

SSPC: The Society for Protective Coatings

COATING STANDARD NO. 20

Zinc-Rich Coating (Type I – Inorganic, and Type II – Organic)

1. Scope

This standard contains minimum formulation requirements for two types of highly pigmented zinc-rich coatings with inorganic (Type I) and organic (Type II) vehicles.

2. Description

2.1 Coatings described in this standard consist of zinc dust, functional additives, and an organic or inorganic binder with appropriate solvents (see Note 8.1). These coatings may consist of one, two, or three components.

2.2 Coatings meeting this standard are categorized according to vehicle type and zinc level. These coatings are categorized as having inorganic (Type I) or organic (Type II) vehicles. In addition, these coatings are categorized as having one of the three levels of zinc content described in Section 4.1.2.

2.3 These coatings are uniquely defined by their capabilities for protecting steel exposed at film discontinuities such as narrow scratches and holidays. A zinc-rich coating meeting this standard may be used alone or as a primer in a multi-coat system. Zinc-rich coatings, both topcoated and untopcoated, have been used successfully in a wide variety of environmental zones. For a detailed breakdown of applicability of various types of zinc-rich coatings in different environmental zones, refer to SSPC-PS Guide 12.00. Consult the coating manufacturer for specific exposure recommendations (see Note 8.2).

2.4 UNITS OF MEASURE: This standard makes use of both the IEEE/ASTM⁽¹⁾ SI 10, “American National Standard for Metric Practice” International System Units (SI) and U.S. Customary units. The measurements may not be exact equivalents; therefore, each system shall be used independently of the other. This standard uses SI units with approximate U.S. Customary conversions shown in parentheses.

⁽¹⁾ ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959. Standards are available online from <<https://www.astm.org>>

This standard, developed by the SSPC C.1.1 Zinc-Rich Coatings Committee, was first issued in 1982, with revisions in 1991, 2002, 2004, and 2019.

3. Referenced Standards

3.1 The date of the referenced standard in effect at the time of publication of this standard shall govern unless otherwise specified. Standards marked with an asterisk (*) are referenced only in the Description or Notes, which do not contain requirements.

3.2 If there is a conflict between the requirements of any of the cited reference documents and this standard, the requirements of this standard shall prevail.

3.3 SSPC STANDARDS AND JOINT STANDARDS

Guide 13	Guide for the Identification and Use of Industrial Coating Material in Computerized Product Databases
* Paint 29	Zinc Dust Sacrificial Primer, Performance-Based
* Paint 30	Weld-Through Inorganic Zinc Primer
* PS Guide 12.00	Guide to Zinc-Rich Coating Systems

3.4 ASTM INTERNATIONAL STANDARDS:

D520	Specification for Zinc Dust Pigment
D521	Standard Test Methods for Chemical Analysis of Zinc Dust (Metallic Zinc Powder)
* D562	Test Method for Consistency of Paints Measuring Krebs Unit (KU) Viscosity Using a Stormer-type Viscometer
D823	Standard Practices for Producing Films of Uniform Thickness of Paint, Varnish, and Related Products on Test Panels
* D1475	Test Method for Density of Liquid Coatings, Inks, and Related Products*
* D1640/D1640M	Test Methods for Drying, Curing, or Film Formation of Organic Coatings at Room Temperature
* D2369	Test Method for Volatile Content of Coatings
* D2371	Test Method for Pigment Content of Solvent-Reducible Paints
* D2621	Test Method for Infrared Identification of Vehicle Solids from Solvent-Reducible Paints
D3278	Test Methods for Flash Point of Liquids by Small-Scale Closed-Cup Apparatus

D3335	Standard Test Method for Low Concentrations of Lead, Cadmium, and Cobalt in Paint by Atomic Absorption Spectroscopy
* D6580	Standard Test Method for the Determination of Metallic Zinc Content in Both Zinc Dust Pigment and in Cured Films of Zinc-Rich Coatings

3.5 U. S. CODE OF FEDERAL REGULATIONS

29 CFR 1910.1200, Hazard Communication⁽²⁾

4. Composition Requirements

4.1 PIGMENTATION

4.1.1 Zinc Pigment Type: The major pigment component in these coatings shall be zinc dust of the type described in ASTM D520, Type II (as determined in accordance with ASTM D521) unless otherwise specified (see Note 8.3 for additional information on methods for determination of metallic zinc content). The amount of zinc dust by weight present in the dried film shall be one of the zinc dust levels defined in Section 4.1.2. Note 8.4 provides an example of language for use when specifying SSPC-Paint 20 in procurement documents.

