATCC (American Association of Textile Chemists and Colorists) methods and seven Evaluation Procedures applicable to textile materials. Table 4B lists twelve SAE (Society of Automotive Engineers) methods applicable to automotive materials. Table 4C lists 16 selected ISO and JIS standards applicable to appearance measurement for several different types of materials.

In Tables 5, 6, and 7, the standards are arranged according to optical characteristics of specimens, optical appearance attributes involved, and industries from which the standards come.

As before, user comments have guided us as to which standards should be included. Suggestions and comments to enhance the usefulness of future editions of this compilation are always welcome and should be addressed to Product Manager, Publications, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.

Richard W. Harold
Chairman, ASTM E12.95

D 4890-98(2003)	*Test Method for Polyurethane Raw Materials: Determination of Gardner and APHA Color of Polyols (see Vol 08.03)*
D 4941-89 (1999)$^{\varepsilon 1}$	*Practice for Preparing Drawdowns of Artists' Paste Paints (see Vol 06.02)*
D 4960-89 (1998)	*Method for Evaluation of Color for Thermoplastic Traffic Marking Materials (see Vol 06.02)*
D 5007-99 (2003)	*Test Method for Wet-to-Dry Hiding Change (see Vol 06.02)*
D 5010-03	*Guide for Testing Printing Inks and Related Materials (see Vol 06.02)*
D 5053-03$^{\varepsilon 1}$	*Test Method for Colorfastness of Crocking of Leather (see Vol 15.04)*
D 5146-03	*Guide to Testing Solvent-Borne Architectural Coatings (see Vol 06.02)*
D 5150-92 (2003)	*Test Method for Hiding Power of Architectural Paints Applied by Roller (see Vol 06.02)*
D 5180-93 (1998)	*Test Method for Quantitative Test for Turbidity in Clear Liquids (see Vol 06.03)*
D 5215-93 (1999)	*Test Method for Instrumental Evaluation of Staining of Vinyl Flooring by Adhesives (see Vol 15.06)*
D 5324-03	*Guide to Testing Water-Borne Architectural Coatings (see Vol 06.02)*
D 5343-97	*Guide for Evaluating Cleaning Performance of Ceramic Tile Cleaners (see Vol 15.04)*
D 5382-02	*Guide to Evaluation of Optical Properties of Powder Coatings (see Vol 06.02)*
D 5383-02 (2003)	*Practice for the Visual Determination of the Light-fastness of Art Materials by Art Technologies (see Vol 06.02)*
D 5398-97 (2003)	*Practice for the Visual Evaluation of the Light-fastness of Art Materials by the User (see Vol 06.02)*
D 5548-99	*Guide for Evaluating Color Transfer or Color Loss of Dyed Fabrics in Laundering (see Vol 15.04)*
D 5552-00	*Test Method for Resistance of Colored Leather to Bleeding (see Vol 15.04)*
D 5626-94 (2001)	*Test Methods for U.S. Postal Service Optical Measurements for Small Areas (see Vol 15.09)*
D 5814-02	*Practice for Determination of Contamination in Recycled Poly(Ethylene Terephthalate) (PET) Flakes and Chips Using a Plaque Test (see Vol 08.03)*
D 6279-03	*Test Method for Rub Abrasion Mar Resistance of High Gloss Coatings (see Vol 06.02)*
D 6288-98 (2003)	*Practice for Separation and Washing of Recycled Plastics Prior to Testing (see Vol 08.03)*
D 6409-99	*Practice for Color Tests with Sheepskin Skivers (see Vol 15.04)*
D 6441-99a$^{\varepsilon 1}$	*Test Methods for Measuring the Hiding Power of Powder Coatings (see Vol 06.02)*
E 202-00	*Test Method for Analysis of Ethylene Glycols and Propylene Glycols (see Vol 15.05)*
E 388-72 (1998)	*Test Method for Spectral Bandwidth and Wavelength Accuracy of Fluorescence Spectrometers (see Vol 03.06)*
E 460-88 (2003)$^{\varepsilon 1}$	*Practice for Determining Effect of Packaging on Food and Beverage Products During Storage (see Vol 15.08)*
E 925-02	*Practice for Monitoring the Calibration of Ultraviolet-Visible Spectrophotometers Whose Spectral Slit Width Does Not Exceed 2 nm (see Vol 03.06)*
E 958-93 (1999)	*Practice for Measuring Practical Spectral Bandwidth of Ultraviolet-Visible Spectrophotometers (see Vol 03.06)*
E 971-88 (2003)	*Practice for Calculation of Photometric Transmittance and Reflectance of Materials to Solar Radiation (see Vol 12.02)*
E 972-96 (2002)	*Test Method for Solar Photometric Transmittance of Sheet Materials Using Sunlight (see Vol 12.02)*
E 973-02	*Practice for Determination of the Spectral Mismatch Parameter Between a Photovoltaic Device and a Photovoltaic Reference Cell (see Vol 12.02)*
E 1084-86 (2003)	*Test Method for Solar Transmittance (Terrestrial) of Sheet Materials Using Sunlight (see Vol 12.02)*
E 1135-97 (2003)	*Test Method for Comparing the Brightness of Fluorescent Penetrants (see Vol 03.03)*
E 1175-87 (2003)	*Test Method for Determining Solar or Photopic Reflectance, Transmittance, and Absorptance of Materials Using a Large Diameter Integrating Sphere (see Vol 12.02)*
E 1264-98	*Classification for Acoustical Ceiling Products (see Vol 04.06)*
E 1422-01	*Guide for Test Methods for Forensic Writing Ink Comparison (see Vol 14.02)*
E 1733-95 (2002)	*Guide for Use of Lighting in Laboratory Testing (see Vol 11.05)*
F 843-98 (2003)	*Test Method for Assessing the Color Strength and Dispersibility of Alkali Blue Pigment in Hot Melt Carbon Copy Paper Ink (see Vol 15.09)*
F 974-96 (2001)	*Test Method for Determination of the Color Response of an Electrostatic Copying System, Black and White Output (see Vol 15.09)*
F 1037-87 (1998)	*Test Method for Visual Rating of Appearance of Resilient Floors After In-Service Exposure to Foot Traffic (see Vol 15.04)*
F 1048-87 (1999)	*Test Method for Measuring the Effective Surface Roughness of Optical Components by Total Integrated Scattering (see Vol 10.04)*
F 1206-94 (2000)	*Test Method for Evaluating Color Image Output from Color Printers and Copiers (see Vol 15.09)*
F 1252-89 (2002)	*Test Method for Measuring Optical Reflectivity of Transparent Materials (see Vol 15.03)*
F 1316-90 (2002)	*Test Method for Measuring the Transmissivity of Transparent Parts (see Vol 15.03)*
F 1514-03	*Test Method for Measuring Heat Stability of Resilient Flooring by Color Change (see Vol 15.04)*
F 1515-03	*Test Method for Measuring Light Stability of Resilient Flooring by Color Change (see Vol 15.04)*
F 1595-00	*Practice for Viewing Conditions for Visual Inspection of Membrane Switches (see Vol 10.04)*
F 1843-97 (2002)	*Practice for Sample Preparation of Transparent Plastic Films for Specular Gloss Measurements, on Membrane Switch Overlays (see Vol 10.04)*
F 1863-98	*Test Method for Measuring the Night Vision Goggle-Weighted Transmisivity of Transparent Parts (see Vol 15.03)*
F 1944-98 (2003)	*Practice for Determining the Quality of the Text, Line- and Solid-Fill Output Produced by Ink Jet Printers (see Vol 15.09)*
G 104-89 (1993)	*Test Method for Assessing Galvanic Corrosion Caused by the Atmosphere (see Vol 03.02)*

