



Designation: D5067 – 16 (Reapproved 2021)

Standard Specification for Artists' Watercolor Paints¹

This standard is issued under the fixed designation D5067; 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 for composition, physical properties, performance, and labeling of artists' watercolor paints.

1.2 This specification covers pigments, vehicles, and additives. Requirements are included for pigment identification, lightfastness, and consistency.

1.3 **Table 1** lists some pigments meeting the lightfastness requirements in this specification. In order to identify other pigments that meet these requirements, instructions are given for test specimen preparation. Test methods for determining relative lightfastness are referenced.

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

1.5 *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

D185 Test Methods for Coarse Particles in Pigments

D1210 Test Method for Fineness of Dispersion of Pigment-Vehicle Systems by Hegman-Type Gage

D4236 Practice for Labeling Art Materials for Chronic Health Hazards

D4303 Test Methods for Lightfastness of Colorants Used in Artists' Materials

E284 Terminology of Appearance

¹ This specification is under the jurisdiction of ASTM Committee D01 on Paint and Related Coatings, Materials, and Applications and is the direct responsibility of Subcommittee D01.57 on Artist Paints and Related Materials.

Current edition approved Nov. 1, 2021. Published November 2021. Originally approved in 1990. Last previous edition approved in 2016 as D5067 – 16. DOI: 10.1520/D5067-16R21.

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. Terminology

3.1 *Definitions:*

3.1.1 *Colour Index Name, n*—consists of the category (type of dye or pigment), general hue, and an assigned number given to a colorant in the Colour Index³ as an international identification system.

3.1.1.1 *Discussion*—For example, the Colour Index Name of one phthalocyanine blue pigment is Pigment Blue 15 (PB 15).

3.1.2 *Colour Index Number, n*—a five-digit number given in the Colour Index that describes the chemical constitution of a colorant.

3.1.2.1 *Discussion*—For example, the Colour Index Number of one phthalocyanine blue pigment is 74160.

3.1.3 Appearance terms used in this standard are defined in Terminology **E284**.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *watercolor paint, n*—a pigment dispersion in a water soluble gum/resin vehicle that dries water soluble and is intended primarily for transparent applications.

4. Significance and Use

4.1 This specification establishes quality requirements and provides a basis for common understanding among producers, distributors, and users.

4.2 It is not intended that all paints meeting the requirements be identical nor of uniform excellence in all respects. Variations in manufacture, not covered by this specification, may cause some artists to prefer one brand over another, either of which may be acceptable under this specification.

5. Labeling Requirements

5.1 *Pigment(s) Identification:*

5.1.1 Every label shall include for each pigment contained in the paint (1) the information underlined in **Table 1** (which includes the Common Name, Colour Index Name, and any additional terms necessary to identify the form of the pigment), and (2) the appropriate Lightfastness Category.

³ *Colour Index*, 3rd ed., The Society of Dyers and Colourists, London, 1971–75, five vols and revisions. Available from the American Association of Textile Chemists and Colorists, PO Box 12215, Research Triangle Park, NC 27709.

TABLE 1 Suitable Pigments List

NOTE 1—Underlined information and the lightfastness category in the table shall be included on every label.

