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AMERICAN SOCIETY FOR TESTING AND MATERIALS
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Standard Guide for Determining Constituents Classified as Hazardous Contained in Protective Coatings¹

This standard is issued under the fixed designation D 3630; 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 guide applies to liquid protective coatings, related products, and their dried films. It is a guide for the selection of analytical procedures for the determination of the presence and quantity of selected materials that may present potential physiological hazards.

1.2 Various levels of government have established laws and regulations that limit the quantity or prohibit the presence of certain materials classified as hazardous in protective coatings. Materials subject to such regulations are within the scope of this guide.

1.3 A hazardous material within the scope of this guide is one that exhibits harmful physiological effects through ingestion, inhalation, absorption, or skin or eye contact. Hazards associated with combustion are not within its scope.

1.4 *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 49 Test Methods of Chemical Analysis of Red Lead²
- D 126 Test Methods for Analysis of Yellow, Orange, and Green Pigments Containing Lead Chromate and Chromium Oxide Green²
- D 215 Practice for Chemical Analysis of White Linseed Oil Paints³
- D 283 Test Methods of Chemical Analysis of Cuprous Oxide and Copper Pigments²
- D 444 Test Methods for Chemical Analysis of Zinc Yellow Pigment (Zinc Chromate Yellow)²
- D 564 Test Methods for Liquid Paint Driers³
- D 715 Test Methods for Analysis of Barium Sulfate Pigment²

- D 1301 Test Methods for Chemical Analysis of White Lead Pigments²
- D 1844 Test Methods for Chemical Analysis of Basic Lead Silicochromate²
- D 1845 Test Methods for Chemical Analysis of Strontium Chromate Pigment²
- D 2348 Test Method for Arsenic in Paint³
- D 2349 Test Method of Qualitative Determination of Nature of Thinner in Solvent-Reducible Paints³
- D 2350 Test Method for Antimony Oxide in White Pigment Separated From Solvent-Reducible Paints³
- D 2371 Test Method for Pigment Content of Solvent-Reducible Paints³
- D 2372 Practice for Separation of Vehicle From Solvent-Reducible Paints³
- D 2374 Test Method for Lead in Paint Driers by EDTA Method³
- D 2621 Test Method for Infrared Identification of Vehicle Solids From Solvent-Reducible Paints³
- D 2698 Test Method for Determination of the Pigment Content of Solvent-Reducible Paints by High-Speed Centrifuging³
- D 2742 Methods for Chemical Analysis of Tribasic Lead Phosphosilicate⁴
- D 3257 Test Methods for Aromatics in Mineral Spirits by Gas Chromatography⁵
- D 3271 Practice for Direct Injection of Solvent-Reducible Paints Into a Gas Chromatograph for Solvent Analysis²
- D 3272 Practice for Vacuum Distillation of Solvents From Solvent-Reducible Paints For Analysis³
- D 3280 Test Methods for Analysis of White Zinc Pigments²
- D 3329 Test Method for Purity of Methyl Isobutyl Ketone by Gas Chromatography⁵
- D 3335 Test Method for Low Concentrations of Lead, Cadmium, and Cobalt in Paint by Atomic Absorption Spectroscopy³
- D 3432 Test Method for Free Toluene Diisocyanates in Urethane Prepolymers and Coating Solutions by Gas Chromatography²
- D 3618 Test Method for Detection of Lead in Paint and Dried Paint Films³

¹ This guide is under the jurisdiction of ASTM Committee D-1 on Paint and Related Coatings, Materials, and Applications and is the direct responsibility of Subcommittee D01.22 on Health and Safety.

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² *Annual Book of ASTM Standards*, Vol 06.03.

³ *Annual Book of ASTM Standards*, Vol 06.01.

⁴ Discontinued; see *1989 Annual Book of ASTM Standards*, Vol 06.02.

⁵ *Annual Book of ASTM Standards*, Vol 06.04.

D 3624 Test Method for Low Concentrations of Mercury in Paint by Atomic Absorption Spectroscopy³

D 3717 Test Method for Low Concentrations of Antimony in Paint by Atomic Absorption Spectroscopy³

D 3718 Test Method for Low Concentrations of Chromium in Paint by Atomic Absorption Spectroscopy³

E 202 Test Methods for Analysis of Ethylene Glycols and Propylene Glycols⁶

E 260 Practice for Packed Column Gas Chromatography⁷

2.2 ANSI Standard:

Z66.1 Specification for Paints and Coatings Accessible to Children to Minimize Dry Film Toxicity⁸

2.3 Federal Standards:⁹

U.S. Federal Test Method Standard No. 141:

