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Standard Specification for Zinc Oxide Pigments¹

This standard is issued under the fixed designation D79; 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.

This standard has been approved for use by agencies of the U.S. Department of Defense.

1. Scope

1.1 This specification covers the pigments commercially known as “zinc white” or zinc oxide. The pigments may be purchased in the dry form or as a paste in oil.

NOTE 1—Zinc oxides are used in many industries. For additional information, see Classification [D4295](#) and Test Methods [D4315](#) for descriptions of zinc oxide use in rubber compounding.

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

1.3 *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](#)
- [D280 Test Methods for Hygroscopic Moisture \(and Other Matter Volatile Under the Test Conditions\) in Pigments](#)
- [D281 Test Method for Oil Absorption of Pigments by Spatula Rub-out](#)
- [D332 Test Method for Relative Tinting Strength of White Pigments by Visual Observation](#)
- [D1483 Test Method for Oil Absorption of Pigments by Gardner-Coleman Method](#)
- [D2745 Test Method for Relative Tinting Strength of White Pigments by Reflectance Measurements](#)
- [D3280 Test Methods for Analysis of White Zinc Pigments](#)

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 [D01.31](#) on Pigment Specifications.

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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.

[D4295 Classification for Rubber Compounding Materials—Zinc Oxide](#)

[D4315 Test Methods for Rubber Compounding Material—Zinc Oxide](#)

[E20 Practice for Particle Size Analysis of Particulate Substances in the Range of 0.2 to 75 Micrometres by Optical Microscopy \(Withdrawn 1994\)](#)³

3. Significance and Use

3.1 Zinc oxide functions as both a chemical and a pigment. It is used in a variety of applications including rubber, paint, reprography, glass, chemicals, etc. In paint, it contributes to mildew protection, ultraviolet absorption, hiding power, and neutralization of acids formed upon oxidation of the paint film.

4. Composition and Properties

4.1 *Dry Pigment, French Process*—In the manufacture of French process zinc oxide, metallic zinc is vaporized, either in a boiler or a refining column, and the resulting vapor is burned in a controlled manner in an orifice. The fine particles of zinc oxide are cooled enough to agglomerate and are collected by a system of fabric bags. French process oxide shall conform to the properties listed in [Table 1](#).

4.2 *Dry Pigment, American Process*—In the manufacture of American process zinc oxide, zinc ore is reduced in the presence of a carbonaceous fuel. The resulting vapor is burned in a combustion chamber, and the fine particles of zinc oxide are cooled enough to agglomerate and are collected by a system of fabric bags. American process oxide shall conform to the properties listed in [Table 1](#).

4.3 *Paste in Oil*—The paste shall be made by thoroughly grinding the specified pigment with linseed oil. As received it shall not be caked in the container and shall break up readily in oil to form a smooth paint of brushing consistency. The paste shall conform to the following requirements:

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



TABLE 1 Composition

	French Process	American Process
Zinc oxide, min, %	99	98.5
Total sulfur, max, %	0.1	0.2
Moisture and other volatile matter, max, %	0.5	0.5
Total impurities, including moisture and other volatile matter, max, %	1.0	1.5
Coarse particles (total residue retained on a No. 325 (45- μ m) sieve), max, %	0.10	0.25

Pigment, %	80 to 86
Linseed oil, %	14 to 20
Moisture and other volatile matter, max, %	0.5
Coarse particles and skins (total residue retained on a No. 325 (45- μ m) sieve), max, % of the dry pigment	1.5

4.4 In such physical properties as are specified by the purchaser, the pigment shall satisfactorily match a reference sample mutually agreed upon by the purchaser and the seller. The most frequently specified properties are oil absorption, tinting strength, and particle shape. Appropriate test methods are listed in Section 6. In the event that either an acicular type or a nodular (spherical) type of zinc oxide is desired, the particle shape shall be determined by examining or photographing microscopic mounts (1000 \times or more) of the sample and the mutually agreed upon standard that are to be prepared as specified in Practice E20.

5. Sampling

5.1 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 4540 kg (10 000 lb), except that for shipments of less than 10 000 lb, two samples shall be taken. At the option of the purchaser, the samples may be tested separately or after blending in equal quantities the samples from the same production unit to form a composite sample.

6. Test Methods

6.1 Tests shall be conducted in accordance with the appropriate ASTM test methods, where applicable. Test procedures not covered by ASTM test methods shall be mutually agreed upon by the purchaser and the seller.

6.1.1 *Coarse Particles*—Test Methods D185.

6.1.2 *Moisture in Pigments*—Test Methods D280.

6.1.3 *Chemical Analysis of Dry Pigments*—Test Methods D3280.

6.1.4 *Oil Absorption of Pigments by Gardner-Coleman Method*—Test Method D1483.

6.1.5 *Oil Absorption of Pigments by Spatula Rub-Out*—Test Method D281.

6.1.6 *Instrumental Tinting Strength of White Pigments*—Test Method D2745.

6.1.7 *Tinting Strength of White Pigments*—Test Method D332.

7. Keywords

7.1 American process; French process; mildew protection; ultraviolet absorption; zinc oxide; zinc white

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