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Standard Specification for Chrome Yellow and Chrome Orange Pigments[1]

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1. Scope

1.1 This specification covers six types of commercially pure lead chromate pigments as follows:

Type I—Primrose Chrome Yellow,
Type II—Lemon Chrome Yellow,
Type III—Medium Chrome Yellow,
Type IV—Light Chrome Orange,
Type V—Dark Chrome Orange, and
Type VI—Chrome Yellow for Green.

1.2 The values stated in SI units are to be regarded as standard. The values given in parentheses are for information only.

1.3 The following hazard caveat applies to the test method portion of this specification only.*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:*[2]

D126 Test Methods for Analysis of Yellow, Orange, and Green Pigments Containing Lead Chromate and Chromium Oxide Green
D185 Test Methods for Coarse Particles in Pigments
D235 Specification for Mineral Spirits (Petroleum Spirits) (Hydrocarbon Dry Cleaning Solvent)
D387 Test Method for Color and Strength of Chromatic Pigments with a Mechanical Muller
D523 Test Method for Specular Gloss
D562 Test Method for Consistency of Paints Measuring Krebs Unit (KU) Viscosity Using a Stormer-Type Viscometer
D600 Specification for Liquid Paint Driers
D822 Practice for Filtered Open-Flame Carbon-Arc Exposures of Paint and Related Coatings
D1210 Test Method for Fineness of Dispersion of Pigment-Vehicle Systems by Hegman-Type Gage
E97 Method of Test for Directional Reflectance Factor, 45-Deg 0-Deg, of Opaque Specimens by Broad-Band Filter Reflectometry (Withdrawn 1991)[3]

2.2 *Federal Specification:*

TT-R-266 Resin, Alkyd; Solutions[4]

3. Composition and Properties

3.1 The pigments shall be chemical precipitates consisting of normal or basic lead chromates, or mixtures of these, with or without admixtures of other insoluble compounds of lead or other materials used in manufacture to control certain properties. The pigments shall conform to the requirements for composition as prescribed in Table 1.

3.2 The mass color and character of the tint formed by mixture with a white pigment shall be the same as, and the strength shall be within mutually agreed upon limits of a standard acceptable to both the purchaser and the seller.

3.3 When mutually agreed upon between the purchaser and the seller as being essential to the end use of the pigment, resistance to loss of gloss, chalking, and color change shall be tested as specified in 5.1.4. The exposed panel shall show no chalking, a loss of not more than 30 % of the original gloss, and a color change no greater than the lightness difference. ΔL, shown for each pigment type in Table 2.

4. Sampling

4.1 Two samples shall be taken at random from different packages from each lot, batch, day's pack, or other unit of production in a shipment. When no markings distinguishing between units of production appear, samples shall be taken from different packages in the ratio of two samples for each 4450 kg (10 000 lb), except that for shipments of less than 10 000 lb two samples shall be taken. At the option of the

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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.

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

[4] Available from Standardization Documents Order Desk, DODSSP, Bldg. 4, Section D, 700 Robbins Ave., Philadelphia, PA 19111-5098, http://www.dodssp.daps.mil.

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TABLE 1 Requirements for Composition

	Type I	Type II	Type III	Type IV	Type V	Type VI
Lead chromate ($PbCrO_4$), min %	50	65	87	55	55	75
Total matter soluble in water, max %	1.0	1.0	1.0	1.0	1.0	1.0
Total of all substances other than insoluble compounds of lead, max %	8.0	10.0	10.0	10.0	3.0	10.0
Moisture and other volatile matter, max %	1.5	1.5	1.5	1.5	1.5	1.5
Coarse particles (total residue retained on a 45-μm (No. 325) sieve), max %	1.0	1.0	1.0	1.0	1.0	1.0
Organic colors and lakes	none	none	none	none	none	none

TABLE 2 Permissible Lightness Difference (Δ*L*)

Type	Pigment	Δ*L*
I	Primrose chrome yellow	35
II	Lemon chrome yellow	8
III	Medium chrome yellow	6
IV	Light chrome orange	3
V	Dark chrome orange	3
VI	Chrome yellow for green	6

purchaser, the samples may be tested separately, or samples from the same production unit may be blended in equal quantities to form a composite sample.

5. Test Methods

5.1 Tests shall be conducted in accordance with the following test methods. Test procedures not covered by ASTM methods shall be mutually agreed upon between the purchaser and the seller.

5.1.1 *Chemical Analysis of Dry Pigment*—Test Methods D126. The lead chromate analysis should be conducted in accordance with the Procedure section of Test Methods D126; the procedure outlined in Procedure section is not applicable.

5.1.2 *Coarse Particles*—Test Methods D185.

5.1.3 *Mass Color and Tinting Strength*—Test Method D387.

5.1.4 *Resistance to Loss of Gloss, Chalking, and Color Change:*

5.1.4.1 A test enamel shall be prepared consisting of ingredients conforming to the applicable specifications in the following proportions:

Ingredient	Weight Percent
Pigment under test	30 to 34
Alkyd resin vehicle solids, min[A]	28
Total solids, min	60
Mineral spirits	[B, C]
Driers	[D, E]

[A] An alkyd resin solution conforming to Type III of Federal Specification TT-R-266 is suggested.
[B] See Specification D235.
[C] As required to give a Stormer consistency of 100 to 150 g at 200 r/min as prescribed in Test Method D562.
[D] See Class B in Specification D600.
[E] As required to obtain set-to-touch in 2 h and dry-hard in 8 h.

5.1.4.2 The enamel shall have a fineness of grind, as prescribed in Test Method D1210, of 1.5 mils or less. Apply the enamel to duplicate flat metal panels by spray or applicator to complete hiding and allow to dry 72 h. Measure the gloss at 60° in accordance with Test Method D523. Measure the directional reflectance of the coating in accordance with Test Method E97. Subject the coated panels for 168 h to accelerated weathering under the conditions prescribed in Practice D822. Examine the exposed coating for chalking. Wash the exposed panel under running water with a thoroughly degreased lamb's wool pad to remove scum or dirt. Wipe off water with clean cheesecloth and dry the panel for 2 h. Calculate the loss of gloss from gloss measurements made before and after exposure. After exposure, determine the directional reflectance for each panel as described in Test Method E97. Calculate the color change or lightness-difference estimate (Δ*L*) as follows:

$$\Delta L = K\left(Y_2^{1/2} - Y_1^{1/2}\right) \quad (1)$$

where:

Y_1 = luminous directional reflectance of the panel measured before exposure,
Y_2 = reflectance measured after exposure, and
K = 100 when the reflectances are expressed as decimal fractions or 10 if reflectances are expressed in percent.

The color change for the coating shall be the average obtained for the two panels.[5]

6. Keywords

6.1 chrome orange; chrome yellow; lead chromate; orange pigments; pigments; yellow pigments

[5] The method of determining the lightness-difference estimate is described in detail in example 4, "Photoelectric Tristimulus Colorimetry with Three Filters," *Circular C429*, Nat. Bureau Standards.

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