INTRODUCTION

1. Uses of Measurements of Appearance

1.1 *Complexity of Total Appearance and Limited Applicability of Specific Appearance Scales*—Involving, as it does, potentially infinite variations in both chromatic (spectral) and geometric (spatial) distributions of light by objects and materials, total appearance is very complex. It is only feasible with instruments to measure specific attributes of appearance that are important for specific applications. These test methods, which do exist, have proved to be valid and useful for identifying and controlling product appearance, even though they measure only partial (not total) appearance.

1.1.1 Numerical measurements of the various attributes of the appearance of materials are used for the purposes in the industries listed in Table 1.

1.1.2 Appearance measurements are used to provide scientists, engineers, and technologists with quantitative permanent data about important attributes of products.

1.1.3 Measurements are needed because the eye, though versatile, cannot assign numbers suitable for records or for quantitative comparisons. Thus, the justifications for appearance measurements are as follows:

1.1.3.1 They assign numbers and thus facilitate communication about appearance.

1.1.3.2 They employ standardized conditions of observation and provide permanent records.

1.1.3.3 They can be selected to have specific observing conditions critical for the product at hand.

1.1.3.4 They can be used in conjunction with computations to derive formulations which are fundamentally more accurate than formulations by skilled artisans, and

1.1.3.5 They can be used to guide improvement of product quality and saving of money in a variety of ways.

2. Distinctions Between the Attributes of Appearance

2.1 *Spectral and Geometric Attributes*—Objects and materials are seen by how they affect the light that falls on them. The measurable attributes of appearance divide broadly into two categories: spectral (having to do with color) and geometric (having to do with the spatial distribution of light, for example, gloss, haze, etc.). The spectral or color attributes are the most important commercially, but it is necessary, when considering overall appearance and when selecting conditions for the measurement of color, that geometric characteristics of light distribution by the objects be considered. Simple changes in the gloss, roughness, or texture of a surface can cause noticeable changes in its color attributes.

2.1.1 Changes in the gloss, roughness, or texture of a surface can cause noticeable changes in its color attributes. Gloss can be thought of as one end of a texture scale. In this scale high gloss represents zero texture, and such specimens feel smooth to the touch. As gloss is reduced, the texture increases and the tactile correlation continues, so that a very low gloss, or matte, surface feels much rougher than a high gloss surface. This level of texture is not visible to the unaided eye, but can be readily seen under magnification. As texture increases it becomes visible. If the texture is regular and uniform, as with a woven fabric, correlation can be determined between change in texture and change in color appearance or measurement or both. If the texture is directional in nature as often occurs with fabrics, this needs to be taken into account. Texture can be measured by many different techniques; however, goniophotometry and image analysis are two of the more popular methodologies.

As texture increases its importance visually it often requires that it be rated on a visible texture scale, apart from color. Such a scale can be produced from a graded series of the product itself, or from pictures showing specimens of increasing texture. Computer image manipulation, or "morphing" can also produce texture scales. Standardizing illumination and viewing angles becomes very important when comparing pictures of textures with actual three-dimensional specimens. Texture scales benefit from psychophysical scaling, as described in the next sub-section.

2.2 *Physical and Psychophysical Attributes*—A second important distinction in classifying appearance measurements is that between measurements of complete spectral and geometric distributions, which can be called physical, and measurements of quantities chosen specifically to correlate with visual estimates. These latter are called psychophysical since they are physical measurements designed specifically to correlate with the various attributes of object appearance. One must always remember that the eye is not looking at a single spot or area on the surface of a specimen (as an instrument does). Where feasible, multiple-area measurements of a specimen (or multiple specimens where appropriate) and averaging can reduce the variability often associated with color measurement (see ASTM Practice E 1345).

2.2.1 Table 2 is intended to summarize the distinctions between the physical and the psychophysical attributes of appearance as well as those between the spectral and geometric. In Table 2, there are spectrophotometric curves giving physical analyses of the distribution of light responsible for color, and there are goniophotometric curves giving physical analyses of spatial distributions responsible for the geometric attributes such as gloss. Also in Table 2, there are the psychological or visual attributes of appearance which one normally sees and speaks of in his visual recognition of the corresponding attributes.

TABLE 1—Numbers for Standards Listed by Materials Tested and Their Appearance Attributes

