Designation: A 780 – 01 (Reapproved 2006)

Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings[1]

This standard is issued under the fixed designation A 780; 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 Department of Defense.

1. Scope

1.1 This practice describes methods that may be used to repair damaged hot-dip galvanized coatings on hardware, structural shapes, and other products fabricated prior to hot-dip galvanizing, and uncoated areas remaining after initial hot-dip galvanizing. The damage may be the result of welding or cutting (flame), in which case the coating will be damaged predominantly by burning. This practice can also be used to repair hot-dip galvanized coatings damaged by excessively rough handling during shipping or erection. Requirements concerning the renovation of uncoated areas remaining after initial hot-dip galvanizing are contained within the applicable material specification.

1.2 This practice describes the use of low melting point zinc alloy repair rods or powders made specifically for this purpose, the use of paints containing zinc dust, and the use of sprayed zinc (metallizing).

1.3 The extent of repair shall be limited to an area mutually agreeable to the contracting parties. Similarly, contracting parties shall agree to the repair method to be used.

1.4 *This standard does not purport to address the safety problems, 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.*

1.5 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are for information only.

2. Referenced Documents

2.1 *ASTM Standards:* [2]

A 902 Terminology Relating to Metallic Coated Steel Products

D 520 Specification for Zinc Dust Pigment

2.2 *Society for Protective Coatings (SSPC) Documents:*[3]

SSPC-PA2 Measurement of Dry Paint Thickness with Magnetic Gages

SSPC-SP2 Hand Tool Cleaning

SSPC-SP5/NACE No.1 White Metal Blast Cleaning

SSPC-SP10/NACE No.2 Near-White Blast Cleaning

SSPC-SP11 Power Tool Cleaning to Bare Metal

3. Terminology

3.1 *Definitions*—For definitions of terms used in this practice, refer to Terminology A 902.

4. Materials

4.1 *Properties*—The material used for repairs shall have the following characteristics:

4.1.1 One application of the material shall provide a coating thickness of at least 2.0 mils (50.8 μm).

4.1.2 The applied coating shall provide barrier protection and shall preferably be anodic to steel.

4.1.3 Application of the coating material shall be possible under shop or field conditions.

4.2 *Types*—There are three types of material that possess the required properties and may be used to repair damaged galvanized coatings, as follows:

4.2.1 *Zinc-Based Solders*—Zinc alloy solders are to be used for repairs. The most common types of solders are zinc-cadmium, zinc-tin-lead, and zinc-tin-copper alloys. Zinc-cadmium and zinc-tin-lead alloys have liquidus temperatures in the ranges from 518 to 527°F (270 to 275°C) and 446 to 500°F (230 to 260°C), respectively. (The liquidus temperature is that temperature above which an alloy is completely molten.) The zinc-tin-copper alloys have a liquidus temperature in the range from 660 to 670°F (349 to 354°C), but they are applied while in a semisolid state in the preferred application temperature range from 480 to 570°F (250 to 300°C). The solders can be used in rod form or as powders. Annex A1 describes the use of zinc-based solders.

[1] This practice is under the jurisdiction of ASTM Committee A05 on Metallic-Coated Iron and Steel Products and is the direct responsibility of Subcommittee A05.13 on Structural Shapes and Hardware 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.

[3] Available from Steel Structures Painting Council, 4400 Fifth Ave., Pittsburgh, PA 15213.

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4.2.2 *Paints Containing Zinc Dust*—These are usually based on organic binders, pre-mixed and formulated specifically for use on steel surfaces. Paints containing zinc dust, with concentrations of zinc dust in the range of 65 to 69 % or above 92 % in the dried film, are considered equally effective for the repair of damaged galvanized coatings. The repair paint to be used shall be selected by the galvanizer, unless the purchaser specifies a particular concentration or paint system. Corrosion resistance and service performance are very dependent on the properties of the paint system, the extent of surface preparation, and skills of individual applicators. Annex A2 describes the use of paints containing zinc dust. Specification D 520 describes the zinc dust component of these paints.

4.2.3 *Sprayed Zinc*—This method involves the application of a zinc coating by spraying the surface to be repaired with droplets of molten metal using wire or ribbon, or powder processes. Annex A3 describes the use of sprayed zinc.

4.3 For further information, reference may be made to the papers, procedures, and specifications in Refs. **(1)** through **(4)** (see list of references at the end of this practice).

5. Keywords

5.1 coatings—zinc; galvanized coating repair; galvanized coatings; touch-up; zinc coating repair; zinc coatings

ANNEXES

(Mandatory Information)

A1. REPAIR USING ZINC-BASED ALLOYS

A1.1 Clean the surface to be reconditioned using a wire brush, a light grinding action, or mild blasting. To ensure that a smooth reconditioned coating can be effected, surface preparation shall extend into the surrounding, undamaged galvanized coating.

