

REL	25575-2	CH'D	DATE	APP'D
A1	45535-142	J. B.	2/17/66	JM

# SPECIFICATION

## 9-2640

QUANT. A1

### PROCESS

SHEET 1 OF 9

ISSUED: 8-11-50

SCINTILLA DIVISION

THE **Scintilla** CORPORATION

SIDNEY, N. Y., U. S. A.

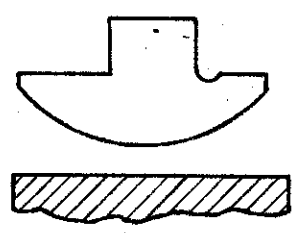
## SURFACE ROUGHNESS, WAVINESS AND LAY

U

THE PURPOSE OF THIS SPECIFICATION IS TO FAMILIARIZE ALL CONCERNED WITH THE SUBJECT OF SURFACE FINISH SYMBOLS USED ON ENGINEERING DRAWINGS.

### A. DEFINITIONS

1. Surface - A surface is usually defined as the boundary between an object and its surrounding medium or contacting object. On Engineering drawings, this nominal surface is represented by a line if shown in profile or by its boundary lines or contours if shown in plane view.



2. Mean Line - An imaginary line about which surface roughness is measured parallel to the general direction of the profile, so positioned that the sums of the areas contained between it and those parts of the profile which lie on either side of it are equal.

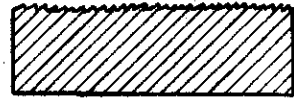


3. Profile - The contour of a surface in a plane perpendicular to a surface unless some other angle is specified.

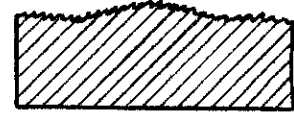


4. Surface Irregularities - Deviations from the mean line including roughness, waviness and flaws.

5. Roughness - Relatively finely spaced surface irregularities on surfaces produced by machining and abrasive operations, the irregularities produced by the cutting action of tool edges and abrasive grains, and by the feed of the machine tool.



Roughness may be considered as being superimposed upon a "wavy" surface.



USE OF THIS DOCUMENT IS UNLIMITED. DOCUMENTS REFERENCED HEREON CONTAIN LIMITED RIGHTS DATA.

SCINTILLA DIVISION  
SIDNEY, N. Y., U. S. A.

THE *Barrett* CORPORATION

9-2640

CHANGE

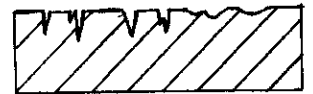
A1

SHEET 2 OF 9

- A. 6. Waviness. - Surface irregularities from a mean line in the form of waves which are of greater spacing than roughness. On machined surfaces such irregularities may result from machine or work deflections. Irregularities of similar geometry may occur due to warping, strains, etc.



7. Flaws. - Irregularities which occur at one place or at relatively infrequent or widely varying intervals in a surface. Flaws include such defects as cracks, blow holes, checks ridges, scratches, etc.



8. Lay. - The direction of a predominant surface pattern produced by tool marks or grain of the surface, ordinarily determined by production method used. (See description of Lay Symbols, Section C).

9. Microinch. - One millionth of an inch (.000001)

10. RMS (Root-Mean-Square). - RMS formerly used in connection with a surface roughness value or number indicates that the value is assumed to be approximately equal to the square root of the mean value of the squares of the heights and depths of the surface roughness irregularities measured from the mean line in microinches.

AA or RMS may be calculated but is usually taken from a meter of an instrument made for measuring surface roughness. The Profilometer meter reads directly in AA or RMS values.

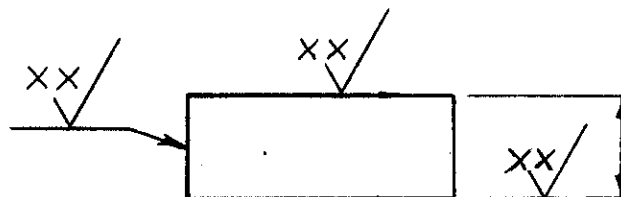
Conversion factor AA  $\frac{\text{RMS}}{1.1}$

COMMON ECD/ENP

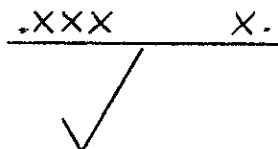
11. Roughness Height Rating (RHR) is specified by Arithmetical Average (AA). The (AA) Arithmetical Average deviation from the mean line is approximately equal to the sum of the measurements taken from the peak to the valleys of the surface, divided by the number of measurements taken. For specific formulae see Mil-STD-10.

