

SSPC: The Society for Protective Coatings

Procedure for Determining Conformance to Steel Profile/Surface Roughness/Peak Count Requirements

1. Scope

This standard describes a procedure suitable for shop or field use for determining compliance with specified profile ranges on a steel substrate using Methods A (visual comparator), B (depth micrometer) and C (replica tape) as described in ASTM D 4417, and the portable stylus instrument method used to determine surface roughness and peak count as described in ASTM D 7127.

2. Description

The standard includes brief generic descriptions of the instruments used by each Method, procedures for verification of accuracy for each type of instrument, and requirements for evaluating the preparation process, obtaining surface profile readings, obtaining surface roughness and peak count readings, and determining if the profile of an evaluated area is within the specified range.

3. Referenced Standards

3.1 The latest issue, revision, or amendment of the referenced standards in effect on the date of invitation to bid shall govern, unless otherwise specified.

3.2 If there is a conflict between the requirements of any of the cited referenced standards and this standard, the requirements of this standard shall prevail.

3.3 American Society for Mechanical Engineers Standard¹

ASME B46.1 Surface Texture (Surface Roughness, Waviness and Lay)

3.4 ASTM International Standard²

D 4417 Standard Test Methods for Field Measurement of Surface Profile of Blast Cleaned Steel

D 7127 Standard Test Method for Measurement of Surface Roughness of Abrasive Blast Cleaned Metal Surfaces Using a Portable Stylus Instrument

3.5 International Organization for Standardization (ISO) Standard³

ISO 4287 Geometrical Product Specifications (GPS) – Surface Texture: Profile Method—Terms, Definitions and Surface Texture Parameters

4. Definitions

Accuracy: The degree of conformity of a measured or calculated value to some recognized standard or specified value. This concept involves the systematic error of an operation, which is seldom negligible.

Adjustment: The physical act of aligning a gage's readings to match those of a known sample (removal of bias), in order to improve the accuracy of the gage on a specific surface or within a specific portion of the gage's measurement range.

Calibration: To check and adjust measurement equipment to a measurement standard. The controlled documented process of measuring traceable calibration standards and verifying that the results are within the stated accuracy of the equipment. Calibrations and any resulting adjustments to the measurement equipment are typically performed by the equipment manufacturer or by a qualified laboratory in a controlled environment using a documented process. The standards used in the calibration are such that the combined uncertainties of the resultant measurement are less than the stated accuracy of the equipment.

Deadband: That distance above and below the mean line that a continuous Trace line must cross in both directions (up and down) to count as a single peak.

Depth Micrometer: A surface profile gage consisting of a dial or digital gage and a stylus that protrudes from the base of the gage into the valleys of a blasted steel surface. The extent of protrusion provides a measure of the profile. Its use is described in ASTM D 4417.

Evaluation Length: A sequence of five consecutive sampling lengths.

Gage/Gauge: an instrument for measuring quantity, or an instrument for testing.

Location Average: The average of a series of instrument readings within a 15 x 15 cm (or 6 x 6 inch) area on the profiled steel surface.

Mean Line: A line defining the statistical average height of the profile in an evaluation length.

Measurement: The single average of multiple location averages obtained, in accordance with ASTM D 4417 or ASTM

¹ American Society for Mechanical Engineers standards are available online from <http://www.asme.org>.

² ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959. For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For Annual Book of ASTM Standards volume information, refer to the standard's Document Summary page on the ASTM website.

³ ISO standards are available online from <http://www.ansi.org> or <http://www.iso.org>.

D 7127, "in a sufficient number of locations to characterize the prepared surface," and reported as the surface profile.

Peak Count (Pc): (sometimes referred to as peak density)

The number of peak/valley pairs, per unit of evaluation length, extending outside a "deadband" centered around the mean line over the sampling length.

Replica Tape: A layer of crushable plastic microfoam coated onto an incompressible polyester substrate of highly uniform thickness. Different grades of replica tape are available for different ranges of profile height. The tape is compressed against the surface to produce an impression of the surface profile; then, the impression in the tape is measured with a micrometer. The use of replica tape is described in ASTM D 4417.

Rmax: The greatest distance between the highest peak and lowest valley for any of the five sampling lengths that comprise an evaluation length

Rt: The distance between the highest peak and the lowest valley within any given evaluation length.