4021.1 Pigment Content (Ordinary Centrifuge)

4032 Vehicle Isolation (Super Centrifuge)

7041 Analysis of Basic Carbonate White Lead Pigment

7051 Analysis of Basic Sulfate White Lead Pigment

7071 Red Lead Pigments

7106 Analysis of Antimony Oxide Pigment

7111 Analysis of Chrome Green Pigment

7131 Analysis of Chrome Yellow and Chrome Orange Pigments

7135 Analysis of Cadmium Pigment

7231 Metal Content of Driers

7271 Analysis of Pigments Extracted from Chrome Yellow and Chrome Orange Paints

7281 Analysis of Pigment Extracted from Chrome Green Paints

2.4 Canadian Standards Association Standards:¹⁰

CAN2-1.500 Method of Test for Toxic Trace Elements in Protective Coatings:

1-GP-500.1 Determination of Lead in Low Concentration

1-GP-500.2 Determination of Leachable Cadmium in Low Concentration

1-GP-500.3 Determination of Leachable Barium in Low Concentration

1-GP-500.4 Determination of Leachable Antimony in Low Concentration

1-GP-500.5 Determination of Leachable Selenium in Low Concentration

1-GP-500.6 Determination of Leachable Mercury in Low Concentration

3. Summary of Guide

3.1 This guide covers each material separately, discussing the methods available, the advantages and drawbacks of each, including the range, the equipment needed, and when information is available, the precision. Methods discussed are:

3.1.1 ASTM methods adopted by Committee D-1,

3.1.2 Other ASTM methods believed to be applicable to paint and related products,

3.1.3 Methods adopted as standard by other scientific and technical or governmental organizations, and

3.1.4 Widely used methods reported in the literature.

4. Significance and Use

4.1 Protective coatings and related products containing materials classified as hazardous may be regulated or controlled in various ways as follows:

4.1.1 *Precautionary Labeling Required:*

4.1.1.1 Under the U.S. Federal Hazardous Substances Act and corresponding state laws, “consumer” paint products must carry precautionary labeling as specified in the laws, or implementing regulations, or both.

NOTE 1—Under the Federal Hazardous Substances Act lead, ethylene and diethylene glycol, petroleum distillates, and turpentine are classed as hazardous through ingestion. Methyl alcohol, benzene, xylene, and toluene are classed as hazardous through ingestion and inhalation. Ethylene diamine, diethylene triamine, and diglycidyl ethers are classed as strong sensitizers.

4.1.1.2 In certain states, coatings and related materials packaged and sold for industrial application are subject to precautionary labeling laws and regulations.

4.1.2 *Use Prohibited in Certain Areas:*

4.1.2.1 Under the U.S. Federal Hazardous Substances Act and the Lead Paint Poisoning Prevention Act, and the laws of certain states and municipalities, coatings and related products containing more than a specified quantity of lead are banned for use in and around a household or other areas where children might be exposed.

4.1.2.2 Under certain local ordinances, coatings and related products containing more than a specified quantity of “other toxic heavy metals” are also subject to control.

NOTE 2—The amount of lead, antimony, arsenic, cadmium, mercury, selenium, and soluble barium that may be present in coatings for use on children’s furniture and toys and areas that might be chewed by children is restricted under ANSI Standard Z 66.1 and under various U.S. municipal ordinances.

4.1.3 *Subject to Approval for Certain Uses:*

4.1.3.1 The U.S. Food and Drug Administration permits only approved ingredients to be used in coatings for food and beverage containers or processing equipment that comes into contact with the product.

4.1.3.2 The U.S. Department of Agriculture authorizes for use on structural surfaces in federally inspected meat and poultry processing plants only coatings accepted as nonhazardous.

4.1.3.3 The U.S. Environmental Protection Agency regulations control the distribution of paints that claim special fungicidal or pesticidal characteristics, and the use in ship-bottom paints of materials that have the potential for harming the aquatic environment.

NOTE 3—Cuprous oxide, bis(tributyltin oxide), arsenic, and mercury are classed as hazardous materials by the U.S. Environmental Protection Agency when used in antifouling paints.

4.1.4 *Environmental Controls During Use and Corrective Measures in the Event of Accidents or Misuse Required:*

⁶ Annual Book of ASTM Standards, Vol 15.05.

⁷ Annual Book of ASTM Standards, Vol 14.02.

⁸ Available from American National Standards Institute, 11 W. 42nd St., 13th Floor, New York, NY 10036.

⁹ Available from Standardization Documents Order Desk, Bldg. 4, Section D, 700 Robbins Ave., Philadelphia, PA 19111-5094.

¹⁰ Available from Canadian Standards Association, 178 Rexdale Blvd., Rexdale, Ontario, Canada M9W 1R3.