Replica Tape Response Curve:

The graph on the other side shows the generally linear response of replica tape to changes in surface profile. This curve also shows the beginnings of non-linear behavior at the upper and lower ends of the range and the slightly distorted response that occurs where **Coarse** and **X-Coarse** grades overlap (and where the averaging procedure is applied).

This distorted response—between 1.5 mils and 1.9 mils (38 and 48 µm) and between 2.1 mils and 2.5 mils (53 and 64 µm) - is a result of the fact that the low end of the **X-Coarse** range and high end of the **Coarse** range do not quite match up. The expected measurement uncertainty associated with these two regions is also anomalously large. Standard deviations are illustrated by the green curve at bottom of the graph.

In most cases, inspectors are interested in assuring that the measured profile is within a certain limits ("Pass/Fail").

Pass/Fail determinations of profile around the values 1.5, 2.0 and 2.5 mils (38, 50 and 64 µm) will tend to be quite accurate. Pass/Fail assessments centered on other values in this 1.5 to 2.5 mil (38 to 64 µm) "overlap" part of the range will be less accurate. Testex recommends that specifiers and inspectors agree, before beginning a job, to limits on profile that take this circumstance into account.

Using the Averaging Instructions:

Testex began recommending the averaging procedure ("Step 9") in 2010, when it introduced it's High Temperature (HT) formulation. Testex recommends switching to the new (averaging) instructions but recognizes that, where consistency between old and new measurements requires it, contractors and inspectors always have the option of continuing to use the old, non-averaging, instructions.
Measurements made using the old instructions can be marked "non-HT". Those using the new instructions can be marked "HT". **Agreement on whether to use "HT" or "non-HT" instructions should be arrived at prior to starting a job.**

Number of Measurements:

Testex recommends that each replica be supplemented by a "check" replica obtained at the same surface location. If the two replicas differ by 0.2 mil (5 µm) or less, their average should be recorded as the profile.

If these two initial replicas differ by more than 0.2 mils (5 µm), a third replica is recommended. The average of these three should be recorded as the profile.

If the first replica value is inside the 1.5 to 2.5 mil (38 to 64 µm) overlap region, requiring a 2nd replica to meet the averaging requirement, only these 2 are required for a valid measurement.

Standards Governing Use of Replica Tape to Measure Profile:

ASTM (American Society for Testing and Materials) **D 4417** - "Standard Test Methods for Field Measurement of Surface Profile of Blast Cleaned Steel"

ISO (International Organization for Standardization) **ISO8503-5**

NACE International (National Association of Corrosion Engineers) **RP0287** - "Standard Recommended Practice: Field Measurement of Surface Profile of Abrasive Blast Cleaned Steel Surfaces Using a Replica Tape"

SSPC - The Society for Protective Coatings
Standard Currently in Development: "Procedure for Determining Conformance to Steel Profile/Surface Roughness/ Peak Count Requirements"

In cases where standards compliance is required, the full original current standard should be consulted.

Sources of Error:

A human hair is about 2 mils (50 µm) thick and individual bacteria are 0.1 mil (2.5 µm) in size. Field profile measurements to accuracies in this range will be influenced by subtle effects.

The four major sources of error in determining the profile of a blasted surface using replica tape and a micrometer gage are:

1) Inherent variation in point-to-point profile over the surface being measured,

2) presence of particles of dirt on either the replica tape or gage,

3) gage accuracy (typically 0.2 mils or 5 µm),

4) rubbing technique, including incomplete compression of the foam.

Testex Training Surface:

The Training Surface is a 1.5 inch (38 mm) diameter disk of phenolic material. Its top surface carries the impression of a set of parallel ridges each of which has an inverted 'V' cross-section. The height of the highest ridge is the profile cited on the bottom of the training surface.

The training surface should not be used as a surface comparator or roughness standard. It can be useful, however, for familiarizing new users with replica tape.

Why Determination of Profile is Important:

Industrial steel in bridges, ships, railcars, etc., is almost always painted or otherwise coated to prevent corrosion. Before they can be painted, these metal surfaces must be cleaned and roughened to insure that the paint adheres. This is usually done by grit or shot blasting the surface. If the resulting surface is too smooth, the paint or coating will not stick. If the surface is too rough, the peaks poke through the coating and rusting occurs.

Grades of Replica Tape:

Testex Press-O-Film replica tape is available in several thicknesses to facilitate profile measurements in different ranges:

Grade	Foam Layer Thickness (mils)	(µm)	Range When Used With Gage (mils)	(µm)
Fine / Medium	0.4	10	***not applicable***	
Coarse Minus	1.2	30	**0.5 to 1.0**	**13 to 25**
Coarse	3.0+	75+	**0.8 to 2.5**	**20 to 64**
X-Coarse	5.2+	140+	**1.5 to 4.5**	**38 to 115**
X-Coarse Plus	6.4+	162+	**4.5 to 5.0**	**112 to 125**

Coarse and **X-Coarse** grades together cover replica tape's primary measurement range.
The two grades shown in **green** are "check grades" at the upper and lower ends of this primary range.
(X-Coarse Plus may be used with caution, *and at users risk*, at profiles somewhat above the grade's nominal upper cut-off of 5.0 mils, or 125 um. Details at Testex website.)

Fine/Medium grade replica film is commonly used in applications in which the replica is analyzed using optical interferometric techniques. Fine/Medium grade is not suitable for use with a micrometric thickness gage.

Select grades can be provided with a thin Indium coating, to facilitate optical measurement. All grades are coated onto a tough polyester substrate 2.0 mils (50 µm) in thickness.

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