

Australian Standard™

Paints and related materials—Methods of test

Method 406.1: Resistance to impact—Falling weight test (Gardner-type tester)

METHOD

1 SCOPE

This Standard sets out two procedures for assessing the resistance of paint systems to the impact of a hemispherically-tipped indenter.

NOTES:

- 1 The method for checking the adhesion using this test may not be suitable in all cases. For example, it should not be used where the thickness of the paint system is less than 50 µm.
- 2 For the coil coating industry reference may also need to be made to AS 2728.

2 REFERENCED DOCUMENTS

The following documents are referred to in this Standard.

AS

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| 1580 | Paints and related materials—Methods of test |
| 1580.101.3 | Method 101.3: Standard procedure for stoving |
| 1580.101.5 | Method 101.5: Conditions of test—Temperature and humidity control |
| 1580.104.1 | Method 104.1: Recommended materials for test panels |
| 1580.108.1 | Method 108.1: Determination of dry film thickness on metallic substrates—Non-destructive methods |
| 2728 | Prefinished/prepainted sheet metal products for interior/exterior building applications—Performance requirements |

3 DEFINITIONS

For the purposes of this Standard the definitions below apply.

3.1 Direct impact

The indenter falls onto the coated side of the test.

3.2 Impact zone

The entire area of distortion created by the indenter.

3.3 Reverse impact

The indenter falls onto the back or the uncoated side of the panel.

4 PRINCIPLE

The coating or coating system to be tested is applied to a metal panel of specified thickness. After conditioning, it is placed on an anvil of the tester, and subjected to either of the following:

- (a) *Method A—Fixed impact loading* A specified indenter is driven into the panel by a drop-weight of specified mass which falls from a specified height, the coating system then being assessed for its impact resistance.
- (b) *Method B—Quantitative determination of impact resistance* A specified indenter is driven into the panel by a drop-weight of specified mass which is allowed to fall from a minimal height; the panel is then inspected and, if no failure of integrity is indicated, the test is repeated on a fresh area of the panel with the drop-weight set at increasingly greater heights until coating failure occurs.

The object of the method is to test the effect that deformation of the coating system has on the adhesion to the substrate. The result obtained will depend on the characteristics and method of operation of the tester used, and specifically on the diameter and mass of the indenter and the height from which it drops.

NOTE: The impact resistance of a coating or coating system and the ease with which it is deformed is affected by film thickness, strength, flexibility and adhesion, and by the nature and thickness of the substrate.

5 OCCUPATIONAL HEALTH AND SAFETY

Care should be exercised when using sharp tools. Ensure hands are clear off impact zone when dropping weights.

6 APPARATUS

6.1 Impact tester

Consisting essentially of an anvil supporting a guide tube, down which a calibrated drop-weight is allowed to fall, driving the hemispherical tip of the indenter into the test panel. The area of the anvil immediately under the indenter shall be hollowed to accommodate the deformed area of the test panel after the impact. The dimensions of the hollow shall ensure that the major object of this test, viz assessment of the performance of the test film or system when the substrate is deformed, is achieved without other interfering effects.

NOTES:

- 1 Some impact testers have the hemispherical tip as part of the drop-weight, whereas others may have the tip as a separate part.
- 2 Calibration of mass should be performed annually. Mass deviation should be within 5% of nominal.

6.2 Film thickness measuring apparatus

As described in AS 1580.108.1.

6.3 Metal test panels

Conforming to AS 1580.104.1, and of specified size and thickness. Two panels shall be used unless otherwise specified. Test panels made of other substrates can be used under this method by agreement of interested parties.

6.4 Magnifier

Providing 10× (area) magnification. The magnifier may be illuminated if required.

6.5 Knife

Sharp-edged, freshly-honed with a sharp point of approximately 45° or less, such as a scalpel.

6.6 Rule or measuring tape

Suitable for measuring the dropping height of the indenter.

7 TEST CONDITIONS

The test shall be carried out under the conditions described in AS 1580.101.5, unless otherwise specified.

8 PREPARATION OF TEST PANELS

The test panels shall be prepared as follows:

- (a) Pretreat the test panels by the specified method, if required.
- (b) Coat the panels at the prescribed film thickness by the appropriate method, and unless otherwise specified, cure under the conditions described in AS 1580.101.5 or AS 1580.101.3.

NOTE: A description of any deviation from the specified curing conditions is to be included in the test report.

9 PROCEDURE

9.1 General

After determining the dry film thickness in accordance with AS 1580.108.1, carry out the test in accordance with Clause 9.2 or Clause 9.3, as appropriate.

9.2 Method A—Fixed impact loading

The procedure shall be as follows:

- (a) Check that the guide is vertical and that the drop-weight falls freely. Ensure the tip of the indenter and the rim of the anvil are free of burrs or any other defect likely to damage the coating or coating system under test.
- (b) Place the coated test panel on the anvil to allow for either a direct or a reverse impact (see Clause 3). The panel shall be located so that the impact is not less than 25 mm from any edge.
- (c) Raise the drop-weight to the prescribed height and allow it to fall. Ensure that the tube height is set correctly and accurately record the true dropping height.
- (d) Repeat Steps (b) and (c) four times, unless otherwise specified, with each impact point being at least 40 mm away from its neighbour and 25 mm away from any edge.

NOTE: In specific industries, such as coil coatings, it may be sufficient to conduct Steps (b) and (c) in duplicate only. Nevertheless, any deviation from this Standard is to be described in the test report.

- (e) Examine the surface of the paint system under 10× magnification at each impact zone, noting any cracking, crazing or stripping. Note the number of test zones showing the presence of such defects.