Measurement of Surface Profile of Metal Surfaces Using a Replica Tape

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Foreword

Before the application of protective coatings to metal surfaces, the surfaces are frequently cleaned by abrasive impact or power tools. Such cleaning roughens the surface, assuring a surface profile (also known as an anchor pattern, anchor profile, or anchor-tooth profile). The resulting degree of surface roughness is affected by many variables, including the type, size, and shape of the abrasive or tool used, its velocity, and the angle of impact, etc. This surface profile enhances coating adhesion.

Many techniques and instruments are currently used to measure the surface texture or surface profile; however, those providing the highest degree of precision are suitable only for use in a laboratory. Because a surface profile range is frequently specified and the recommended surface profile is different for various types of coatings, a means to measure the surface profile at the work site is desirable.

The purpose of this standard is to describe and characterize one procedure for measuring the surface profile of metal surfaces. The measurement technique uses a compressible foam that replicates the surface profile. The thickness of the compressed foam (with the profile replicated) is then measured with a micrometric thickness gauge to determine the surface profile. Other common methods of measuring surface profile are not discussed.

The procedure described in this standard is limited to the measurement of the surface profile with a profile defined as 13 to 150 µm (0.5 to 6.0 mil).

Rationale

The 2024 version of this document contains substantial changes from the previous version, which was last revised in 2016. It reflects updates to the manufacturer's recommended instructions, including the use of the new High Accuracy Burnishing Tool and new conversion technique discussed in Appendix A (nonmandatory) and B (nonmandatory). The methods outlined in the previous version remain valid and are included in this document.

Referenced Standards and Other Consensus Documents

Unless specifically dated, the latest edition, revision, or amendment of the documents listed in the table below shall apply.

ASTM International, www.astm.org:	
ASTM D4417	Standard Test Methods for Field Measurement of Surface Profile of Blast Cleaned Steel
International Organization for Standardization (ISO), www.iso.org:	
ISO 8503-5	Preparation of steel substrates before application of paints and related products–Surface roughness characteristics of blast-cleaned steel substrates–Part 5: Replica tape method for the determination of the surface profile

In AMPP standards, the terms *shall* and *must* are used to state requirements and are considered mandatory. The term *should* is used to state something that is recommended, but is not considered mandatory. The term *may* is used to state something considered optional.

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Section 1: Scope

1.1 This standard provides procedures for measurement of the surface profile height of a part prepared by abrasive blast cleaning or another method, using replica tape.

1.2 The range for measurement of surface profile height by this method is 13–150 µm (0.5–6.0 mils).

1.3 This standard is not intended to suggest the appropriate surface profile height for an application. Appropriate surface profile height should be determined through agreement between interested parties and consultation with the manufacturer of the coating to be applied.

Section 2: Definitions

Burnish: The action of using a tool to apply force using a rubbing motion to compress the replica foam layer of the replica tape.

Replica Foam: A small square of foam with polyester backing, approximately 12 mm x 12 mm, which is the component of a piece of replica tape into which the surface profile replica is created.

Surface Profile: The series of peaks and valleys of a prepared surface, typically created through abrasive blast cleaning or another method of surface preparation, prior to the surface being coated.

Surface Profile Height: The distance between the highest peaks and lowest valleys in a surface profile. Equivalent to R_t as measured using a drag stylus profilometer in accordance with ASTM D4417 Method D.

Section 3: Apparatus

3.1 Replica Tape

Replica tape consists of compressible foam attached to an incompressible polyester film 50 µm (2.0 mils) thick.[1] The foam/polyester is affixed to an adhesive-backed tape for holding the replica foam on the surface. The tape has a circular cut-out 9.5 mm (0.38 in) in diameter that exposes the underlying replica foam.

Different grades of replica tape, with different foam thicknesses, are available depending on the height of the profile being measured. The grade of replica tape used should be selected based on the expected surface profile height, using the ranges in Table 1.

Table 1
Range of Replica Tape Grades

Replica Tape Grade	Range (µm)	Range (mils)
Coarse Minus	13 – 25	0.5 – 1.0
Coarse	20 – 50	0.8 – 2.0
X-Coarse	38 – 115	1.5 – 4.5
X-Coarse Plus	100 – 150	4.0 – 6.0

If a measurement falls outside of the range of the grade of replica tape used, the measurement should be disregarded and a more appropriate grade should be selected.

[1] The sole source of supply of the tape known to the committee at this time is Testex, 800 Proctor Avenue, Ogdensburg, NY 13669, www.testextape.com. If you are aware of alternative suppliers, please provide this information to AMPP headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee, which you may attend.

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