Materials	All Materials	Palats, Coatings, Plastics, Resins, Inks, Oils	Dyes, Pigments, and Colorants	Textiles, Detergents, and Polishes	Papers and Printing	Building Materials and Ceramics	Bare Metals	Signalling Materials
Spectral (Color) Variables:	E 1331				T 2722			
Spectral data	E 308, E 1164, E 805	E 308		AATCC EP6	ISO 13655, T 524, T 527, T 1209, T 442			
Tristimulus	E 308, E 805	E 308, D 3134		AATCC EP6, ISO 105-J01	T 527, T 442, ISO 13655			
color: Y, x, y or L, a, b	D 3134, E 1164, E 1331, E 1345, E 1347, E 1348, E 2022	D 5379 ISO 7724-1 ISO 7724-2						
Color systems	D 1535, E 1360	D 1535						
Color difference	D 2244, D 1729, D 2616, E 805	D 2244, D 3134, D 1500, D 2616, ISO 7724-3, SAE J1545		AATCC EP6, ATCC 173, SAE J1545, ISO 105-J03	T 1215	C 609		
Yellowness, whiteness, reflectance factor	D 1925, E 313, E 450, D 1209, D 1544, D 2851, E 1349	D 1925, D 1209, D 2430, D 1544, D 1500, D 156, E 450, E 313, D 3349, D 2851, D 5386	T 626, D 387, D 3022, D 2745	D 2253 D 3430, D 4008, AATCC 110, ISO 105-J02	T 1216, T 452, T 525, T 534, T 646, D 985, E 1651	C 523, E 97, C 110, E 1477		F 768, D 4061, E 811, E 1696, E 1709, E 1710, E 1743
Fading	D 2616	D 659, D 2616		AATCC 16				
Color standards	D 5513, E 259				T 1217, TIS 0804-07			
Fluorescence/ Photoluminescense	E 991, E 1247, E 2030, E 2072, E 2073, E 2152, E 2153, E 2301, F 923			ISO 105-J02, AATCC 110	T 1218			
Metamerism		D 4086						
Geometric (Gloss, Turbidity, etc.) Variables:								
Goniophotometry	E 167, E 430, E 179						E 430	E 808, E 809, E 810
Gloss specular	D 523, T 480	D 523, D 4449, D 3928, ISO 2813, D 2457			T 480, D 1834	D 523, C 346, C 584, D 1455	E 430	
Gloss, distinctness- of-image	E 430	E 430, D 881, D 1746				D 540, E 770	E 430	
Gloss, contrast or luster	E 430						E 430	
Haze: Refl., Trans.	D 1003, D 4030	D 1889, D 4039		AATCC 148	E 430		E 429, E 430	
Opacity, turbidity, transmittance factor	D 1889, D 881	D 344, D 2747, D 1494, D 1746, D 4061, D 2090			T 1214	C 523, C 347		F 768
Definitions, etc.	E 284	E 284			T 1213			
Materials Not Listed:								
Foods		Visual Display Units						
Pharmaceuticals		Radiant Sources						
Plant and animal life								

Table 2—Distinctions Between Spectral and Geometric Attributes in the Appearance of Objects

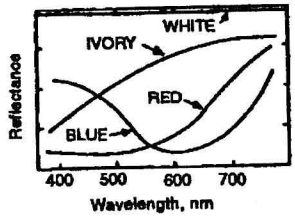
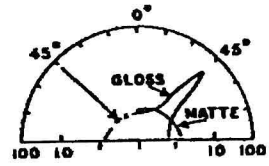
Category	Spectral (Color) Attributes	Geometric (Spatial) Attributes
Physical Analyses	Spectrophotometric curves	Goniophotometric curves
		
Psychological (visual)	Color: Hue Chroma Lightness or one of the geometric attributes in the next Column	Luminous intensity: Lightness (by diffuse relfection) Gloss (by specular reflection) Lightness (by diffuse transmission) Transparency (by regular transmission) (clarity)
Basis of Psychophysical Measurement	Ability of human observer to match color of any object by adding proper amounts of three colored primary lights	Comparisons with ideal objects that either diffuse light perfectly or are perfectly nondiffusing
Psychophysical Quantities with Symbols	Chromaticity (hue and saturation together) may be any of the following pairs of attributes: (1) Chromaticity coordinates (x,y) (2) Dominant wavelength (λ), purity (p) (3) Redness-greenness (a) yellowness-blueness (b) (4) CIE 1976 a,b chroma (C^*_{ab}), CIE 1976 a,b hue-angle (H_{ab})	Reflectance factor (R) (total R; diffuse R_d; spcular R_S) Lightness ($L = 10\sqrt{\ }\ Y$) Gloss (R_S, G_S, G_C, etc.) Transmittance factor (T) (total T; diffuse T_d, regular T_r)

Table 2 identifies the bases by which appearance correlating measurements are derived from the purely physical. The symbols and psychophysical quantities which are measured to give numbers correlating with the attributes seen visually are also included in Table 2.

2.3 *Geometric Classes of Objects*—To select geometric conditions for appearance measurement, objects and materials are divided into the following four classes, depending on whether they only reflect light, or also transmit light, and depending on whether they distribute most of the light that leaves them diffusely or specularly:

2.3.1 Diffusely reflecting opaque nonmetal surfaces,

2.3.2 Specular reflecting metallic surfaces,

2.3.3 Translucent (diffusely transmitting and reflecting) materials, and

2.3.4 Transparent films, sheets, and volumes.

2.4 Table 3 lists the four optical classes that result when one makes these separations and identifies the dominant geometric mode of light distribution and corresponding appearance attributes of each. The majority of products measured instrumentally are diffusely reflecting nonmetals.

3. Breakdown of Standards on Appearance

3.1 Table 4 lists titles of 18 TAPPI standards and eight TAPPI Technical Information Sheets (T1212–T1219) relating to optical properties measured in the paper industry. Table 4A lists the AATCC test methods applicable to the textile industry. Table 4B lists the SAE methods applicable to the automotive industry. Table 4C lists 16 selected ISO and JIS standards applicable to appearance measurement. Tables 5, 6, and 7 arrange the titles of the same standards by appearance attribute and by materials or product(s) measured.

3.2 Table 5 lists, by appearance attributes, published standards applicable to diffusely reflecting materials. Table 6 lists standards applicable to various types of light-transmitting and metallic (specular reflecting) materials. Table 7 includes the titles of standards on a variety of subjects related to the measurement of appearance. Some of these subjects are terminology, material standards, specimens, and composite test programs, designed to analyze thoroughly each given product. These composite standards are lengthy, with only a small section of each standard devoted to appearance analysis.

Table 3—Classification of Objects According to Their Geometric Distributions of Light

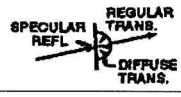
Object Class	Idealized Distribution of Light	Dominant Appearance Attribute	Other Appearance Attributes
Diffusely Reflecting Opaque Nonmetals Painted Panel Ceramic Tile Heavy Fabric Pad of Paper		Color (chromaticity and lightness): by diffuse reflections	Gloss: by specular reflection
Specularly Reflecting Opaque Metals Auto Bumper Brass Doorplate		Color (chromaticity and glass): by specular reflection	Haze or diffuseness: by diffuse relfection
Translucent Plastic Light Enclosure		Color (chromaticity and lightness): by diffuse transmission	Gloss: by specular reflection; and color: by diffuse reflection
Transparent Vegetable Oil Sunglass Lens		Color (chromaticity and transparency): by regular transmission	Gloss: by specular reflection; and haze or turbidity: by diffuse transmission

TABLE 4—Titles of TAPPI Standards and Technical Information Sheets Applicable to the Appearances of Paper Materials[A]