### B. SURFACE FINISH SYMBOL

1. The symbol used to designate a surface finish is a check mark as shown. ✓
2. The point of the ✓ shall be either on the line depicting the surface, on the witness line, or on an arrow pointing to the surface as shown.



3. When waviness width and/or waviness height is specified, a horizontal line is added above the apex of the arrow as shown.

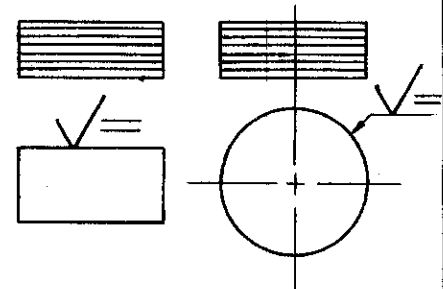


COMMON ECD/ENP

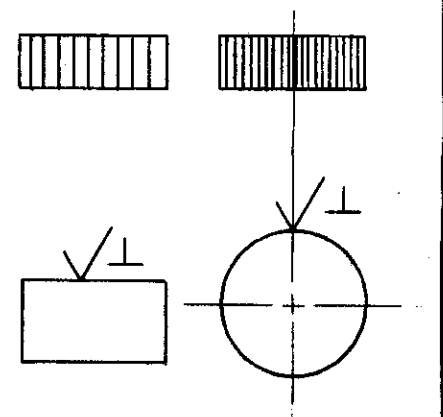
C. SYMBOLS INDICATING DIRECTION OF LAY

Lay designation, when required, is indicated by the lay symbol, placed to the right of the long leg. (See illustrations.)

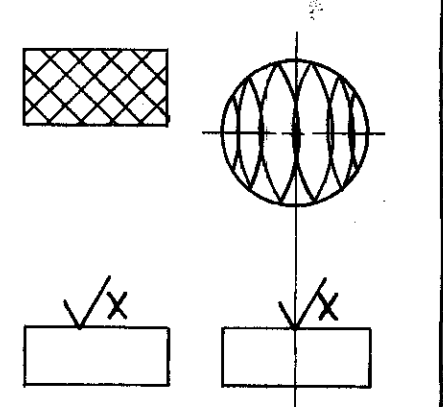
1. Parallel to the boundary line of the surface indicated by the symbol. Such as shaping, milling.



2. Perpendicular to the boundary line of the surface indicated by the symbol. Such as end view of shaping.

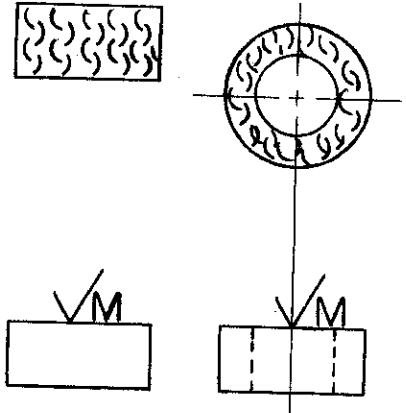


3. Angular in both directions to the boundary line of the surface indicated by the symbol. Such as side wheel grind.

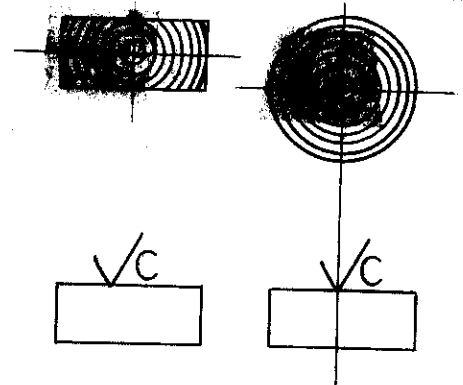


COMMON ECD/ENP

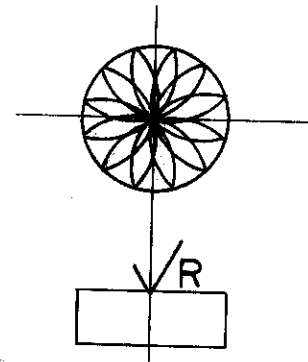
- C. 4. Multidirectional as shown by the symbol. Such as lap, superfinish.



5. Approximately circular relative to the center of the surface indicated by the symbol. Such as facing.



6. Approximately radial relative to the surface indicated by the symbol. Such as surface ground on a turn-table.



7. Typical examples of Lay Symbols: -

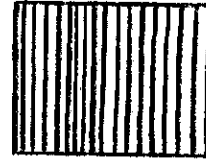
Lay perpendicular to boundary line representing the surface to which the symbol applies in the view in which the symbol appears.