Key:			
<i>Lightfastness Category:</i>			
Lightfastness I	Excellent Lightfastness		
Lightfastness II	Very Good Lightfastness		
<i>Abbreviations Used for Colour Index Names:</i>			
BR	Basic Red		
NR	Natural Red		
PB	Pigment Blue		
PBk	Pigment Black		
PBr	Pigment Brown		
PG	Pigment Green		
PO	Pigment Orange		
PR	Pigment Red		
PV	Pigment Violet		
PW	Pigment White		
PY	Pigment Yellow		
<i>Pigment Notations:</i>			
(CC)	Concentrated cadmium pigments may contain up to 15 % barium sulfate for color control. Cadmium-barium pigments contain a much higher amount of barium sulfate.		
(NA)	Colour Index name or number not assigned.		
(SM)	Sensitive to moisture in direct sunlight.		
Colour Index Name	Lightfastness Category	Common Name and Chemical Class	Colour Index Number
	Watercolors		
YELLOWS			
<u>PY 3</u>	II	<u>Arylide Yellow 10G</u> , with option of adding the name Hansa Yellow Light, arylide yellow	11710
<u>PY 31</u>	I	<u>Barium Chromate Lemon</u> , barium chromate	77103
<u>PY 34</u>	I	<u>Chrome Yellow Lemon</u> , lead chromate and lead sulfate	77600
<u>PY 35</u>	I	<u>Cadmium (hue designation)</u> , concentrated cadmium zinc sulfide (CC) (SM)	77205
<u>PY 35:1</u>	I	<u>Cadmium-Barium (hue designation)</u> , cadmium zinc sulfide coprecipitated with barium sulfate (SM)	77205:1
<u>PY 37</u>	I	<u>Cadmium (hue designation)</u> , concentrated cadmium sulfide (CC) (SM)	77199
<u>PY 37:1</u>	I	<u>Cadmium-Barium (hue designation)</u> , cadmium sulfide coprecipitated with barium sulfate (SM)	77199:1
<u>PY 40</u>	II	<u>Aureolin</u> , with option of adding the name Cobalt Yellow, potassium cobaltinitrite	77357
<u>PY 42</u>	I	<u>Mars Yellow or Iron Oxide Yellow</u> , with option of adding the name Yellow Iron Oxide, synthetic hydrated iron oxide	77492
<u>PY 42</u>	I	<u>Mars Orange or Iron Oxide Yellow</u> , synthetic hydrated iron oxide	77492
<u>PY 43</u>	I	<u>Yellow Ochre</u> , natural hydrated iron oxide	77492
<u>PY 53</u>	I	<u>Nickel Titanate Yellow</u> , oxides of nickel antimony and titanium, or nickel titanate	77788
<u>PY 65</u>	II	<u>Arylide Yellow RN</u> , with option of adding the name Hansa Yellow (hue designation), arylide	11740
<u>PY 97</u>	II ^A	<u>Arylide Yellow FGL</u> , arylide yellow	11767
<u>PY 109</u>	II	<u>Isoindoline Yellow G</u> , tetrachloroisoindoline	56284
<u>PY 110</u>	II	<u>Isoindoline Yellow R</u> , tetrachloroisoindoline	56280
<u>PY 117</u>	I	<u>Azomethine Yellow</u> , copper organic complex	48043
<u>PY 138</u>	II	<u>Quinophthalone Yellow</u> , quinophthalone	56300
<u>PY 150</u>	I	<u>Nickel Azo Yellow</u> , nickel azo complex	12764
<u>PY 153</u>	II	<u>Nickel Dioxine Yellow</u> , dioxine nickel complex	48545
<u>PY 154</u>	I	<u>Benzimidazolone Yellow H3G</u> , benzimidazolone	11781
<u>PBr 24</u>	I	<u>Chrome Titanate Yellow</u> , oxides of chromium, antimony and titanium, or chrome titanate	77310
ORANGES			
<u>PO 20</u>	I	<u>Cadmium (hue designation)</u> , concentrated cadmium sulfo-selenide (CC)	77202
<u>PO 20:1</u>	I	<u>Cadmium-Barium (hue designation)</u> , cadmium sulfo-selenide coprecipitated with barium sulfate	77202:1
<u>PO 36</u>	I	<u>Benzimidazolone Orange HL</u> , benzimidazolone	11780
<u>PO 48</u>	II	<u>Quinacridone Gold</u> , or <u>Quinacridone Orange</u> , quinacridone	73900
<u>PO 62</u>	II	<u>Benzimidazolone Orange H5G</u> , monoacetolone	11775
REDS			
<u>PR 101</u>	I	<u>Indian Red</u> , synthetic red iron oxide (bluish hue)	77491
<u>PR 101</u>	I	<u>Light or English Red Oxide</u> , synthetic red iron oxide (yellowish hue)	
<u>PR 101</u>	I	<u>Mars Red or Iron Oxide Yellow</u> , with option of adding the name Red Iron Oxide, synthetic red iron oxide	77491
<u>PR 101</u>	I	<u>Mars Violet or Iron Oxide Yellow</u> , with option of adding the name Violet Iron Oxide, synthetic iron oxide (violet hue)	77015
<u>PR 101</u>	I	<u>Venetian Red</u> , synthetic iron oxide (yellowish hue)	77491
<u>PR 104</u>	I	<u>Chrome Orange</u> , lead chromate and lead molybdate	77605
<u>PR 108</u>	I	<u>Cadmium (hue designation)</u> , concentrated cadmium-seleno sulfide (CC)	77202
<u>PR 108:1</u>	I	<u>Cadmium-Barium (hue designation)</u> , cadmium seleno-sulfide coprecipitated with barium sulfate	77202:1
<u>PR 170</u>	II	<u>Naphthol Red F3RK</u> , naphthol carbamide	12475
<u>PR 179</u>	I	<u>Perylene (hue designation)</u> , perylene	71130
<u>PR 188</u>	II	<u>Naphthol (hue designation) AS</u> , naphthol AS	12467
<u>PR 209</u>	II	<u>Quinacridone (hue designation)</u> , gamma quinacridone	73905
<u>PR 216</u>	I	<u>Pyranthrone Red</u> , halogenated pyranthrone	59710
<u>PR 255</u>	I	<u>Pyrrrol Red</u> , diketo-pyrrolo-pyrrol	NA
PURPLES			
<u>PV 14</u>	I	<u>Cobalt Violet</u> , cobalt phosphate, cobalt ammonium phosphate	77360
<u>PV 15</u>	I	<u>Ultramarine Red</u> , complex silicate of sodium and aluminum with sulfur or sodium alumino-sulpho-silicate	77007