TAPPI Method	Title
T 218	Forming Handsheets for Reflectance Tests of Pulp (Buchner Funnel Procedure)
T 272	Forming Handsheets for Reflectance Tests of Pulp (Sheet Machine Procedure)
T 425	Opacity of Paper (15°/Diffuse Illuminant A, 89% Reflectance Backing and Paper Backing)
T 442	Spectral Reflectance Factor, Transmittance, and Color of Paper and Pulp (Polychromatic Illumination)
T 452	Brightness of Pulp, Paper and Paperboard (Directional Reflectance at 457 nm)
T 480	Specular Gloss of Paper and Paerboard at 75 Degrees
T 515	Visual Grading and Color Matching of Paper
T 519	Diffuse Opacity of Paper (Paper Backing)
T 524	Color of Paper and Paperboard (45/0 Geometry)
T 525	Diffuse Brightness of Pulp (*d*/0°)
T 527	Color of Paper and Paperboard (*d*/0 Geometry)
T 534	Brightness of Clay and Other Mineral Pigments (diffuse blue reflectance)
T 560	CIE Whiteness and Tint of Paper and Paperboard (using *d*/0° diffuse Illumination and Normal Viewing)
T 562	CIE Whiteness and Tint of Paper and Paperboard (using 45°/0° Direct Illumination and Normal Viewing)
T 567	Determination of Effective Residual Ink Concentration by Infared Reflectance Measurement
T 571	Diffuse Brightness of Paper and Paperboard
T 646	Brightness of Clay and Other Mineral Pigments (45°/0° Directional)
T 653	Specular Gloss of Paper and Paperboard at 20°
T 1212	Light Sources for Evaluating Paper Including Those Containing Fluorescent Whitening Agents
T 1213	Optical Measurements Terminology (Related to Appearance Evaluation of Paper)
T 1214	Interrelation of Reflectance, R_0; Reflectivity, R_∞; and TAPPI Opacity, Scattering, S; and Absorption, K.
T 1215	The Determination of Instrumental Color Difference
T 1216	Indices for Whiteness, Yellowness, Blue Reflectance Factor and Luminous (Green) Reflectance Factor
T 1217	Photometric Linearity of Optical Properties Instruments
T 1218	Calibration of Reflectance Standards for Hemispherical Geometry
T 1219	Storage of Paper Samples for Optical Measurements and Color Matching

[A] From: 2003 TAPPI Test Method; TAPPI; Technology Park/Atlanta; P.O. Box 105113; Atlanta, GA 30348-5113; USA.

TABLE 4A—Titles of AATCC Test Methods Applicable to Appearances of Textile Materials[A]

AATCC Designation	Title
Test Method 16-1998	Colorfastness to Light
Test Method 110-1995	Whiteness of Textiles
Test Method 173-1998	CMC: Calculation of Small Color Differences of Acceptability
Evaluation Procedure 1	Gray Scale for Color Change
Evaluation Procedure 2	Gray Scale for Staining
Evaluation Procedure 4	Standard Depth Scales for Depth Determination
Evaluation Procedure 6	Instrumental Color Measurement
Evaluation Procedure 7	Instrumental Assessment of the Change in Color of a Test Specimen
Evaluation Procedure 8	AATCC 9-Step Chromatic Transference Scale
Evaluation Procedure 9	Visual Assessment of Color Difference of Textiles

[A] From 2004 Technical Manual of the American Association of Textile Chemists and Colorists; P.O. Box 12215; Research Triangle Park, NC 27709-2215; USA. In addition, thirty-eight different procedures (each with test method number) are given for simulating various service exposures of textiles, followed by ratings of colorfastness, either visually by the gray scale (Procedures 1 or 2), or instrumentally (Procedures 6 or 7), followed by Gray Scale equivalent ratings.

TABLE 4B—Titles of SAE Standards Applicable to Appearances of Automotive Materials[A]

SAE Designation	Title
Colors	
SAE J361 APR96	Procedure for Visual Evaluation of Interior and Exterior Automotive Trim
SAE J1326 FEB85	Test Method for Measuring Wet Color Transfer Characteristics
Lighting Devices	
SAE J578 JUN95	Color Specification
Measurement	
SAE J1545 JUN86	Instrumental Color Difference Measurement for Exterior Finishes, Textiles, and Colored Trim
SAE Standards for Retroreflection	
J292	Snowmobile and Snowmobile Cutter Lamps, Reflective Devices and Associated Equipment
J594	Reflex Reflectors
J2041	Reflex Relectors fro Use on Vehicles 2032 mm or More in Overall Width
J576	Plastic Materials for Use in Optical Parts Such as Lenses and Reflex Reflectors of Motor Vehicle
Lighting Devices	
J774	Emergency Warning Device (Triangular Shape)
J943	Slow-Moving Vehicle Identification Emblem
J1339	Photometry Laboratory Accuracy Guidelines
J1967	Retroreflective Materials for Vehicle Conspicuity
All ANSI accepted documents	

[A] From: 1999 SAE Handbook; SAE World Headquarters 400 Commonwealth Drive; Warrendale, PA 15096-0001; USA.

TABLE 4C—Titles of Selected ISO and JIS Standards Applicable to Appearances of Materials[A]

ISO and JIS Designation	Title
ISO/CIE 10526	CIE Standard Colorimetric Illuminants
ISO/CIE 10527	CIE Standard Colorimetric Observers
	Paints and Varnishes
ISO 2813	Determination of Specular Gloss of Non-metallic paint films at 20°, 60°, 85°
ISO 7724-1	Colorimetry: Principles
ISO 7724-2	Colorimetry: Colour Measurement
ISO 7724-3	Colorimetry: Calculation of Colour Differences
	Textiles—Tests for Colour Fastness
ISO 105-A01	General Principles of Testing
ISO 105-A02	Grey Scale for Assessing Change in Colour
ISO 105-A03	Grey Scale for Assessing Staining
ISO 105-A04	Method for the Instrumental Assessment of the Degree of Staining of Adjacent Fabrics
ISO 105-J01	General Principles for Measurement of Surface Colour
ISO 105-J02	Instrumental Assessment of Relative Whiteness
ISO 105-J03	Calculation of Colour Differences (Note: Based on CMC)
	Paper and Paper Products
ISO 13655	Graphic Technology—Spectral Measurement and Colorimetric Computation for Graphic Arts Images
JIS P8142:1993	Testing Method for 75° Specular Glossiness of Paper and Paperboard
	Textiles, Waxes, Building Materials, Ceramics, and Like Materials
JIS Z8741:1997	Specular Glossiness—Method of Measurement

[A] From: ISO Catalogue 2003; ISO Central Secretariat; 1, rue de Varembé, Case Postale 56; CH-1211 Genève 20; Switzerland.