Sampling Length: The nominal distance parallel to the surface being assessed within which a single value of a surface parameter is determined.

Shim: A flat strip of plastic, metal, or other material of known uniform thickness used to verify the accuracy of a micrometer.

Structure: A unit composed of one or more connected steel members comprising a bridge, tank, ship, etc. It is possible for a single steel shape (beam, angle, tee, pipe, channel, etc.) to be considered a structure, if it is painted in a shop.

Surface Profile: The textured surface that results from abrasive blast cleaning, commercial grade power tool cleaning or power tool cleaning to bare metal. For steel, surface profile is an instrument reading of the peak-to-valley height of the surface, often expressed as an average of multiple individual instrument readings, and typically ranges from less than 25 μm up to 127 μm (1 mil up to 5 mils). A statement of the measurement method used should accompany both specifications and records of profile.

Surface Profile Reading: A single instrument reading. When using a stylus-type device, each "sampling length" provides one reading containing two parameters (Rt and Pc). When using replica tape, each replica provides one reading. When using a depth micrometer, each placement of the probe provides one reading.

Surface Roughness: The combined characteristics of surface profile (height) and peak count or density for a surface.

Verification of Accuracy: Obtaining readings on a reference standard prior to gage use for the purpose of determining the ability of the gage to produce reliable values compared to the combined gage manufacturer's stated accuracy and the stated accuracy of the reference standard.

5. Description of Instruments

5.1 Visual Profile Comparator (ASTM D 4417 Method A): A set of discs, coupons, or areas prepared to various identified surface profile depths using a designated abrasive type (typically grit/slag, shot, sand). The profile comparator is

used for comparison by touch or by visual examination, with or without magnification of 5 to 10 power.

5.2 Depth Micrometer (ASTM D 4417 Method B): An instrument used to measure surface profile by measuring the depth of a "single valley" (in relation to the height of the surrounding peaks) using a pointed, cone-shaped probe.

5.3 Replica Tape (ASTM D 4417 Method C): Replica tape (see definition in Section 4) is used to form a negative impression of the profile that is then measured with a spring micrometer. Spring micrometers with a measurement accuracy of at least 5 μm (tenths of a mil [0.0001 in]) specifically designed for measuring replica tape are required. It is important that the spring micrometer has the anvil size, parallelism and spring loading that is specified for the replica tape application.

5.4 Portable Stylus Instrument (ASTM D 7127): A portable electronic instrument for determining surface roughness (Rt and Rmax) in compliance with ISO 4287, and Pc in compliance with ASME B46.1.

6. Verification of Accuracy

Prior to determining compliance with specified profile range, the instrument used to obtain the required readings and averages shall be checked for accuracy in accordance with the written instructions provided by its manufacturer. Appendix A2.1 and subsections contain suggested procedures for verifying the accuracy of the various instruments if the manufacturer provides no instructions. An instrument that fails to provide accurate readings shall not be used.

7. Required Number and Location of Readings

7.1 Number of Locations Used to Characterize the Surface: For each specific surface preparation apparatus used during each work shift or twelve-hour period, whichever is shorter, select a minimum of three 15 x 15 cm (or three 6 x 6 inch) locations in which to take readings. For the purpose of this standard, "apparatus" is defined as an individual blast pot (which may supply multiple nozzles), individual self-contained abrasive recycling/blast cleaning units (which may contain multiple pots), individual stationary or mobile centrifugal cleaning unit, or individual power tool. An optional method for specifying required number of locations based on process changes between acceptance of a field job standard and completion of production work is provided in Nonmandatory Appendix B.

7.2 Number of Readings to Determine Location Average: Unless otherwise specified, the number of readings to determine the average profile at each location on steel substrates shall be the number required by the Test Method specified from ASTM D4417⁴ or, if the portable stylus

⁴ Visual comparators used for ASTM D 4417 Method A represent surfaces prepared by abrasive blast cleaning and are inappropriate for comparison with power tool cleaned surfaces. The replica tape used for ASTM D 4417 Method C cannot accurately measure the profile produced by some types of power tool cleaning media. A test area prepared at the job site can be used to assess the suitability of media and profile measurement method for a project prior to full-scale production.

instrument is specified, the number required by ASTM D 7127 (see Note 11.1). The average of the readings at each location shall be the “location average.”