4.1.2 Zinc Dust Level Classification: The coating shall be classified according to the level of zinc dust by weight present in the dried film as follows:

- Level 1 — equal to or greater than 85%
- Level 2 — equal to or greater than 77% and less than 85%
- Level 3 — equal to or greater than 65% and less than 77%.

4.1.3 Other possible pigment components include extenders, curing aids, tinting colors, and suspension and pot-life control agents.

4.2 VEHICLE TYPE: If no vehicle type is specified, either Type I (Inorganic) or Type II (Organic) is acceptable (see Sections 4.2.1 and 4.2.2).

4.2.1 Inorganic Vehicles: Type I inorganic vehicles include post-cured water-borne alkali silicates (IA); self-cured, water-borne alkali silicates (IB); and self-cured, solvent-borne alkyl silicates (IC). The vehicles of Types IA and IB may include the alkali metals (commonly sodium, lithium, and potassium), while IC vehicles are alkyl silicates (most commonly ethyl silicates). Type IA vehicles are post-cured with a separate wash solution, usually mildly acidic in nature, applied as an aftercoat. Type IB vehicles are chemically similar to Type IA vehicles, except they are formulated to self-cure upon exposure to moisture and carbon dioxide in the air. Type IC vehicles self-cure upon exposure to atmospheric moisture.

4.2.2 Organic Vehicles: Type II vehicles include those with thermoplastic binders (IIA) and thermoset binders (IIB). Type II thermoplastic vehicles include polymers of chlorinated rubber, styrene, vinyl, and other organic materials that soften upon exposure to heat. Type IIB thermoset vehicles do not soften upon heating, and include polymers of epoxy, polyurethane, polyester, silicone, and other chemically cross-linked materials.

4.3 VOC CONTENT: Immediately prior to application, the mixed coating shall comply with all Federal, state, and local VOC requirements (see Note 8.1).

4.4 ANALYTICAL TEST DATA: If required by the procurement documents (project specification), the coating manufacturer shall provide records of chemical and physical analysis of coating batches qualified by independent testing to meet this standard, including ASTM D520 Type, percentage of zinc loading, and total lead content in dry film tested in accordance with ASTM D3335 (see Notes 8.5 and 8.6).

5. Requirements for Liquid Coating

5.1 MIXING: The liquid portion of a multi-component coating shall be mixed and dispersed to produce a product that is uniform; stable; free from grit, lumps, undispersed zinc and other undesirable particles; and in conformance with the requirements of this standard.

5.1.1 The pigment portion of a multi-component coating (if supplied as a dust) shall be dry and loosely packed prior to mixing.

5.1.2 The ready-mixed coating shall be capable of being dispersed under mechanical agitation to a smooth, uniform consistency and shall not show any objectionable properties in the mix.

5.2 POT LIFE: The coating shall be applied according to the manufacturer's written instructions and within the manufacturer's stated pot life. Adjustments to pot life due to temperature and humidity shall be approved in writing by the coating manufacturer.

5.3 STORAGE LIFE: Neither the vehicle of the multi-component coating nor the ready-mixed coating shall show thickening that is detrimental to performance or application properties. The components or coating shall exhibit no curdling, gelling, gassing, or hard caking after being stored unmixed for a minimum of six months from date of delivery in a tightly sealed, unopened container at a temperature of 10 to 32 °C (50 to 90 °F).

5.4 WORKING PROPERTIES: The mixed coating shall spray easily and show no signs of streaking, running, sagging, or other objectionable features when applied within

⁽²⁾ U.S. Code of Federal Regulations is available online at <<https://gov.ecfr.io/cgi-bin/ECFR?page=browse>>

the coating manufacturer's recommended film thickness range in accordance with ASTM D 823, Method D, and dried in a vertical position.

5.5 FLASH POINT: The minimum flash point, as determined by ASTM D3278, shall be "none" for inorganic water-based zinc dust coatings, and a minimum of 4 °C (~40 °F) for solvent-based inorganic zinc primers (Type I) and for organic zinc primers (Type II).

6. Labeling

6.1 Labeling of products for use within the U.S. shall conform to the requirements of 29 CFR 1910.1200, which are consistent with the provisions of Revision 3 of the Globally Harmonized System of Classification and Labelling of Chemicals (GHS). Products intended for use outside the U.S. shall conform to local requirements for labeling.

6.2 Manufacturer shall identify the Type of zinc dust (as defined by ASTM D520) on the product label.

6.3 Technical data shall be provided for at least all data elements categorized as "essential" in SSPC-Guide 13.

7. Disclaimer

7.1 This is a consensus standard developed by SSPC: The Society for Protective Coatings. While every precaution is taken to ensure that all information furnished in SSPC standards and specifications is as accurate, complete, and useful as possible, SSPC cannot assume responsibility nor incur any obligation resulting from the use of any materials, coatings, or methods specified herein, or of the specification or standard itself.