TABLE 5—Titles of Standards for Color: Listed by Attributes and Materials Tested

Colors: By Spectrophotometric Data

Applied to Most Materials:

E 308* Practice for Computing the Colors of Objects by Using the CIE System
E 805* Practice for Identification of Instrumental Methods of Color or Color-Difference Measurement of Materials
E 1164* Practice for Obtaining Spectrophotometric Data for Object-Color Evaluation
E 1331* Test Method for Reflectance Factor and Color by Spectrophotometry Using Hemispherical Geometry
E 1345* Practice for Reducing the Effect of Variability of Color Measurements by the Use of Multiple Measurements
E 1347* Test Method for Color and Color Difference Measurement of Object-Color Specimens by Tristimulus (Filter) Colorimetry
E 1348* Test Method for Transmittance and Color by Spectrophotometry Using Hemispherical Geometry
E 1349* Test Method for Reflectance Factor and Color Using Bidirectional Geometry
E 2022* Practice for Calculation of Weighting Factors for Tristimulus Integration

Applied to Paints and Coating Materials:

E 308* Practice for Computing the Colors of Objects by Using the CIE System
ISO 7724/1 Paints and Varnishes—Colorimetry—Part 1: Principles
ISO 7724/2 Paints and Varnishes—Colorimetry—Part 2: Colour Measurement

Applied to Papers and Paper Products:

T 272 Forming Handsheets for Reflectance Tests of Pulp (Sheet Machine Procedure)
T 442 Spectral Reflectance Factor, Transmittance, and Color of Paper and Pulp (Polychromatic Illumination)

Applied to Radiant Sources and Visual Display Units

E 1336* Test Method for Obtaining Colorimetric Data from a Visual Display Unit by Spectroradiometry
E 1341* Practice for Obtaining Spectroradiometric Data from Radiant Sources for Colorimetry

Colors: By CIE X,Y,Z; Y,x,y; or Dominant Wavelength and Purity

Applied to Most Materials:

E 308* Practice for Computing the Colors of Objects by Using the CIE System
E 805* Practice for Identification of Instrumental Methods of Color-Different Measurement of Materials

Applied to Paints and Coating Materials:

E 308* Practice for Computing the Colors of Objects by Using the CIE System

Applied to Papers and Paper Products:

T 442 Spectral Reflectance Factor, Transmittance and Color of Paper and Pulp; (Polychromatic Illumination)
T 527 Color of Paper and Paperboard in (d/0 Geometry)

Applied to Radiant Sources and Visual Display Units

E 1336* Test Method for Obtaining Colorimetric Data from a Visual Display Unit by Spectroradiometry
E 1341* Practice for Obtaining Spectroradiometric Data from Radiant Sources for Colorimetry

Colors of Surfaces: By Opponent-Colors (L,a,b) Scales

Applied to Most Materials:

E 805* Practice for Identification of Instrumental Methods of Color or Color-Difference Measurement of Materials
E 1164* Practice for Obtaining Spectrophotometric Data for Object-Color Evaluation
E 1331* Test Method for Reflectance Factor and Color by Spectrophotometry Using Hemispherical Geometry
E 1345* Practice for Reducing the Effect of Variability of Color Measurements by the Use of Multiple Measurements
E 1347* Test Method for Color and Color Difference Measurement of Object-Color Specimens by Tristimulus (Filter) Colorimetry
E 1348* Test Method for Transmittance and Color by Spectrophotometry Using Hemispherical Geometry
E 1349* Test Method for Reflectance Factor and Color Using Bidirectional Geometry

Applied to Paints and Coating Materials:

E 805* Practice for Identification of Instrumental Methods of Color or Color-Difference, Measurement of Materials
ISO 7724/1 Paints and Varnishes—Colorimetry—Part 1: Principles
ISO 7724/2 Paints and Varnishes—Colorimetry—Part 2: Colour Measurement

Applied to Papers and Paper Products:

T 524 Color of Paper and Paperboard (45/0 Geometry)

Applied to Plastics:

D 6290* Test Method for Color Determination of Plastic Pellets

Applied to Textiles, Waxes, Building Materials, Ceramics, Etc.:

D 2253 Test Method for Color of Raw Cotton Using the Nickerson-Hunter Cotton Colorimeter
AATCC EP6 Instrumental Color Measurement

Colors: By Multiangle Spectrophotometers

Applied to Most Materials:

E 2175* Practice for Specifying the Geometry of Multiangle Spectrophotometers
*E 2194** Practice for Multiangle Color Measurement of Metal Flake Pigmented Materials

Colors: By Colorcurve System

Applied to Most Materials:

E 1541* Practice for Specifying and Matching Color Using the Colorcurve System

Colors: By Munsell Color Designation
Applied to Most Materials:
D 1535* Method of Specifying Color by the Munsell System

Colors: By OSA-UCS System
Applied to Most Materials:
E 1360* Practice for Specifying Color by Using the Optical Society of America Uniform Color Scales System

Color Differences
Applied to Most Materials:
D 2244* Method for Calculation of Color Differences from Instrumentally Measured Color Coordinates
D 2616* Evaluation of Visual Color Difference with a Gray Scale
D 3134* Practice for Establishing Color and Gloss Tolerances
E 805* Practice for Indentification of Instrumental Methods of Color or Color-Difference Measurement of Materials
E 1345* Practice for Reducing the Effect of Variability of Color Measurements by the Use of Multiple Measurements
E 1347* Test Method for Color and Color Difference Measurement of Object-Color Specimens by Tristimulus (Filter) Colorimetry
SAE J1545 Instrumental Color Difference Measurement for Exterior Finishes, Textiles, and Colored Trim

Applied to Paints and Coating Materials:
D 2244* Instrumental Evaluation of Color Differences of Opaque Materials
D 3134* Practice for Establishing Color and Gloss Tolerances
SAE J 1545 Instrumental Color Difference Measurement for Exterior Finishes, Textiles, and Colored Trim
ISO 7724/3 Paint and Varnishes—Colorimetry—Part 3: Calculation of Color Differences

Applied to Papers and Paper Products:
T1215 The Determination of Instrumental Color Difference

Applied to Textiles, Waxes, Building Materials, Ceramics, and Like Materials:
C 609 Test Method for Measurement of Small Color Differences Between Ceramic Wall or Floor Tile
SAE J1545 Instrumental Color Difference Measurement for Exterior Finishes, Textiles, and Color Trim
AATCC 145 Color Measurement of the Blue Wool Lightfastness Standards: Instrumental (Currently Under Revision)
AATCC EP6 Instrumental Color Measurement
AATCC 173 CMC: Calculation of Small Color Differences for Acceptability

Metamerism
Applied to Paints and Coating Materials:
D 4086* Practice for Visual Examination of Metamerism