8. Reporting

Report the range of location averages (lowest location average and highest location average), and the profile measurement (see Definitions) for each surface preparation apparatus.

9. Conformance to the Specified Surface Profile Range

9.1 Surface Profile: The average of readings obtained at each location (“location average”) shall be within the specified profile range.

9.2 Non-Conforming Surface Profile:

- STEP 1: Determine location averages at regular intervals in four equally spaced directions radiating outward from the non-compliant 15 x 15 cm (or 6 x 6 inch) location. If there is no space to take readings in a given direction, then no readings need to be taken. Determine additional location averages in each direction until two consecutive location averages are compliant in each direction or until there is no space to take additional measurements in that direction. Determine a single location average on repeating structural units or elements of structural units until location averages on two consecutive units (or elements) in each direction are compliant or until there are no more units or elements to test.
- STEP 2: Acceptable location averages are as defined by the specification for minimum and maximum values. Use removable chalk or other specified marking material to identify the extent of the non-conforming surface profile.
- STEP 3: Record the extent of the nonconformity using readily identifiable structural members or permanent structural details.

10. Accuracy

To qualify under this standard, the instruments employed for ASTM D 4417 Methods B and C must have accuracy of +/-10% or better.

11. Notes

11.1 Four different methods for measuring surface profile are referenced in Section 5 of the standard. It is important to consider the type and interpretation of the data provided by each method when specifying the profile measurement method for a given project.

12. Disclaimer

12.1 While every precaution is taken to ensure that all information furnished in SSPC standards and specifications is as accurate, complete, and useful as possible, SSPC cannot assume responsibility nor incur any obligation resulting from the use of any materials, coatings or methods specified therein, or of the specification or standard itself.

12.2 This standard does not attempt to address problems concerning safety associated with its use. The user of this standard, as well as the user of all products or practices described herein, is responsible for instituting appropriate health and safety practices and for ensuring compliance with all governmental regulations.

NONMANDATORY APPENDIX A: Calibration and Verification of Accuracy

A1 Calibration: Instruments used for ASTM D 4417 measurement Methods B, C, and ASTM D 7127 are calibrated by the manufacturer or a qualified lab that may issue a Certificate of Calibration or other documentation showing traceability to a national metrology institution. There is no standard time interval for re-calibration. Calibration intervals are usually established based upon experience and the work environment. A one-year calibration interval is a typical starting point suggested by equipment manufacturers. Recalibration of the comparator used for Method A is not practical, so regular replacement of the comparator depending on its visual condition is recommended. Calibration and verification for Method C applies to the spring micrometer only.

A2 Verification of Accuracy

A2.1 Visual Comparator (ASTM D 4417 Method A): The comparator should be inspected visually for damage prior to each field use. Use of the portable stylus instrument, as described in ASTM D 7127, is another option for evaluating the condition of the comparator. Verification of the reference profiles is normally performed on the master profile used by the manufacturer to form the comparators used in the field. The laboratory method requires visual inspection using a microscope to determine the depth of the valley relative to the nearest peak. Details of these assessments are provided with the comparator.

A2.2 Depth Micrometer (“Fine Pointed Probe” per ASTM D 4417 Method B): Verification of “zero setting” of a depth micrometer requires placing the gage probe onto the supplied glass plate and verifying “0” on the display. An adjustment to set the micrometer at “0” may be required. Check the micrometer for “zero-set” at least at the beginning and the end of each work shift. If the depth micrometer is dropped or suspected of giving erroneous readings during the work shift, the zero-set should be rechecked. The serial number of the micrometer and the date and time that the zero-set was verified should be recorded.

Shims, which may be supplied by the gage manufacturer or purchased separately, are used to verify gage accuracy. Most shims for use with profile gages have a hole cut in the center to allow the cone-shaped metal tip to pass through to a glass slide below. The value displayed by the gage is compared to the stated thickness value of the shim to verify that the gage can measure known thicknesses accurately.

The condition of the cone-shaped tip should be verified by visual inspection with a 10X magnifier before use. Tips are usually made of tungsten carbide, which can be chipped by impact. The visual inspection should ensure that the tip is not chipped or cracked. Verify the accuracy of the micrometer after replacement of the tip.