TABLE 1 *Continued*

Colour Index Name	Lightfastness Category		Common Name and Chemical Class	Colour Index Number
	Watercolors			
<u>PV 15</u>	I		<u>Ultramarine Violet</u> , complex silicate of sodium and aluminum with sulfur or sodium aluminosulphosilicate	77007
<u>PV 16</u>	I		<u>Manganese Violet</u> , manganese ammonium pyrophosphate	77742
<u>PV 19</u>	I		<u>Quinacridone (hue designation)</u> , gamma quinacridone	73900
BLUES				
<u>PB 15</u>	II		<u>Phthalocyanine Blue</u> or <u>Phthalo Blue</u> , with option of adding Red Shade, copper phthalocyanine	74160
<u>PB 15:6</u>	II		<u>Phthalocyanine Blue</u> , or <u>Phthalo Blue</u> , with option of adding Green Shade, copper phthalocyanine	74160:6
<u>PB 27</u>	I		<u>Prussian Blue</u> , with the option of adding the name Milori Blue, ferriammonium ferrocyanide	77510
<u>PB 28</u>	I		<u>Cobalt Blue</u> , oxides of cobalt and aluminum or cobalt aluminates	77346
<u>PB 29</u>	I		<u>Ultramarine Blue</u> , complex silicate of sodium and aluminum with sulfur	77007
<u>PB 33</u>	I		<u>Manganese Blue</u> , barium manganate with barium sulfate	77112
<u>PB 35</u>	I		<u>Cerulean Blue</u> , oxides of cobalt and tin or cobalt stannate	77368
<u>PB 36</u>	I		<u>Cerulean Blue</u> , <u>Chromium</u> or <u>Cobalt Chromite Blue</u> , oxides of cobalt and chromium, or cobalt chromite	77343
GREENS				
<u>PG 7</u>	I		<u>Phthalocyanine Green</u> or <u>Phthalo Green</u> , chlorinated copper phthalocyanine	74260
<u>PG 17</u>	I		<u>Chromium Oxide Green</u> , anhydrous chromium sesquioxide	77288
<u>PG 18</u>	I		<u>Viridian</u> , hydrous chromium sesquioxide	77289
<u>PG 19</u>	I		<u>Cobalt Green</u> , oxides of cobalt and zinc, or cobalt zincate	77335
<u>PG 23</u>	I		<u>Green Earth</u> , or <u>Terre Verte</u> , natural ferrous silicate containing magnesium and aluminum potassium silicates	77009
<u>PG 36</u>	I		<u>Phthalocyanine Green</u> , Y. S. (yellow shade), chlorinated and brominated phthalocyanine	74265
<u>PB 36</u>	I		<u>Cobalt Chromite Green</u> or <u>Cobalt Turquoise</u> , oxides of cobalt and chromium, or cobalt chromite	77343
BROWNS				
<u>PBr 7</u>	I		<u>Burnt Sienna</u> , calcined natural iron oxide	77491 or 77492
<u>PBr 7</u>	I		<u>Burnt Umber</u> , calcined natural iron oxide containing manganese	77491 or 77492
<u>PBr 7</u>	I		<u>Raw Sienna</u> , natural iron oxide	77491 or 77492
<u>PBr 7</u>	I		<u>Raw Umber</u> , natural iron oxide containing manganese	77491 or 77492
BLACKS				
<u>PBk 6</u>	I		<u>Lamp Black</u> , nearly pure amorphous carbon	77266
<u>PBk 7</u>	I		<u>Carbon Black</u> , nearly pure amorphous carbon	77266
<u>PBk 8</u>	I		<u>Charcoal Black</u> or <u>Vine Black</u> , nearly pure amorphous carbon of vegetable origin	77268
<u>PBk 9</u>	I		<u>Ivory Black</u> or <u>Bone Black</u> , amorphous carbon produced by charring animal bones	77267
<u>PBk 19</u>	I		<u>Gray Hydrated Aluminum Silicate</u> , hydrated aluminum silicate	77017
WHITES				
<u>PW 4</u>	I		<u>Zinc White</u> , zinc oxide with option of adding the name Chinese White	77947
<u>PW 6</u>	I		<u>Titanium White</u> , titanium dioxide (rutile or anatase) with option of including some barium sulfate or zinc oxide	77891