Whiteness and Yellowness Indices
Applied to Most Materials:
D 156* Test Method for Saybolt Color of Petroleum Products (Saybolt Chromometer Method)
D 1209* Test Method for Color of Clear Liquids (Platinum-Cobalt Scale)
D 1500* Test Method for ASTM Color of Petroleum Products (ASTM Color Scale)
D 1544* Test Method for Color of Transparent Liquids (Gardner Color Scale)
D 2851* Specification for Liquid Optical Adhesive
E 313* Test Method for Indexes of Whiteness and Yellowness of Near-White Opaque Materials
E 450* Method for Measurement of Color of Low-Colored Clear Liquids Using the Hunterlab Color Difference Meter

Applied to Water, Chemicals, Liquid Pharmaceuticals, Petroleum Products:
D 156* Test Method for Saybolt Color of Petroleum Products (Saybolt Chromometer Method)
D 1209* Test Method for Color of Clear Liquids (Platinum-Cobalt Scale)
D 1500* Test Method for ASTM Color of Petroleum Products (ASTM Color Scale)
D 1544* Test Method for Color of Transparent Liquids (Gardner Color Scale)
D 1686 Test Method for Color of Solid Aromatic Hydrocarbons and Related Materials in the Molten State (Platinum-Cobalt Scale)
D 1728 Method of Test for Phthalate Ester Color of High-Gravity Glycerin
D 2108 Test Method for Color of Halogenated Organic Solvents and Their Admixtures (Platinum-Cobalt Scale)
D 3366 Test Method for Color of Maleic Anhydride and Phthalic Anhydride in the Molten State and After Heating (Platinum-Cobalt Scale)
D 5386* Test Method for Color of Liquids Using Tristimulus Colorimetry
D 6045* Test Method for Color of Petroleum Products by the Automatic Tristimulus Method
D 6166* Test Method for Color of Naval Stores and Related Products (Instrumental Determination of Gardner Color)
E 202 Test Methods for Analysis of Ethylene Glycols and Propylene Glycols

Applied to Paints and Coating Materials:
D 365 Test Methods for Testing Soluble Nitrocellulose Base Solution
D 1209* Test Method for Color of Clear Liquids (Platinum-Cobalt Scale)
D 1544* Test Method for Color of Transparent Liquids (Gardner Color Scale)
D 1686 Test Method for Color of Solid Aromatic Hydrocarbons and Related Materials in the Molten State (Platinum-Cobalt Scale)
D 1728 Test Method for Phthalate Ester Color of High-Gravity Glycerin (Platinum-Cobalt Scale)
D 2108 Test Method for Color of Halogenated Organic Solvents and Their Admixtures (Platinum-Cobalt Scale)
D 3366 Test Method for Color of Maleic Anhydride and Phthalic Anhydride in the Molten State and After Heating (Platinum-Cobalt Scale)
E 202 Test Method for Analysis of Ethylene Glycols and Propylene Glycols
E 313* Test Method for Indexes of Whiteness and Yellowness of Near-White Opaque Materials

Applied to Plastics:
D 4890 Test Method for Polyurethane Raw Materials: Determination of Gardner and APHA Color of Polyols
D 5386* Test Method for Color of Liquis Using Tristimulus Colormetry
E 313* Test Method for Indexes of Whiteness and Yellowness of Near-White Opaque Materials

Applied to Papers and Paper Products:
T 1216 Indices for Whiteness, Yellowness, Blue Reflectance Factor and Luminous (Green) Reflectance Factor
T 560 CIE Whiteness and Tint of Paper and Paperboard (using a/0° Diffuse Illumination and Normal Viewing)
T 562 CIE Whiteness and Tint of Paper and Paperboard (using 45°/0° Direct Illumination and Normal Viewing)

Applied to Textiles, Waxes, Building Materials, Ceramics, and Like Materials:
D 333 Method of Testing Clear and Pigmented Lacquers
D 1500* Test Method for ASTM Color of Petroleum Products (ASTM Color Scale)
D 2392 Test Method for Color of Dyed Aviation Gasoline
D 2985 Test Method for Color of Asbestos
D 3157 Method of Testing Rubber from Natural Sources—Color
D 3210 Method of Comparing Colors of Films from Water Emulsion Floor Polishes
D 3430 Test Method for Clarity and Yellowness of Liquid Water-Based Clear Floor Polishes
D 5215 Test Method for Instrumental Evaluation of Staining of Vinyl Flooring by Adhesives
D 6045* Test Method for Color of Petroleum Products by the Automatic Tristimulus Method
D 6166* Test Method for Color of Naval Stores and Related Products (Instrumental Determination of Gardner Color)
E 450* Method for Measurement of Color of Low-Colored Clear Liquids Using the Hunterlab Color Difference Meter
AATCC 110 Whiteness of Textiles
ISO 105-J02* Instrumental Assessment of Relative Whiteness

White Pigments
Applied to Paints and Coating Materials:
D 332* Test Method for Relative Tinting Strength of White Pigments by Visual Observation
D 344* Test Method for Relative Hiding Power of Paints by the Visual Evaluation of Brushouts
D 2745* Test Method for Relative Tinting Strength of White Pigments by Reflectance Measurements
D 5007 Test Method for Wet-to-Dry Hiding Change

Applied to Papers and Paper Products:
T 534 Brightness of Clay and Other Mineral Pigments (Diffuse Blue Reflectance)
T 646 Brightness of Clay and Other Mineral Pigments (45°/0° Directional)
T 1214 Interrelation of Reflectance, R_0; Reflectivity, R_∞; and TAPPI Opacity, Scattering, S; and Absorption, K.

Applied to Textiles, Waxes, Building Materials, Ceramics, and Like Materials:
C 110 Method of Physical Testing of Quickline, Hydrated Lime and Limestone

Colorants and Colored Pigments
Applied to Paints and Coating Materials:
D 387* Test Method for Color and Strength of Color Pigments with a Mechanical Muller
D 3022* Test Method for Color and Strength of Color Pigments by Use of a Miniature Sandmill
D 4838* Test Method for Determining the Relative Tinting Strength of Chromatic Paints
D 5326* Test Method for Color Development in Tinted Latex Paints

Applied to Plastics:
D 3349 Test Method for Absorption Coefficient of Carbon Black Pigmented Ethylene Plstic Film

Blue Reflectance Factor
Applied to Most Materials:
E 1347* Test Method for Color and Color-Difference Measurement by Tristimulus (Filter) Colorimetry

Applied to Paints and Coatings Materials:
E 1347* Test Method for Color and Color-Difference Measurements by Tristimulus (Filter) Colorimetry

Applied to Papers and Paper Products:
D 985* Test Method for Brightness of Pulp, Paper and Paperboard (Directional Reflectace at 457 nm)
T 452 Brightness of Pulp, Paper and Paperboard (Directional Reflectance at 457 nm)
T 525 Diffuse Brightness of Pulp (d/0°)
T 534 Brightness of Clay and Other Mineral Pigments (diffuse blue reflectance)
T 646 Brightness of Clay and Other Mineral Pigments (45°/0° Directional)