A2.3 Replica Tape (ASTM D 4417 Method C): The primary profile measurement range for replica tape is 20 to 115 μm (0.8 to 4.5 mils). Begin by selecting an appropriate grade of replica tape based on the target profile. For a target profile between 20 to 64 μm (0.8 and 2.5 mils), select "Coarse" grade. For a target profile between 38 and 115 μm (1.5 and 4.5 mils) select "X-Coarse" grade. (Use of "Coarse Minus" grade, less than 20 μm or less than 0.8 mil, or "X-Coarse Plus" grade, greater than 115 μm or greater than 4.5 mil, should be restricted to checking measurements at the lower or upper ends of the primary range.) Prepare the micrometer thickness gage: clean the contact surfaces and adjust the zero point to read -51 micrometers, or -2.0 mils, the thickness of the incompressible substrate. (Pre-setting the gage in this way automatically subtracts the thickness of the incompressible plastic substrate from all subsequent readings.) Affix the film to the profiled surface. Firmly compress the replica film against the surface to be measured with a suitably rounded rubbing tool, applying sufficient pressure to fully compress the film and produce a replica with a uniform "pebble-grain" appearance. Remove the replica and place it between the contact surfaces of the micrometer thickness gage.

If the gage reading obtained using either Coarse or X-Coarse grade is inside the 38 to 64 μm (1.5 to 2.5 mil) "overlap" window, take a second reading with the OTHER grade. If both readings are in the 38 to 64 μm (1.5 to 2.5 mil) range, record the average as the observed profile. Readings made with either grade that are outside this range – i.e., between 20 to 38 μm (0.8 and 1.5 mils) or between 64 and 115 μm (2.5 and 4.5 mils) – should be used as is, or without averaging.

Within the 38 to 64 μm (1.5 to 2.5 mil) "overlap" window, determinations of profile around the values 38, 50 and 64 μm (1.5, 2.0 and 2.5 mils) will tend to be quite accurate. Because of the nature of the averaging technique determinations of profile centered on other values in this 38 to 64 μm (1.5 to 2.5 mil) "overlap" range will be less accurate. Specifiers and inspectors should agree, before beginning a job, to limits on profile that take this circumstance into account.

A2.4 Portable Stylus Instrument (ASTM D 7127): It is important to first confirm that instrument parameters such as sampling length, evaluation length, deadband and filter have been set in accordance with ASTM D 7127. Verification of

accuracy of a portable stylus instrument then requires the use of a surface roughness standard containing a known surface roughness and peak count. The gage manufacturer typically supplies the surface roughness standard. To prevent acquisition of readings with an inaccurate instrument, the instrument should be checked against the surface roughness standard prior to each use. If the portable stylus instrument is dropped or suspected of giving erroneous readings during the work shift, its accuracy should be rechecked. If readings do not agree with the surface roughness standard, all readings made since the last accuracy check are suspect. In the event of physical damage, wear, high usage, or after an established interval, the portable stylus instrument shall be rechecked for accuracy.

NONMANDATORY APPENDIX B: Determining Compliance Based on Process Control Procedure (Nonmandatory unless specified)

This process is based on several process control procedures identified prior to beginning work. A change in any of the process control procedures during production work requires verification of continued conformance with specified surface profile.

B1 Development of Process Control Procedure: Within 15 minutes after the start of surface preparation on each project, the contractor shall prepare a representative sample area for testing to determine compliance with profile requirements. Unless otherwise specified, the sample area shall measure at minimum 61 cm x 61 cm (2 x 2 ft). After the test area has been determined to comply with the required profile range for the project, the items listed in Tables B1, B2, and B3 below shall be identified and documented.

B2 Number of Readings and Measurements Required

B2.1 Number of Readings Required: Unless otherwise specified, the number of readings to determine the profile measurement of abrasive blast cleaned substrates shall be the number required by the Test Method specified from ASTM D 4417⁵ or the number required by ASTM D 7127 if the portable stylus instrument is specified (see Note 11.1). The readings shall be taken at randomly selected locations on the prepared surface(s) of the structure or on one of the prepared pieces if surface preparation is done in the shop or on a minimum of two randomly selected individually prepared pieces. The measurement shall be the average of the readings.

