

Surface Texture Measurement of Cold Rolled Sheet Steel -SAE J911 OCT81

SAE Recommended Practice
Completely Revised October 1981

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φ SURFACE TEXTURE MEASUREMENT OF COLD ROLLED SHEET STEEL—SAE J911 OCT81

SAE Recommended Practice

Report of the Iron and Steel Technical Committee, approved January 1965, completely revised by ISTC Division 32 October 1981.

1. Scope

1.1 This SAE Recommended Practice describes a method for measuring the surface texture of cold rolled, matte finish sheet steel with a roughness average (R_a) of 20–80 μ in.

1.2 The method includes a system for equipment calibration and procedures for determining the arithmetical average surface roughness (R_a) and the average peak density (peaks per inch (ppi)) on sheet metal surfaces.

2. Equipment and Materials

2.1 **Digital Surface Roughness and Peak Counting Instrument**—Bendix QHD or equivalent.

2.2 Instrument and precision reference specimens shall comply with specifications for stylus type instruments as detailed in the American National Standards Institute ANSI B46.1-1978 or SAE J449.

2.3 The instrument shall be calibrated in terms of arithmetic average (R_a) and peaks per inch (ppi) on a precision reference specimen consisting of:

1. Calibration check—a 120 μ in typical roughness patch,
2. Linearity check—a 20 μ in typical roughness patch, and
3. A stylus check patch as shown in Fig. 1.

The contour material, accuracy, and uniformity of the precision reference specimen shall comply to requirements described in ANSI B46.1-1978.

2.3.1 The 120 μ in patch is used to provide the basis for surface roughness (R_a) and peaks per inch (ppi) calibration.

2.3.2 The 20 μ in patch is used to insure linearity of the instrumentation and moderate frequency system response.

2.3.3 Finally, the stylus check patch provides necessary calibration information regarding stylus condition, effective size, and high frequency system response.

2.4 Sample material selected for measurement shall be representative of the material as produced. The area tested should be at least 2 in from the coil edge. Samples for sheet examination shall be identified as to rolling direction, suitably flat, and the sample size large enough to run the tests. (A convenient size is 6 in long and 4 in wide, with the longer dimension parallel to the direction of rolling.)

3. Definitions

3.1 **Roughness Average**—The surface roughness average (R_a) shall be reported in microinches as the arithmetical average of the absolute deviations from the median line established within the limits of the roughness width cut-off.

Surface roughness consists of the finer irregularities in the surface texture usually including those irregularities which result from the inherent action of the production process. These are considered to include transverse feed marks and other irregularities wherein the limits of the roughness width cut-off.

3.2 **Peak**—A surface irregularity wherein the profile intersects consecutively a lower and an upper boundary line. The boundary lines are located parallel to and equidistant from the profile mean line as established within the limits of the roughness width cut-off. The vertical distance between these boundary lines is termed the peak count level.

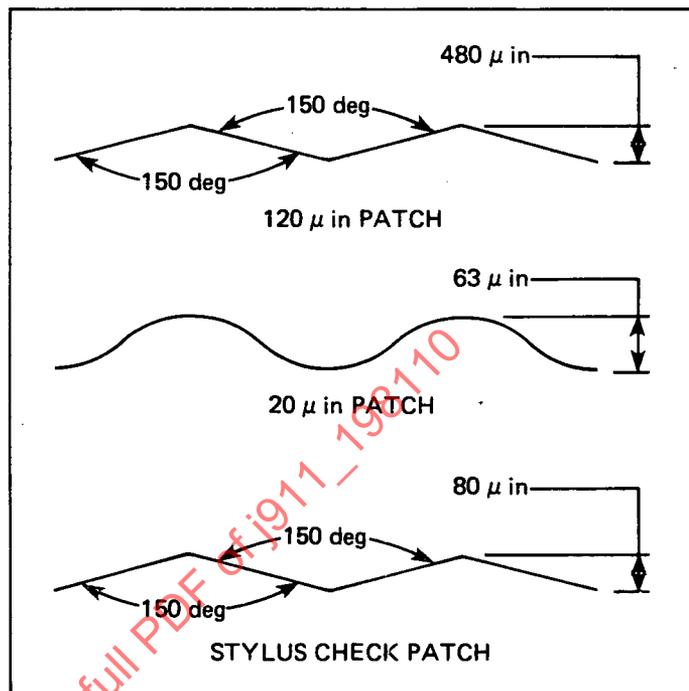
3.2.1 **PEAK COUNT LEVEL**—The vertical distance (in microinches) between the boundary lines described in the definition of "peak," see Fig. 2.

3.2.2 **PEAK DENSITY**—The peak density is the number of peaks per inch measured at a specific peak count level. The value of peak density is reported in units of peaks per inch (ppi).

4. Test Procedure

4.1 **Preparation**—The following items should be inspected to insure proper operation of the measuring equipment.

- (a) Secure all cable connections.
- (b) Tighten mechanical fastening of posts, link arms, etc.
- (c) Adjust link arm to be free to rotate about its axis.
- (d) Both link arm and sample must be level and parallel.
- (e) Adjust stroke to 1-1/8 in.
- (f) Set roughness mode to arithmetic average R_a (formerly AA).
- (g) Set pilot or speed selector to correspond to the pilot or being used.
- (h) Set width cut-off to 0.030 in.
- (i) Set peak count level when measuring peak density.
- (j) Check suitability of location. The suitability of the location can be checked by observing the roughness reading obtained on a smooth piece



PRECISION REFERENCE SPECIMEN
SPECIFIC FOR CALIBRATION

Reference Specimen	Roughness, μ in	Peak Count, ppi
120 μ in	117 \pm 1.0	267–269 at 50 μ in level ^a
20 μ in	18–21	710–730 at 10 μ in level
Stylus check	12–20	1655–1695 at 10 μ in level

^aFor those instruments which have two 50 μ in count levels, peak count readings on both settings shall be within 2%.

FIG. 1—CALIBRATION MEASUREMENTS

of glass. A reading of 2 μ in or less in the display indicates the location is suitably vibration free.

(k) Wipe test sample with a soft lint-free cloth.

4.2 **Calibration**—To achieve the greatest uniformity between instruments on sheet surface texture measurements, the following calibration procedure should be used as required based on individual instrument used and equipment manufacturer's recommendations.

4.2.1 **CALIBRATION MEASUREMENTS**—After preparation as described in paragraph 4.1, calibration measurements on the precision reference specimen shall be made to establish satisfactory operation of the instrument.

The calibration readings for both roughness and peak count should be obtained from the average of ten readings which are required to obtain correlation between various instruments and users. The instrument is set up to obtain readings that are in the direction indicated on the precision reference specimen (usually a double arrow). Five measurements