Applied to Textiles, Waxes, Building Products, Ceramics, and Like Materials:
AATCC 110 Whiteness of Textiles

Fluorescence/Photoluminescense

Applied to Most Materials
E 991* Practice for color Measurement of Fluorescent Specimens
E 1247* Test Method for Identifying Fluorescence in Object-Color Specimens by Spectrophotometry
E 2030* Guide for Recommended Uses of Photoluminescent (Phosphorescent) Safety Markings
E 2072* Specification for Photoluminescent (Phosphorescent) Safety Markings
E 2073* Test Method for Photopic Luminance of Photoluminescent (Phosphorescent) Markings
E 2152* Practice for Computing the Colors of Fluorescent Objects from Bispectral Photometric Data

E 2153* Practice for Obtaining Bispectral Photometric Data for Evaluation of Fluorescent Color
E 2301* Test Method for Daytime Colorimetric Properties of Fluorescent Retroreflective Sheeting and Marking Materials for High Visibility Traffic Control and Personal Safety Applications Using 45°:Normal Geometry
F 923* Guide to Properties of High Visibility Materials Used to Improve Individual Safety

Retroreflectance (see Table 6)

* Standards reproduced in this compilation

TABLE 6—Titles of Standards for Geometric Light Distribution Listed by Attributes and Materials Tested

Goniophotometric Curves
Applied to Most Materials:
E 167* Recommended Practice for Goniophotometry of Objects and Materials
E 430* Method for Measurement of Gloss of High-Gloss Surfaces by Goniophotometry

Recommendations for Geometric Conditions of Measurement
Applied to Most Materials:
E 179* Guide for Selection of Geometric Conditions for Measurement of Reflection and Transmission Properties of Materials
E 1808* Guide for Designing and Conducting Visual Experiments
E 2175* Practice for Specifying the Geometry of Multiangle Spectrophotometers

Specular Gloss (Shininess)
Applied to Most Materials:
D 523* Test Method for Specular Gloss
E 429* Method for Measurement and Calculation of Reflecting Characteristics of Metallic Surfaces Using Integrating Sphere Instruments
E 430* Method for Measurement of Gloss of High-Gloss Surfaces by Goniophotometry

Applied to Paints and Coating Materials:
D 523* Test Method for Specular Gloss
D 3928* Test Method for Evaluation of Gloss or Sheen Uniformity
BS EN ISO 2813:200 Paints and Varnishes—Determination of Specular Gloss of Non-Metallic Paint Films at 20°, 60°, and 85°

Applied to Metals:
ISO 7668:1986 Anodized Aluminum Alloys—Measurement of Specular Reflectance and Specular Gloss at Angles of 20°, 45°, 60°, or 85°

Applied to Plastics:
D 2457 Test Method for Specular Gloss of Plastic Films

Applied to Papers and Paper Products:
T 480 Specular Gloss of Paper and Paperboard at 75°
T 653 Specular Gloss of Paper and Paperboard at 20°
D 1223* Test Method for Specular Gloss of Paper and Paperboard at 75°
D 1834* Test Method for 20° Specular Gloss of Waxed Paper

Applied to Textiles, Waxes, Building Materials, Ceramics, and Like Materials:
C 346 Test Method for 45-deg Specular Gloss of Ceramic Materials
C 584 Test Method for 60-deg Specular Gloss of Glazed Ceramic Whitewares and Related Products
D 1455 Test Method for 60-deg Specular Gloss of Emulsion Floor Polish

Distinctness-of-Image Gloss
Applied to Most Materials:
E 430* Method for Measurement of Gloss of High-Gloss Surfaces by Goniophotometry

Applied to Paints and Coating Materials:
E 430* Method for Measurement of Gloss of High-Gloss Surfaces by Goniophotometry
D 4449* Method for Visual Evaluation of Gloss Differences Between Surfaces of Similar Appearance
D 5767* Test Methods for Instrumental Measurement of Distinctness-of-Image Gloss of Coating Surfaces

Applied to Plastics:
D 881 Test Method for Deviation of Line of Sight Through Transparent Plastics
D 1746* Test Method for Transparency of Plastic Sheeting

Sheen (Grazing Angle) Texture and Luster
Applied to Most Materials:
D 523* Test Method for Specular Gloss
E 430* Method for Measurement of Gloss of High-Gloss Surfaces by Goniophotometry
E 770* Test Method for Classifying Pavement Surface Textures

Applied to Paints and Coating Materials:
D 523* Test Method for Specular Gloss
D 3928* Test Method for Evaluation of Gloss or Sheen Uniformity

Reflection Haze
Applied to Most Materials:
E 430* Method for Measurement of Gloss of High-Gloss Surfaces by Goniophotometry

Applied to Paints and Coating Materials:
D 4039* Test Method for Reflection Haze of High-Gloss Surfaces

Transmission Haze; Turbidity; Clarity
Applied to Most Materials:
D 1003* Test Method for Haze and Luminous Transmittance of Transparent Plastics
D 1746* Test Method for Transparency of Plastic Sheeting
D 1889* Test Methods for Turbidity of Water

Applied to Paints and Coating Materials:
D 2090 Test Method for Clarity and Cleanness of Paint Liquids

Applied to Plastics:
D 1003* Test Method for Haze and Luminous Transmittance of Transparent Plastics

Applied to Textiles, Waxes, Building Materials, Ceramics, and Like Materials:
D 1889* Test Methods for Turbidity of Water
D 3430 Test Method for Clarity and Yellowness of Liquid Water-Based Floor Polishes

Luminous Reflectance Factor
Applied to Most Materials:
E 429* Method for Measurement and Calculation of Reflecting Characteristics of Metallic Surfaces Using Integrating Sphere Instruments
E 903* Test Method for Solar Absorbance, Reflectance and Transmittance of Materials Using Integrating Spheres
E 1331* Test Method for Reflectance Factor and Color by Spectrophotometry Using Hemispherical Geometry
E 1347* Test Method for Color and Color Difference Measurement by Tristimulus (Filter) Colorimetry
E 1349* Test Method for Relectance Factor and Color Using Bidirectional Geometry

Applied to Paints and Coating Materials:
D 2824 Specification for Aluminum-Pigmented Asphalt Roof Coatings
E 1347* Test method for Color and Color Differences Measurement by Tristimulus (Filter) Colorimetry

Applied to Papers and Paper Products:
TIS 0804–05 Indices for Whiteness-Yellowness, Blue Reflectance Factor and Luminous (Green) Reflectance Factor
E 1651* Test Method for Total Luminous Reflectance Factor by Use of 30/T Integrating Sphere Geometry