Lay parallel to boundary line representing the surface to which the symbol applies in the view in which the symbol applies.

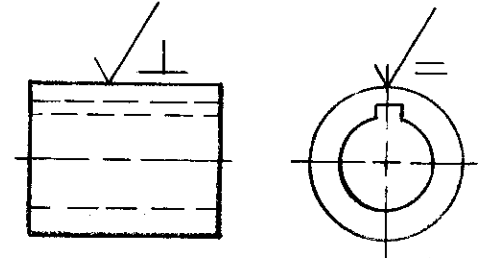


For illustrative purposes, the perpendicular and parallel lay symbols as they might be shown on a cam.



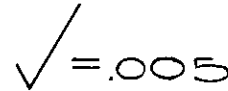
NOTE:

The surface Finish Symbol shall only appear on one view and shall indicate the lay direction as shown in that view. For example, the illustration (shown for cam) clearly shows that both the perpendicular and parallel lay symbols define the same direction of lay, dependent only upon view in which the symbol is placed.



D. DESIGNATION OF ROUGHNESS HEIGHT

1. Roughness height value is placed adjacent to and on the inside of the long leg as shown.
2. Roughness width value, when required, is placed to the right of the lay symbol as shown.



NOTE:

The use of only one number to specify the height of roughness shall indicate the maximum value. When two numbers are used, they shall indicate the maximum and minimum permissible values.



E. DESIGNATION OF SURFACE ROUGHNESS WIDTH

1. Roughness width value (inches) is located to the right of the lay symbol. The numerical value specified indicates the max distance parallel to the nominal surface between successive peaks or ridges which constitute the predominant pattern of the roughness.



F. DESIGNATION OF SURFACE  
ROUGHNESS WIDTH CUTOFF

**Roughness-Width Cutoff.** The greatest spacing of repetitive surface irregularities to be included in the measurement of average roughness height. Roughness-width cutoff is rated in inches. Standard values are given in Table. Roughness-width cutoff must always be greater than the roughness width in order to obtain the total roughness height rating.

Table  
Standard Roughness-Width Cutoff Values (Inches)

0.003	0.010	0.030	0.100	0.300	1.000
-------	-------	-------	-------	-------	-------

✓.010

When no value is specified, the value 0.030 is assumed. When a value is specified, locate to the right of the extension line as shown.

In most electrical averaging instruments, the roughness-width cutoff can be selected. It is a characteristic of the instrument rather than that of the surface being measured.

G. DESIGNATION OF WAVINESS HEIGHT

1. Waviness height value is placed on a line above the extension line and to the left of the apex of the extension line as shown.

.0002  
✓

NOTE:

The use of only one numerical value to specify the height of waviness shall indicate the maximum value. When two numerical values are used, they shall indicate the maximum and minimum permissible values.

For extremely fine lapped or polished surfaces optical flats may be used. The waviness designation for optical flats should be specified by the note as shown.

.0002  
.0004  
✓

"NOTE:

These surfaces to be flat within .00005 total variation. (Approx. 4 interference bands of Van Keuren Monochromatic light.)"

SCINTILLA DIVISION  
SIDNEY, N. Y., U. S. A.

THE *Beckwith* CORPORATION

9-2640

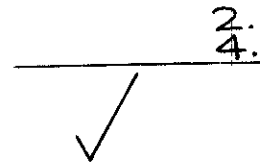
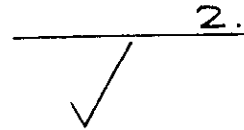
CHANGE

A1

SHEET 8 OF 9

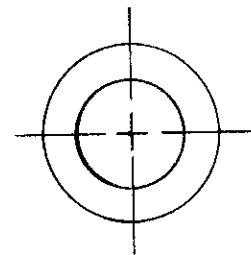
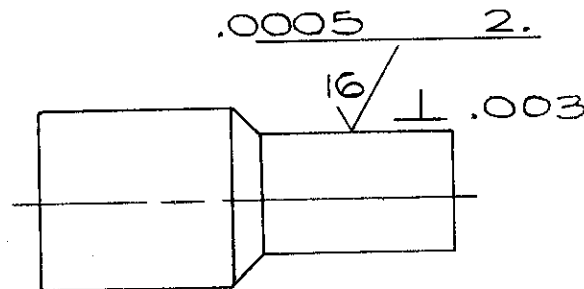
H. DESIGNATION OF WAVINESS WIDTH

1. Waviness width value (inches) is located on a line above and to the right of the extension line as shown.
2. One numerical value indicates maximum width. Two numerical values indicates limits of widths.