⁴ These pigments were put into the Lightfastness II category pending results of retesting.

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5.1.2 The complete pigment identification given in **Table 1**, which also includes the Colour Index Number and a simple chemical description, shall be given by the producer in an appropriate electronic version or printed publication. Manufacturers are encouraged to put this complete identification on the container label when label size permits.

5.1.3 The Common Name shall be placed on the front of the label and shall be the name of the paint except as described in **5.1.5** and **5.1.6**. Other identification may be placed elsewhere on the container.

5.1.4 The Colour Index Name may be spelled out in full or abbreviated depending on the size of the label. Example: Pigment Blue 15, or Pig. Blue 15 or PB 15.

5.1.5 *Substituted Pigments*—In the case of substituted pigments, except for those pigments listed in **Table X2.1**, the word “Hue” in equal size letters shall follow in the title, on the front of the tube, immediately after the name of the pigment that has been simulated.

5.1.6 Proprietary names or optional names may be used provided the Common Name(s) given in **Table 1** is listed along with their Colour Index Names and the Lightfastness Category of the mixture somewhere on the label.

5.1.7 *Mixed Pigments*—Artists’ paints containing more than one pigment comply with this specification if all colored pigments included in the mixture are on the suitable pigment list (**Table 1**) and provided the mixture itself has passed all other test requirements in this specification. The lightfastness category shall be that of the least lightfast pigment. This lightfastness category may be changed if the mixture is tested for lightfastness in accordance with Test Methods **D4303** and results indicating a different category are submitted to ASTM Subcommittee D01.57 for evaluation.

5.1.8 *Historical and Discontinued Pigments*—Pigments that are either (1) primarily of a historical nature, or (2) have not been commercially manufactured for a minimum of ten years or more, may be submitted to Subcommittee D01.57 for inclusion in **Table X2.1**.

5.1.8.1 The Common Name(s) of pigments in **Table X2.1** may be used by substituted pigments without the designation of “Hue” in the title.

5.1.8.2 Paints using pigments listed in **Table X2.1** may use the word “Genuine” in front of the title to differentiate them from substituted pigments.

5.2 Provide on the label the identification of the gum/resin used.

5.3 *Lightfastness*—The label shall contain the word “Lightfastness” followed by the appropriate rating, I or II, as given for each pigment in Table 1, or else one of these corresponding icons (Fig. 1).