Applied to Textiles, Waxes, Building Materials, Ceramics, and Like Materials:
C 523* Test Method for Light Reflectance of Acoustical Materials by the Integrating Sphere Reflectometer
D 1704 Test Method for Determining the Amount of Particulate Matter in the Atmosphere by Measurement of the Absorbance of a Filtered Sample
D 424* Test Method for Solar Energy Transmittance and Reflectance (Terrestrial) of Sheet Materials
E 429* Test Method for Measurement and Calculation of Reflecting Characteristics of Metallic Surfaces Using Integrating Sphere Instruments
E 1477* Test Method for Luminous Reflectance Factor of Acoustical Materials by Use of Integrating-Sphere Reflectometers
F 768 Method for Specular Reflectance and Transmittance Measurements of Optically Flat-Coated and Non-Coated Specimens

Luminous Transmittance Factor
Applied to Most Materials:
D 1003* Test Method for Haze and Luminous Transmittance of Transport Plastics
E 1348* Test Method for Transmittance and Color by Spectrophotometry Using Hemispherical Geometry

Applied to Plastics:
D 1003* Test Method for Haze and Luminous Transmittance of Transparent Plastics
E 1494* Test Method for Diffuse Light Transmission Factor of Reinforced Plastics Panels
D 1746* Test Method for Transparency of Plastic Sheeting
D 2843 Test Method for Density of Smoke from the Burning or Decomposition of Plastics
E 1478* Practice for Visual Color Evaluation of Transparent Sheet Materials

Applied to Textiles, Waxes, Building Materials, Ceramics, and Like Materials:
D 424* Solar Energy Transmittance and Reflectance (Terrestrial) of Sheet Materials
F 727 Test Method for Measuring Transmittance of See-Through Photoplate
F 768 Method for Specular Reflectance and Transmittance Measurement of Optically Flat-Coated and Non-Coated Specimens

Retroreflectance
Applied to Most Materials:
D 3134* Practice for Establishing Color and Gloss Tolerances
D 4061* Test Method for Retroreflectance of Horizontal Coatings
D 4280* Specification for Non-Plowable Raised Pavement Markers
D 4383* Specification for Plowable Raised Reflective Pavement Markers
D 4505* Specification for Preformed Plastic Pavement Marking Tape for Extended Service Life
D 4956* Specification for Retroreflective Sheeting for Traffic Control
E 808* Practice for Describing Retroreflection
E 809* Practice for Measuring Photometric Characteristics of Retroreflectors
E 810* Test Method for Coefficient of Retroreflection or Retroflective Sheeting
E 811* Practice for Measuring Colorimetric Characteristics of Retroreflectors Under Night-time Conditions

E 1501* Specification for Nighttime Photometric Performance of Retroreflective Pedestrian Markings for Visibility Enhancement
E 1696* Test Method for Field Measurement of Raised Retroreflective Pavement Markers Using a Portable Retroreflectometer
E 1709* Test Method for Measurement of Retroreflective Signs Using a Portable Retroreflectometer
E 1710* Test Method for Measurement of Retroreflective Pavement Marking Materials with a Portable Retroreflectometer
E2176* Test Method for Measuring the Coefficient of Retroreflected Luminance (RL) of Pavement Markings in a Standard Condition of Continuous Wetting
E2177* Test Method for Measuring the Coefficient of Retroreflected Luminance (RL) of Pavement Markings in a Standard Condition of Wetness
F 923* Guide for Understanding the Properties of High Visibility Materials for Individual Safety

Opacity or Hiding Power
Applied to Most Materials:
D 2805* Test Method for Relative Hiding Power of Paints by Reflectometry

Applied to Paints and Coating Materials:
D 344* Test Method for Relative Hiding Power of Paints by the Visual Evaluation of Brushouts
D 2805* Test Method for Hiding Power of Paints by Reflectometry
D 5007 Test Method for Wet-to-Dry Hiding Change

Applied to Papers and Paper Products:
D 589* Test Method for Opacity of Paper
T 425 Opacity of Paper (15°/Diffuse Illuminant A, 89% Reflectance Backing and Paper Backing)
T 519 Diffuse Opacity of Paper (Paper Backing)
T 1214 Interrelation of Reflectance, R_0; Reflectivity, R_∞; and TAPPI Opacity, Scattering, S; and Absorption, K.

* Standards reproduced in this compilation

TABLE 7—List of Standards Which Are Related to the Measurement of Appearance in Miscellaneous Ways; Listed by Category and Materials Tested

Appearance Terminology
Applied to Most Materials:
E 284* Standard Terminology of Appearance

Applied to Paints and Coating Materials:
E 284* Standard Terminology of Appearance

Applied to Papers and Paper Products:
T 1213 Optical Measurements Terminology (Related to Appearance Evaluation of Paper)

Material Standards of Appearance Measurement
Applied to Most Materials:
D 5531* Guide for the Preparation, Maintenance, and Distribution of Physical Product Standards for Color and Geometric Appearance of Coatings
E 259* Practice for Preparation of Reference White Reflectance Standards

Applied to Papers and Paper Products:
T 1217 Photometric Linearity of Optical Properties Instruments
T 1218 Calibration of Reflectance Standards for Hemispherical Geometry

Specimen Selection and Tolerances
Applied to Most Materials:
D 3134* Practice for Establishing Color and Gloss Tolerances
E 179* Guide for Selection of Geometric Conditions for Measurement of Reflectance and Transmission Properties of Materials
E 312* Practice for Description and Selection of Conditions for Photographing Specimens
E 691* Practice for Conducting an Interlaboratory Study to Determine Precision of a Test Method
E 1499* Guide to the Selection, Evaluation, and Training of Observers
SAE J1545 Instrumental Color Difference Measurement for Exterior Finishes, Textiles and Colored Trim

Applied to Paints and Coating Materials:
D 3134* Practice for Establishing Color and Gloss Tolerances
D 3964* Practice for Selection of Coating Specimens for Appearance Measurements
SAE J1545 Instrumental Color Difference Measurement for Exterior Finishes, Textiles and Colored Trim

Visual Evaluations
Applied to Most Materials:
D 1729* Practice for Visual Evaluation of Color Differences of Opaque Materials

Applied to Paints and Coating Materials:
D 1729* Practice for Visual Evaluation of Color Differences of Opaque Materials

Applied to Papers and Paper Products:
T 515 Visual Grading and Color-Matching of Paper
T 1212 Light Sources for Evaluating Paper Including Those Containing Fluorescent Whitening Agents

Applied to Textiles:
AATCCEP9 Visual Assessment of Color Difference of Textiles