A1.2 If the area to be reconditioned includes welds, first remove all weld flux residue and weld spatter (of a size that cannot be removed by wire brushing or blast cleaning) by mechanical means, such as chipping, grinding, or power scaling, etc.

A1.3 Preheat the cleaned area to be reconditioned to at least 600°F (315°C). Do not overheat the surface beyond 750°F (400°C), nor allow the surrounding galvanized coating to be burned. Wire brush the surface to be reconditioned during preheating. Pre-flux, if necessary.

A1.4 Rub the cleaned, preheated area with the repair stick to deposit an evenly distributed layer of the zinc alloy. When powdered zinc alloys are used, sprinkle the powder on the cleaned, preheated surface and spread out with a spatula or similar tool. The thickness of the applied coating shall be as agreed upon between the contracting parties.

A1.5 When the repair has been effected, remove flux residue by rinsing with water or wiping with a damp cloth.

A1.6 Take thickness measurements with either a magnetic, electromagnetic, or eddy-current gage to ensure that the applied coating is as specified.

A2. REPAIR USING PAINTS CONTAINING ZINC DUST

A2.1 Preparation of the damaged surface will be influenced by the type of paint selected and the anticipated service conditions. Experience shows that in general, organic zinc-rich systems are tolerant of marginal surface preparation. Most organic paints containing zinc dust are not critical of climatic or atmospheric conditions for curing. The following general guidelines shall apply:

A2.1.1 Surfaces to be reconditioned with paints containing zinc dust shall be clean, dry, and free of oil, grease, preexisting paint, and corrosion by-products.

A2.1.2 Where anticipated, field service conditions include immersion, blast clean the surface in accordance with SSPC-SP10/NACE No. 2 near white metal. For less critical field exposure conditions, clean the surface to bare metal, in accordance with SSPC-SP11, as a minimum. Where circumstances do not allow blast or power tool cleaning, it is permissible to hand tool areas clean in accordance with SSPC-SP2. To ensure that a smooth reconditioned coating can be effected, surface preparation shall extend into the undamaged galvanized coating. The method and extent of surface preparation shall be mutually agreeable to the contracting parties.

A2.1.3 If the area to be reconditioned includes welds, first remove all weld flux residue and weld spatter (of a size that cannot be removed by wire brushing or blast cleaning) by mechanical means, such as chipping, grinding, or power scaling, etc.

A2.1.4 Spray or brush-apply the paints containing zinc dust to the prepared area. Apply the paint as in accordance with the manufacturer's printed instructions in a single application employing multiple passes to achieve a dry film thickness to be agreed upon between the contracting parties. Allow adequate curing time before subjecting repaired items to service conditions in accordance with the manufacturer's printed instructions.

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A2.1.5 Take thickness measurements with either a magnetic, electromagnetic, or eddy-current gage to ensure that the applied coating is as specified in accordance with SSPC-PA2.

A3. REPAIR USING SPRAYED ZINC (METALLIZING)

A3.1 Surfaces to be reconditioned by zinc metallizing shall be clean, dry and free of oil, grease, and corrosion products.

A3.2 If the area to be reconditioned includes welds, first remove all flux residue and weld spatter of a size or type that cannot be removed by blast cleaning by mechanical means, that is, chipping, etc.

A3.3 Blast clean the surface to be reconditioned in accordance with SSPC-SP5/NACE No. 1, white metal.

A3.4 To ensure that a smooth reconditioned coating can be effected, surface preparation shall be extended into the surrounding undamaged galvanized coating.

A3.5 Apply the coating to the clean and dry surface by means of metal-spraying pistols fed with either zinc wire or zinc powder. Apply the sprayed coating as soon as possible after surface preparation and before visible deterioration of the surface has occurred.

A3.6 The surface of the sprayed coating shall be of uniform texture, free of lumps, coarse areas, and loosely adherent particles.

A3.7 The nominal thickness of the sprayed zinc coating shall be previously agreed upon between the contracting parties.

A3.8 Take thickness measurements with either a magnetic, electromagnetic, or eddy-current gage to ensure that the applied coating is as specified.

REFERENCES

(1) Van Eijnsbergen, J. F. H., et al, "Reconditioning Damaged Galvanized Surfaces,'' 6th International Conference on Hot Dip Galvanizing, Interlaken, June 1961, pp. 128–141.
(2) SSPC-Paint-20," Zinc Rich Coatings, Type I Inorganic, Type II Organic,'' Steel Structures Painting Council, 4400 Fifth Ave., Pittsburgh, PA 15213, 1979.
(3) MIL-P-21035 (Ships), Military Specification," Paint, High Zinc Dust Content, Galvanizing Repair,'' Amendment 1, U.S. Government Printing Office, Washington, DC, 1970.
(4) "Recommended Practices for Fused Thermal Sprayed Deposits,'' American Welding Society, Inc., 550 N.W. LeJeune Rd., Miami, FL 33135, 1975.

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