



Standard Practice for Locating the Thinnest Spot in a Zinc (Galvanized) Coating on Iron or Steel Articles^{1, 2}

This standard is issued under the fixed designation A 239; 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 covers the procedure for locating, by the use of a solution of copper sulfate, the thinnest spot in a zinc coating (hot dipped, electroplated, or sprayed) on iron or steel articles that are coated after the shape is produced by casting, drawing, pressing, or other forming methods. Examples are: electrical metallic tubing and rigid conduit pipe, castings and forgings, and structural steel; on special hardware, such as poleline, builder's, and farm implement hardware; bolts, nuts, screws, and other miscellaneous general hardware.

1.2 The use of this practice with zinc coating deposited through different processes (such as hot dipped, electroplated, or sprayed) requires caution in interpretation since the end point may vary considerably between different zinc-coating systems.

1.3 Excluded from this practice is sheet steel from hot-dip or electrocoating lines as the sheet products are normally subject to additional forming after the coating process. Also excluded from this practice are all zinc-coated wire and wire products either continuously or batch coated before or after forming.

NOTE 1—**Caution:** Past research (dating from around 1963) has indicated that this practice can be influenced by operator technique. Variations can be due to the difference in hand pressure used to wipe the sample or the inability of the operator to recognize the end point.

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. Significance and Use

2.1 This practice is designed to locate the thinnest portions of the zinc coating on newly coated items (see Appendix X1). Variations in coating thickness can be due to the process by which the zinc is applied (hot dipped, electroplated, or sprayed) or by the geometry of the part that is coated. During hot-dip galvanizing, the coating thickness is affected by the drainage pattern of the molten zinc, while during zinc spraying (metalizing), coating thickness can be dependent on the operator's manipulation of the spray nozzle. The geometry of the part can also influence coating thickness especially during hot-dip galvanizing, where peaks and valleys on the part can cause molten zinc to build up or thin out. This practice is designed to identify those areas of the part where the coating is thin.

3. Copper Sulfate Solution

3.1 The copper sulfate solution shall be made by dissolving approximately 36 parts by weight of commercial cupric sulfate crystals ($\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$) in 100 parts by weight of distilled water (see 3.1.1). Heat may be used to complete the solution of cupric sulfate crystals. If heated, the solution shall be allowed to cool. The solution shall then be agitated with an excess of powdered cupric hydroxide ($\text{Cu}(\text{OH})_2$), about 0.13 oz/gal (1.0 g/L) of solution. The presence of an excess of cupric hydroxide will be shown by the sediment of this reagent at the bottom of the vessel. The neutralized solution shall be allowed to stand for 24 h and then filtered or decanted.

3.1.1 Cupric oxide (CuO), 0.11 oz/gal (0.8 g/L) may be substituted for cupric hydroxide, provided the solution is allowed to stand not less than 48 h after this addition before decanting or filtering.

3.2 The solution shall have a specific gravity of 1.186 at 18°C (65°F). To adjust a solution of improper specific gravity, add distilled water when the specific gravity is high, and add a copper sulfate solution of a higher specific gravity when the solution is low in specific gravity.

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 A05.07 on Methods of Testing.

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² This practice is used to locate the thinnest spot only, and is not intended as a test for coating weight. This practice is to be used only within the limits of Section 1, Scope.