J. A typical example would be the use of the symbol to express the following specification:

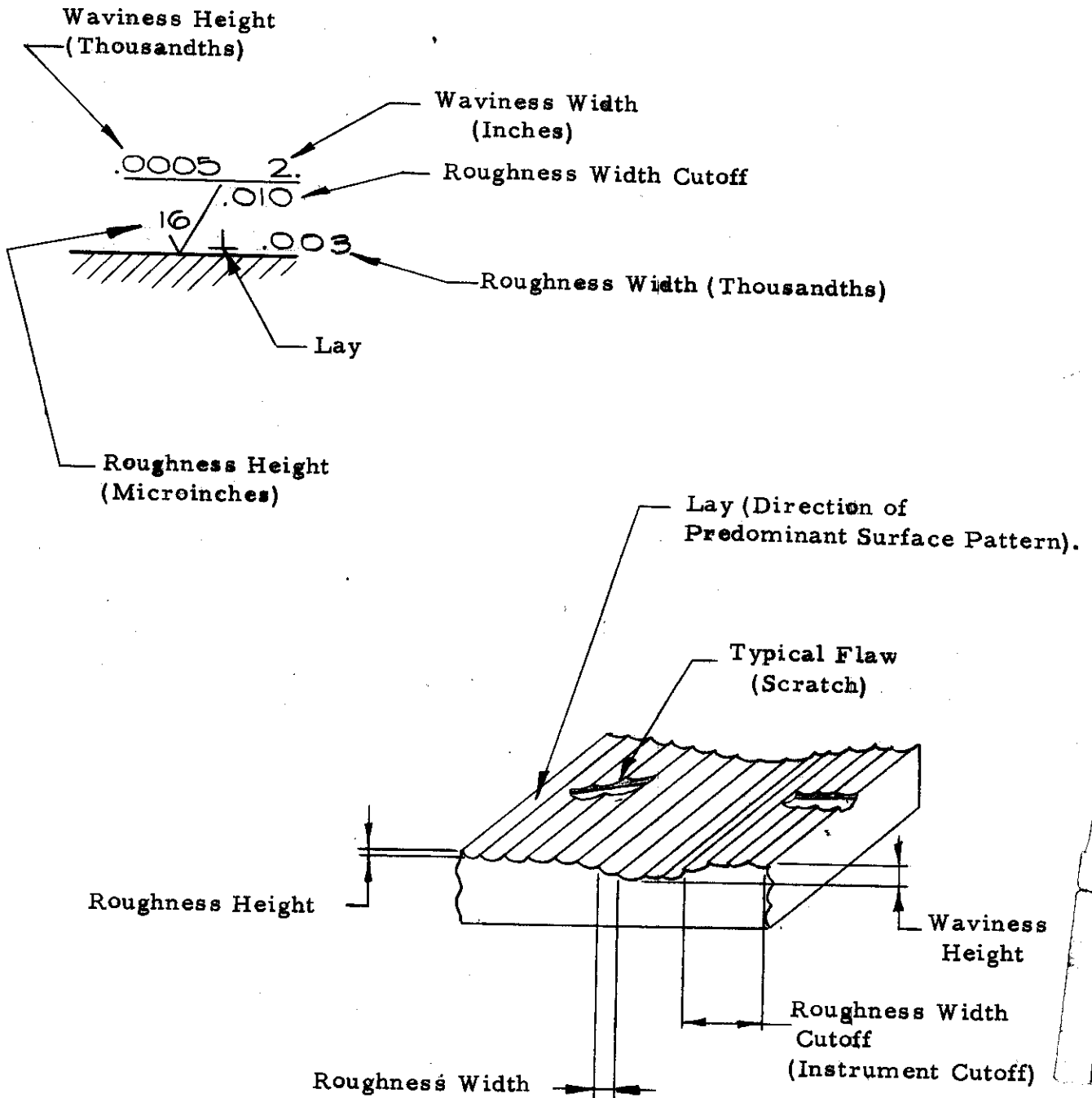
- Roughness Height - 16 microinches
- Waviness Height - .0005 inch
- Waviness Width - 2 inches
- Lay - Circumferential  
(Ground O. D.)
- Roughness Width - .003 inch
- Roughness Width Cutoff - .030 inch (understood)



COMMON ECD/ENP



K. MEANING OF EACH PART OF SYMBOL DEFINED.



\* Surface roughness unless otherwise specified, is always measured across the lay, or as in the case of a "M", "R", or "X" lay, in the direction of maximum roughness.

\* Reference MIL-STD-10

COMMON ECD/ENP

APP'D. Baumgarten

CK'D

*[Signature]*

APP'D

APP'D D. Bibeau