B2.2 Number of Measurements Required: If the ASTM Test Method specified does not require multiple readings to determine a measurement, three (3) surface profile readings shall be taken and averaged to determine one measurement. Unless otherwise specified in the contract documents, one measurement shall be made on the prepared surface(s) of the structure (or on a minimum of two randomly selected individually prepared pieces in the shop). The measurement

⁵ Visual comparators used for ASTM D 4417 Method A represent surfaces prepared by abrasive blast cleaning and are inappropriate for comparison with power tool cleaned surfaces. The replica tape used for ASTM D 4417 Method C cannot accurately measure the profile produced by some types of power tool cleaning media. A test area prepared at the job site can be used to assess the suitability of media and profile measurement method for a project prior to full-scale production.

**TABLE B1
PROCESS CONTROL ITEMS
FOR ABRASIVE NOZZLE BLAST CLEANING**

1	Worker performing abrasive blast cleaning
2	Blast nozzle type
3	Blast nozzle size
4	Number of nozzles operating from same compressor
5	Abrasive manufacturer
6	Abrasive type, hardness and physical shape (e.g., steel grit, steel shot, or ratio of mix, or type of mineral abrasive, such as garnet, coal slag, etc.)
7	Abrasive size (sieve size)
8	Air pressure at nozzle
9	Blast hose length (as a range)
10	Blast hose diameter
11	Compressor size (CFM)
12	Air pressure at compressor

**TABLE B2
PROCESS CONTROL ITEMS
FOR POWER TOOL CLEANING (SP 11, SP 15 only)**

1	Worker performing power tool cleaning
2	Power tool type, model and manufacturer
3	Power tool media manufacturer
4	Type of media used (e.g. wire brush, coated abrasive disc, abrasive embedded in matrix wire bristle impact tool)
5	Abrasive media size
6	Grade of media
7	Replacement/substitution of consumables (e.g., disc, wire brush, needles, bristles)
8	Compressor size (CFM) if tool is air-powered

**TABLE B3
PROCESS CONTROL ITEMS
FOR CENTRIFUGAL BLAST CLEANING**

1	Unit Operator
2	Blast wheel type
3	Wheel motor power
4	Wheel positioning
5	Control cage movement
6	Media flow rate
7	Abrasive manufacturer
8	Abrasive type and physical shape (e.g., steel grit, steel shot, or ratio of mix, or type of mineral abrasive, such as garnet, coal slag, etc.)
9	Abrasive size (sieve size)
10	Configuration, orientation and size of piece being cleaned (if in shop)

shall be obtained on a representative vertical or horizontal surface. When measuring, the inspector shall document the location and results of the individual readings, the test method used, and whether the measurement conformed to contract requirements. A change in any of the items or personnel listed in Tables B1, B2, or B3 (as applicable) between acceptance of the test area and the end of surface preparation shall require verification that the profile remains in compliance with project requirements (see Appendix B3).

B3 Additional Requirements for Process Changes

B3.1 If there is a change to any of the items listed in Tables B1, B2, or B3 (as applicable) during surface preparation, the time that the change took place and the location of the surfaces or the identity of the pieces prepared *before* the change shall be identified.

B3.2 Unless otherwise specified in the contract documents, two measurements shall be taken at randomly selected locations on the prepared surface(s) of the structure (or on a minimum of two of the prepared pieces) upon completion of surface preparation. One measurement shall be taken on the structure's surface(s) prepared (or on one of the pieces prepared) before the process change. The second measurement shall be taken on the prepared surface(s) of the structure (or on one of the pieces prepared) after the process change. The location of the tests, the test methods used, the test results and whether the results conformed to contract requirements shall be documented.

B3.3 If the process changes more than once during surface preparation, an additional measurement per the above procedure each time the process changes shall be taken.

B4 Non-Conforming Surface Profile:

STEP 1: Determine location averages at regular intervals in four equally spaced directions radiating outward from the non-compliant 15 x 15 cm (or 6 x 6 inch) location. If there is no space to take readings in a given direction, then no readings need to be taken. Determine additional location averages in each direction until two consecutive location averages are compliant in each direction or until there is no space to take additional measurements in that direction. Determine a single location average on repeating structural units or elements of structural units until location averages on two consecutive units (or elements) in each direction are compliant or until there are no more units or elements to test.

STEP 2: Acceptable location averages are as defined by the specification for minimum and maximum values. Use removable chalk or other specified marking material to identify the extent of the non-conforming surface profile.