7.2 This standard does not attempt to address all problems concerning safety and health associated with its use. The user of this standard, as well as the user of all products or practices described herein, is responsible for instituting appropriate health and safety practices and for ensuring compliance with all appropriate governmental regulations.

8. Notes

Notes are not requirements of this standard.

8.1 VOC CONTENT: U.S. Federal limits for VOCs in industrial maintenance coatings were published in 1998 and may be found at 40 CFR 59, subpart D, National Volatile Organic Compound Emission Standards for Architectural Coatings <<https://www.ecfr.gov/cgi-bin/ECFR?page=browse>> The Federal limits apply to the coating at the time of manufacture.

Local regulations regarding VOC content, VOC emissions, and container labeling may vary depending on

project location. Many state governments, local governments, or air quality management areas have more stringent VOC regulations than those in the federal rule. Local regulations frequently apply at the time of application, after thinning according to the manufacturer's recommendations. The coating manufacturer's product data sheet usually provides information on the total VOC content.

8.2 Caution should be used when zinc-rich coatings contact austenitic stainless steel. In case of fire, molten zinc metal may cause embrittlement of austenitic stainless steel

8.3 ASTM STANDARDS FOR DETERMINING METALLIC ZINC CONTENT OF ZINC PIGMENTS: ASTM has developed two standards for determining the metallic zinc content of a zinc pigment, ASTM D521 and ASTM D6580. The percentage of metallic zinc obtained using the procedure contained in ASTM D6580 will be significantly lower than the percentage obtained using the procedure contained in ASTM D521. In this revision of Paint 20, the committee decided to retain the ASTM D521 requirement due to (1) the amount of historical performance data that has been obtained using the ASTM D521 procedure, and (2) the lack of known data comparing the performance of zinc-rich coatings based only on metallic zinc content of the pigment.

8.4 EXAMPLE OF SPECIFICATION LANGUAGE: The following language may be used when specifying SSPC-Paint 20 coatings. Select one of each set of italicized options below:

The zinc-rich coating shall conform to SSPC Paint 20 [*Type I/Type II*], with a minimum zinc dust content level of [*Level 1/Level 2/Level 3/specify percent*]. Zinc dust shall meet requirements of ASTM D520 [*Type II/Type III*].

If a zinc level is not specified, then Levels 1, 2 and 3 are acceptable.

Subtypes of coating may be specified from the following examples:

- Type IA = Inorganic; post-cured, water-borne alkali silicates
- Type IB = Inorganic; self-cured, water-borne alkali silicates
- Type IC = Inorganic; self-cured, solvent-borne alkyl silicates
- Type IIA = Organic, thermoplastic binders (e.g., phenoxy)
- Type IIB = Organic; thermoset binders (e.g., epoxy polyamide, moisture-cured urethane)

8.5 ADDITIONAL QUALIFICATION TESTS: Because of the diversity of potential service environments, the user may require the zinc-rich coating be further exposed and qualified by at least one additional test relating to the intended

exposure. It should be emphasized that a well-designed non-standard test may often provide more meaningful information for a given service condition than one or more standard tests. SSPC Paint 29 contains requirements for performance testing of zinc-rich coatings. SSPC-Paint 30 contains requirements for weldable pre-construction primers.

8.6 QUALITY ASSURANCE TESTS: If the user chooses, tests may be used to determine the acceptability of a lot or batch of a qualified coating. The quality assurance tests are used to determine whether the supplied products are of the same type and quality as those originally tested and certified for acceptance. The selected tests should accurately and rapidly measure the physical and chemical characteristics of the coating necessary to verify that the supplied material is substantially the same as the previously accepted material. All of the quality assurance tests must be

performed on the originally submitted qualification sample. The results of these tests are used to establish pass/fail criteria for quality assurance testing of supplied products.

8.6.1 Establishing Quality Assurance Acceptance Criteria: Many ASTM test methods contain precision and bias statements. Specification developers should be cognizant of the fact that these statements exist. Quality assurance test criteria should not be more stringent than the interlaboratory precision of the test methods used.

8.6.2 Recommended Quality Assurance Tests: Recommended quality assurance tests include but are not limited to: infrared analysis (ASTM D2621), viscosity (ASTM D562), weight per gallon (ASTM D1475), total solids (ASTM D2369), dry time (ASTM D1640), and percent pigment (ASTM D2371).

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