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## Standard Test Methods for Microscopical Measurement of Dry Film Thickness of Coatings on Wood Products<sup>1,2</sup>

This standard is issued under the fixed designation D 2691; 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 ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

### 1. Scope

1.1. These test methods cover the measurement of film thickness of dried coatings applied to a plane rigid substrate of wood or a wood-base material. These test methods apply to both opaque and clear coatings. They are not recommended for metal or glass substrates. Test Method A uses a razor blade and Test Method B a microtome for cross sectioning.

1.2. *This standard may involve hazardous materials, operations, and equipment. This standard does not purport to address all of the safety problems 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 test method provides a precise, quantitative measurement of the thickness of a dried coating. It may be used for quality control or monitoring of the production of coated wood products.

### 3. Apparatus

3.1. *Calibrated Monocular Compound Microscope*, equipped with an optical system sufficient to provide sharp resolution of the cross section to be examined. One system, consisting of a 16-mm objective and a 10-power filar micrometer eyepiece, resulting in a magnification of approximately 100 diameters, has been found satisfactory. Other combinations of objectives and eyepieces and other magnifications may also be suitable, although magnifications above 200 diameters may result in distortion of the viewed cross section.

3.2. *Tool for Extracting Test Specimens*—The tool may be similar in design to an ordinary cork borer, except that it shall be made of thicker walled tubing, hard enough to hold a keen cutting edge, and be fitted with a head suitable for pounding with a hammer (Fig. 1). A leather punch has been found satisfactory for this use. The tool shall make a circular cut approximately 1/2 in. (12.7 mm) in diameter and 1/8 in. (3.2 mm) deep through the coating and into the substrate. A sidewise movement of the punch while firmly embedded in the substrate will dislodge the specimen and allow its

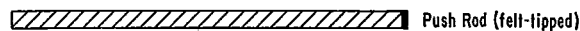
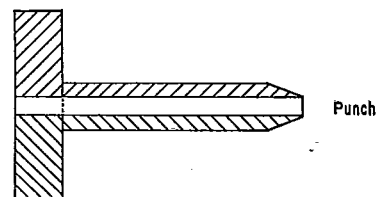


FIG. 1 One Type of Tool for Extracting Coated Wood Specimens

removal intact within the punch.

3.3. *Source of Oblique Illumination.*

3.4. *Hand Microtome (Method B).*

### 4. Test Specimens

4.1. Specimens for microscopical examination shall be extracted from the punch tool by means of a push rod inserted through the hollow shaft of its tube. The end of the push rod should be tipped with felt or other soft material so that the coated surface of the disk will not be damaged during extraction.

### 5. Procedure

5.1. Prepare disks for microscopical examination and measurement by either Method A or Method B. Either method of preparation will expose a cross section of coating and substrate, including the extremes in film thickness resulting from variations in the wood surface or method of application.

5.2. *Method A, Cross Sectioning with Razor Blade*—With a sharp razor blade carefully slice away parallel to the coated surface the substrate adhering to the coating until the disk is approximately 1/16 in. (1.6 mm) thick. Place the disk coated face down on a smooth, hard surface and cut in half by means of a slicing stroke with a fresh razor blade (Fig. 2). Cut in a direction perpendicular to the grain of the wood substrate and at right angles to the coated surface.

5.3. *Method B, Cross Sectioning with Microtome:*

5.3.1. With a sharp razor blade carefully slice away parallel to the coated surface the substrate adhering to the coating until the disk is approximately 1/16 in. (1.6 mm) thick.

5.3.2. Embed the thinned disk in molten paraffin<sup>3</sup> which is

<sup>1</sup> These test methods are under the jurisdiction of ASTM Committee D-1 on Paint and Related Coatings and Materials and are the direct responsibility of Subcommittee D01.52 on Factory-Coated Wood Products.

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<sup>2</sup> This test method is presently under study for revision or replacement with an improved microscopical film thickness method.

<sup>3</sup> Paraplast, available from Fischer Scientific, 191 South Gulph Road, P.O. Box J, King of Prussia, PA 19406 melting point about 50 to 60°C, has been found satisfactory for this purpose. For clear films the addition of 0.5 g of Indigo to 200 mL of paraffin improves optical definition.