STEP 3: Record the extent of the nonconformity using readily identifiable structural members or permanent structural details.

NONMANDATORY APPENDIX C: Additional Considerations When Measuring Surface Profile

C2.1 Determining Surface Profile/Peak Count on Surfaces Shop-Prepared Using Stationary Centrifugal Blast Cleaning Units: A centrifugal blast machine is comprised of one or more spinning wheels that throw abrasive blast media at a conveyed part that moves parallel to the blast machine. Various parameters, including dwell time and rate of travel, can affect the degree of cleaning and blast profile achieved. A key parameter that can affect the uniformity of the blast profile depth is the positioning of the adjustable wheels. Improperly aligned wheels may not achieve a uniform blast profile because some areas could be partially or completely missed. In some cases the blast media may strike the surface at an oblique angle resulting in a lesser profile depth. In order to account for the potential variability in the surface profile, the profile should be measured at representative unique locations. For example, U-shaped sheet piles have three uniquely oriented surfaces on each side. Each of the three surfaces should be evaluated for compliance to the specified blast profile separately. The values should not be averaged. If any one surface is non-compliant, the machine should be adjusted and the piece reblasted and checked for compliance on each surface. The procedure should be repeated until the specified profile is achieved. Caution should be exercised in re-blasting as steel surfaces can be compromised by over blasting causing surface failures in the grain structure of the steel surface.

C2.2 Determining Surface Profile on Surfaces Cleaned Using Portable Centrifugal Blast Cleaning Units: A portable centrifugal blast machine uses one or more spinning wheels that throw abrasive blast media at a surface as the blast machine is moved parallel to the surface. Various parameters, including dwell time and rate of travel, can affect the degree of cleaning and blast profile achieved. A key parameter that can affect the uniformity of the blast profile depth is the distribution of blast media across the width of the cleaned surface. Improperly distributed media may not achieve a uniform blast profile because some areas could be partially or completely missed. In order to account for the potential variability in the surface profile, the profile should be measured at representative locations across the width of the blast path.

C2.3 Determining Surface Profile on Surfaces Cleaned Using Waterjetting Units: Information about the surface preparation history and the effects of long-term exposure may not be available for previously coated surfaces that have been cleaned by water jetting. The newly exposed profile could change significantly within a small area. Therefore, it may be necessary to determine additional location averages of surface profile or surface roughness and peak count to ensure that the profile consistently meets the stated requirements.

C2.4 Determining Surface Profile on Surfaces Cleaned to SSPC-SP 15 or SSPC-SP 11: When power tool cleaning to SSPC-SP 15 or SSPC-SP 11, the designed service life of the cleaning media may end before the specified or default minimum surface profile required is achieved. The frequency of determining additional location averages of profile or surface roughness and peak count should be increased to reflect the productive life of the media being used. The designed service life of the power tool cleaning media used should be considered when specifying the frequency for determining compliance.

C2.5 Precautions Regarding Determination of Surface Profile

C2.5.1 Determination of Surface Profile on Flame Cut Edges: When steel is cut using oxy-acetylene torches, the heat that is generated during the cutting process hardens the cut edge. This is known as carburization or case-hardening (surface hardening) of the steel. Subsequent abrasive blast cleaning of these surfaces will typically yield a shallower surface profile depth due to the increased hardness of the surface. Removal of the hardened surface using grinders prior to abrasive blast cleaning will typically resolve the problem. Surface profile readings and location averages should be obtained in these areas to verify compliance with project requirements.

C2.5.2 Effect of Existing Surface Profile on Newly Generated Surface Profile: Steel surfaces with existing coating that must be removed may already have an existing surface profile. During surface preparation, the new surface profile combined with the existing surface profile may exceed the specified maximum surface profile for maintenance operations. A representative area of the structure should be evaluated to determine the surface profile yield before production abrasive blast cleaning begins so that adjustments to the abrasive, equipment or other factors (or the project specification requirements) can be made.

C2.5.3 Determining Surface Profile on Pitted Steel: Surface profile readings taken on pitted areas of steel can yield false high values (even with visual techniques). Surface profile readings should be obtained from non-pitted areas when the steel surfaces contain pits. If the steel is 100% pitted, a test panel should be created to evaluate the surface profile.

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