



Standard Test Method for Coating Flexibility of Prepainted Sheet¹

This standard is issued under the fixed designation D 4145; 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.

^{ε1} NOTE—Keywords and the unit of measurement statement were added editorially in January 1996.

1. Scope

1.1 This test method describes a procedure for determining the flexibility and adhesion of organic coatings (paints) on metallic substrates that are deformed by bending when the sheet is fabricated into building panels or other products.

1.2 The metal substrate must be capable of passing this test without fracturing and with no excessive grain development.

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

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. Terminology

2.1 *Definitions of Terms Specific to This Standard:*

2.1.1 *T-bend*—a description of the severity of a bend in terms of the thickness (T) of the sheet to which the coating has been applied; *as used in this test method*, the T-bend rating is the minimum number of thicknesses of metal around which the coated sheet is bent (Fig. 1), or if bent around a die, the number of thicknesses of metal equivalent to the diameter of the die to achieve no fracture or removal of the coating.

3. Summary of Test Method

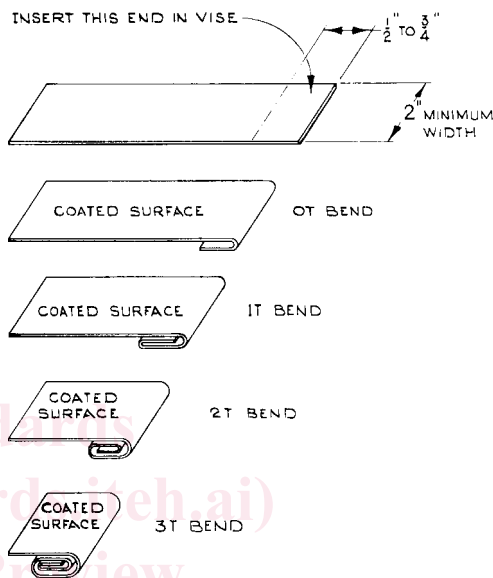
3.1 Prepainted panels are bent 180° around progressively more thicknesses of metal or larger diameter dies, the end point being when failures no longer occur. The panels are examined at low magnification (5 to 10×) after each bend for fracture of the coating (cracking) and, for loss of adhesion pickoff, by means of a tape pull-off test.

4. Significance and Use

4.1 Organic coatings on precoated sheet are subjected to stresses when fabricated into products by roll forming, brake bending, or other deformation processes. These stresses can exceed the flexibility or adhesive strength of the coating,

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

FIG. 1 T-Bend Test in Which the Coated Specimen is Bent Around Itself

resulting in fracture of the coating, exposing the substrate, or loss of adhesion to the substrate. This test is a means of evaluating the ability of a coating system to withstand the stresses of fabrication.

4.2 The bend direction, whether the axis of bend is across or along the rolling diameter of the metal, and the temperature of the specimen when it is bent affect the results of this test and should be agreed upon between the supplier and the user.²

5. Apparatus

5.1 A means of holding one end of the specimen rigidly while making the bend is needed. A bench vise with smooth jaws or with smooth inserts, preferably of a soft metal to avoid damage to the coating, has been found to be satisfactory.

5.2 If the metal is not bent around itself as in Fig. 1, a series of bending dies with smoothly rounded ends may be used as guides around which the specimen is bent (Fig. 2).

² Scotch Brand #610 tape manufactured by 3M Co., St. Paul, MN or equivalent, or as agreed upon between the supplier and the user.