STANDARDS ASSOCIATION OF AUSTRALIA

Australian Standard

METHODS OF TEST FOR METALLIC AND RELATED COATINGS

PART 1 — LOCAL THICKNESS TESTS

AS 2331.1.1—1980 MICROGRAPHIC EXAMINATION OF CROSS-SECTIONS

1 SCOPE. This standard sets out the method for measuring the local thickness of metallic coatings by micrographic examination of cross-sections.

2 APPLICATION. The method is suitable for measuring the thickness of metallic coatings on various substrates. Under the best conditions the accuracy of the method is ±0.8 μm or ±10 percent of the thickness, whichever is the greater.

3 PRINCIPLE. Test pieces are cut from coated products, prepared for testing and then examined micrographically.

4 APPARATUS. A microscope fitted with distance measuring equipment such that the uncertainty must be not greater than ±0.8 μm or ±10 percent of the thickness measured.

5 PREPARATION OF TEST PIECES.

5.1 General. Test pieces shall be free of foreign matter and, if necessary, shall be degreased in a solvent which does not attack the coating.

Prior to mounting, test pieces with soft coatings shall, where practicable, be overplated with a suitable coating not less than 12 μm in thickness so as to provide edge support during grinding and polishing. Copper coatings are frequently employed and when applied over zinc or cadmium coatings, an initial layer should be applied in a cyanide bath after which an acid bath may be used to build-up the coating.

5.2 Mounting of Test Piece (See Note 1). The test piece shall be mounted in a plastics material, such as phenolic resin or an acrylate resin, or, if the coating permits, a low melting point alloy. Care shall be taken to ensure that voids do not form between the test piece and the mounting material, and that the coated surface is at right angles to the surface being ground and polished (see Note 2).

NOTES:

1. When testing coated sheet and strip metals, test pieces may be appropriately clamped prior to mounting and polishing.
2. A deviation of only 10 degrees from the vertical introduces an error of approximately 2 percent in the coating thickness determination.

5.3 Grinding and Polishing. The surface of the test piece, prepared as described in Clause 5.1, is generally in a condition suitable for the grinding operation but should burrs be present on either the test piece or its mountings, they may be removed by means of a smooth file.

The test piece shall be ground and polished in accordance with good micrographic practice. The following procedure has been found to be satisfactory:

(a) Abrade test pieces with successively finer silicon carbide wet and dry abrasive papers placed on a flat glass plate and copiously lubricated with water during the grinding process.

NOTE: A satisfactory finish is generally obtained by first using P180 grade paper and then successively using P360, P600 and P1200 grades.

(b) In each case, immediately before passing the next finer grade of paper, the test piece should be abraded with a back and forth movement in a straight line in order to ensure that, before washing, scratches due to that particular paper are in one direction.

(c) On transferring the test piece to the next finer paper, rotate the test piece through 90 degrees and then repeat the back and forth movement across previous scratches until they disappear. This provides a convenient way in which to determine when to transfer the test piece to the next finer grade of paper.

(d) When operations have been finished on the finest grade paper, rinse and polish the test piece by using either a water suspension of a suitable polishing medium, such as finely divided magnesium oxide, aluminium oxide, or diamond dust (0 to 1 μm) suspended in a suitable wax or paste. The polishing operation should be carried out using a soft cloth, such as 'Selvyt' type cloth or chamois, without the use of undue pressure.

NOTE: Attention to the following precautions will facilitate the preparation of satisfactory test pieces:

(a) Polished surfaces should not be fingered.
(b) Polishing pads should be covered when not in use to avoid contamination by airborne dust.
(c) At the completion of the polishing process the surface should be washed with a suitable solvent, rinsed in alcohol and dried in an air stream.

5.4 Etching. After final polishing, etching is usually employed to obtain maximum contrast between the edges of the coating and the basis metal at one interface and the overplate or mounting material at the other. In some cases, the unetched test piece is often suitable for measurement (e.g. where the metals are reasonably hard and where their natural colours provide good contrast),