FIG. 1 Lightfastness Rating

5.3.1 Lightfastness I pigments, when made into paint specimens as described in Section 7 and exposed, tested, and rated in accordance with Test Methods D4303, shall have a color difference (ΔE^*_{ab}) of 4 or less CIELAB units between the specimens measured before and after exposure.

5.3.2 Lightfastness II pigments, when made into paint specimens as described in Section 7 and exposed, tested, and rated in accordance with Test Methods D4303, shall have a color difference (ΔE^*_{ab}) of more than 4.0 but not more than 8.0 CIELAB units between the specimens measured before and after exposure.

5.3.3 Pigments were placed in a lightfastness category on the basis of either known historical performance in art works or the ratings from four lightfastness tests conducted as described in Test Methods D4303. Results from further tests on these, or other pigments, are solicited by Subcommittee D01.57.

5.3.3.1 The lightfastness category of a pigment shall be changed if results from several further tests conducted in accordance with Test Methods D4303 and approved by ASTM Subcommittee D01.57, establish a different lightfastness category than the one given in Table 1.

5.3.3.2 Additional pigments shall be placed in Table 1 after they have been tested for lightfastness in accordance with Test Methods D4303 and the test results submitted to ASTM Subcommittee D01.57 for evaluation, provided the results demonstrate that the pigments have the lightfastness ratings required for Lightfastness I or Lightfastness II, as described above.

5.3.4 For information and to establish nomenclature, pigments in Lightfastness III, IV, V, categories are given in Table X1.1 in Appendix X1. However, such pigments are not to be used in paint conforming to this specification.

5.4 *Toxicity*—All products and labeling must conform to the Federal Hazardous Substances Act and to Practice D4236.

5.5 *Statement of Conformance*—“Conforms to ASTM Specification D5067,” or “Conforms to ASTM D5067,” or “Conforms to the quality requirements of ASTM D5067.” This statement may be combined with other conformance statements, such as, “Conforms to the quality and health requirements of ASTM Specification D5067 and Practice D4236.”

5.6 *Address*—Include on the label (1) the name and address of the manufacturer or importer, and (2) the country of manufacture.

6. Quality Assurance for Artists’ Watercolor Paints

6.1 *Conditions Not Covered in This Specification That Affect Artists’ Watercolor Paints:*

6.1.1 *Substrate*—The effective pH of the paper used will affect the long-term color of the applied watercolor.

6.1.2 *Environmental Conditions*—Factors such as temperature, humidity, airflow, and light conditions affect application properties, drying time, and adhesion.

6.1.3 *Storage*—With aging and elevated temperatures there may be a change in consistency and a discernible separation of vehicle.

6.2 *Vehicles*—Only water soluble gums/resins shall be used.

6.3 *Pigments*—Pigments used in watercolors shall be limited to those in Table 1. Their lightfastness rating shall be the numeral given in the same row.

6.4 *Additives*—Thickeners, preservatives, surfactants, and humectants may be used to achieve consistency, prevent microbe deterioration, and control application results.

6.5 *Inerts*—Inerts shall only be used to produce desirable working qualities.

6.6 *Preparation of Sample*—For paste and fluid paints, empty the contents of the previously unopened container onto a glass slab and mix thoroughly with a spatula to a homogeneous sample. For cake paints, take a piece of the cake on a glass slab and add water and mix until a homogeneous paint is formed.

6.7 *Coarse Particles*—Paints shall be free of oversize particles and shall form a uniform film. The maximum content of coarse particles shall be 1 weight % as determined by Test Methods D185.

6.8 *Fineness of Dispersion*—Determine the fineness of dispersion by Test Method D1210. For paste paint, on a glass plate, using a spatula, mix the paint with an equal volume of water until homogeneous. The maximum allowable grind reading is 40 μm (1.5 mils).

6.9 *Consistency*—Paints shall be smooth and easily solubilized with water to a homogeneous color.

6.10 *Freeze-Thaw Stability*—Using a freezer that has a temperature of -7°C (20°F) or lower, subject the paint to five freeze-thaw cycles. A freeze-thaw cycle shall consist of freezing the paint to a solid state (minimum of 18 h) and then thawing the paint to room temperature (minimum of 5 h). The paint shall then meet the requirements of 6.7, 6.8, and 6.9.