



Designation: A1122/A1122M – 22

Standard Test Method for Bend Testing of Metallic-Coated Steel Sheet to Evaluate Coating Adhesion¹

This standard is issued under the fixed designation A1122/A1122M; 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 reappraisal. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reappraisal.

1. Scope

1.1 This test method covers a bend test to verify that metallic coatings on steel sheet are free of delamination. The test method described is designed and intended for use in both laboratory and plant situations and their environments.

1.2 The metallic-coated steel product shall conform to all the requirements of the appropriate specifications as follows: Specifications [A463/A463M](#), [A653/A653M](#), [A755/A755M](#), [A792/A792M](#), [A875/A875M](#), [A924/A924M](#), [A929/A929M](#), [A1046/A1046M](#), [A1057/A1057M](#), [A1063/A1063M](#), [A1079](#), and [A1087/A1087M](#).

1.3 Quantitative limits are not addressed and are established in the general requirements, or individual product specifications, or both; or when applicable, as agreed to between supplier and user.

1.4 *Units*—This specification is applicable to orders in either inch-pound units or SI units. Values in inch-pound and SI units are not necessarily equivalent. Within the text, SI units are shown in brackets. Each system shall be used independently of the other.

1.5 *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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.6 *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.*

¹ This test method 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. Referenced Documents

2.1 *ASTM Standards*:²

- [A463/A463M](#) Specification for Steel Sheet, Aluminum-Coated, by the Hot-Dip Process
- [A653/A653M](#) Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
- [A755/A755M](#) Specification for Steel Sheet, Metallic Coated by the Hot-Dip Process and Prepainted by the Coil-Coating Process for Exterior Exposed Building Products
- [A792/A792M](#) Specification for Steel Sheet, 55 % Aluminum-Zinc Alloy-Coated by the Hot-Dip Process
- [A875/A875M](#) Specification for Steel Sheet, Zinc-5 % Aluminum Alloy-Coated by the Hot-Dip Process
- [A902](#) Terminology Relating to Metallic Coated Steel Products
- [A924/A924M](#) Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process
- [A929/A929M](#) Specification for Steel Sheet, Metallic-Coated by the Hot-Dip Process for Corrugated Steel Pipe
- [A1046/A1046M](#) Specification for Steel Sheet, Zinc-Aluminum-Magnesium Alloy-Coated by the Hot-Dip Process
- [A1057/A1057M](#) Specification for Steel, Structural Tubing, Cold Formed, Welded, Carbon, Zinc-Coated (Galvanized) by the Hot-Dip Process
- [A1063/A1063M](#) Specification for Steel Sheet, Twin-Roll Cast, Zinc-Coated (Galvanized) by the Hot-Dip Process
- [A1079](#) Specification for Steel Sheet, Complex Phase (CP), Dual Phase (DP) and Transformation Induced Plasticity (TRIP), Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
- [A1087/A1087M](#) Practice for Using Hand Calipers to Measure the Width of Steel Sheet

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.

D4145 Test Method for Coating Flexibility of Prepainted Sheet

3. Terminology

3.1 *Definitions:* See Terminology **A902** for definitions of general terminology relating to metallic-coated hot-dip products.

3.1.1 *coating t-bend test, n*—a testing procedure using a coupon of metallic-coated steel sheet bent 180° on itself to an inside bend diameter that has a specified ratio to the thickness [t] of the metallic-coated sheet for the purpose of stressing the system to verify metallic coating adhesion to the substrate. The t-bend rating is the minimum number of thicknesses of metal around which the coated coupon is bent to achieve no fracture, removal, or delamination of the metallic coating.

3.1.1.1 *Discussion*—Required t-bend ratings are specified in the relevant product specification (**Fig. 1**).

4. Significance and Use

4.1 This test method provides a standard method to bend the product to verify good coating, adhesion free of delamination, on metallic-coated steel sheet products under the jurisdiction of ASTM Committee A05 and its subcommittees as designated by a purchaser in a purchase order or contract.

4.1.1 Metallic coated coupons are bent 180° around progressively more thicknesses of metal, the end point being when failures no longer occur. The bend area is examined without magnification after each bend in order to determine coating fracture and loss of adhesion.

4.1.2 If desired, further examination of loss of adhesion or pickoff can be determined by performing a tape pull-off test subsequent to bending.

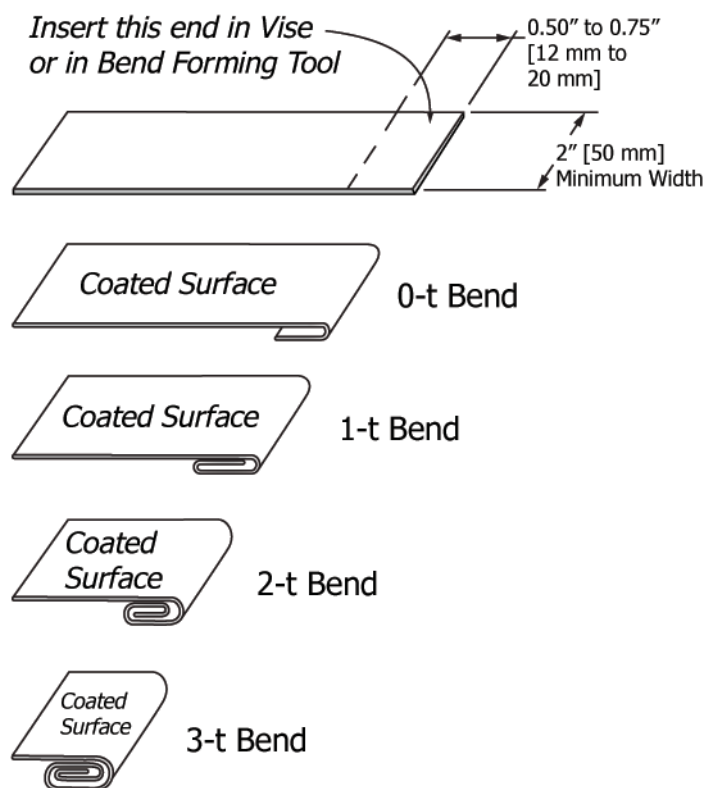
4.1.3 The material condition at the time of testing, sampling frequency, specimen location and orientation, minimum t-bend rating exhibiting no delamination or pick-off, reporting requirements, and other test parameters are contained in the pertinent material specification or in a general requirement specification for the particular product form. References are provided to the appropriate ASTM standards.

4.2 For this test method to successfully evaluate coating adhesion, the metal substrate must be capable of withstanding the bending operation without fracturing.

4.3 Coating adhesion is a significant quality characteristic of metallic coated steel sheet products. This test method employs the relevant t-bend rating specified in the referenced product standards to quickly determine if the metallic coating is free of delamination on the outside of a bend specimen. This is critical in ascertaining product conformance to specifications.

4.4 This test method is similar to, and uses some of the same apparatus as, Test Method **D4145**, which determines a t-bend rating for flexibility and adhesion of organic coatings (paints) on metallic substrates.

4.5 This test method may be used by other ASTM Committees and other standards writing bodies for the purpose of conformance testing.



NOTE 1—The above bends are expanded for clarity. They are actually flat against themselves in the test.

FIG. 1 Bend Test in Which the Metallic-Coated Coupon is Bent Around Itself