



## RCA Specification

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### I. **SCOPE**

This document describes the procedure for abrasion resistance testing of coatings or legend printing onto various type substrates. This specification details wear resistance requirements by use of the Norman Tool, RCA abrasion machine.

### II. **EQUIPMENT REQUIRED**

- A) The Norman Abrasion Wear Tester, manufactured by Norman Tool Inc. (151415 Old State Road, Evansville, Indiana 47711). Model number 7-IBB-647, manufactured for RCA according to RCA print EX-6219264.
- B) Paper Tape, 11/16 inch wide x 8 inch diameter on a 2 inch core, un-oiled paper, to be purchased from Norman Tool Inc.
- C) Paint Chip, with #1680 top coating, manufactured by Red Spot Paint and Varnish Co. (P.O. Box 418, Evansville, Indiana 47703).



### III. ENVIRONMENTAL CONDITIONS

- A) The area where testing is to be conducted shall be controlled to between 30 to 60% relative humidity at ambient room temperature.
- B) The paper reels shall be stored in a cool dry atmosphere and contained within the inner plastic shipment packing until required for use. Normal stock rotation is to be used and the paper reels are to be marked with the supply date. Paper reels which are older than 6 months from the date of supply are not to be used.

### IV. TEST SET UP

- A) Set the cam mechanism on the abrasion tester for continuous cyclic operation.
- B) The counter weight corresponding to 175 gram load force is to be used and mounted to the rocker arm assembly.
- C) The paper tape shall be fed from the top of the feeder reel through the vertical shaft assembly.
- D) The machine should be horizontal to the work surface on which it is placed. The legs can be adjusted using the level mounted on the tester.

**NOTE:** More comprehensive instructions are detailed in the operations manual. A copy should be made available in the work area.

### V. PROCEDURE

- A) Adjust the sample so the washer of the lever assembly is resting on the area to be tested.
- B) Mount the sample rigidly to the base, perpendicular to the vertical shaft. At this point, the tape backed by the washer must be resting on the test area.

**NOTE:** For proper results, the sample must be affixed in such a manner that it does not move, deflect, or cause the lever assembly to bounce.

- C) Adjust the counter to zero.
- D) Start the test by turning on the drive motor.
- E) Run the machine for the specified number of cycles. A more accurate reading can be obtained, by periodically stopping the machine, inspecting the sample, and continuing if failure has not occurred.
- F) Printed surfaces and protective lens coatings shall withstand 40 cycles in continuous mode with a 175 gram normal force, and requirements for all other materials will be documented in the component or product specification, where applicable.
- G) Fine resolution printing should be tested to failure, to ensure that proper placement was made to the test area.



## VI. FAILURE DETERMINATION

Most tested components fall into one of two categories. The first is printed materials where the point of an abrasion test is to be sure that what is printed can withstand significant abrasion without erosion of the legend. Examples of components falling into this category would include keypads, housings, and labels. The second is protective or shielding materials whose intent is to withstand abrasion without a change in transparency. An example of a component falling into this category is a lens. The abrasion requirements for each category follow:

- 1.) Printed keypads, housings, lenses, labels, etc. - No area 0.1mm x 0.2mm or larger may wear through in less than 40 cycles of continuous abrasion except if the layer in question is transparent and only meant to protect underlying layers. Wear through is generally visible when an underlying layer of a different colour may be seen through the first layer. Finally, break through on a first surface printed line constitutes a failure regardless of size.
- 2.) Lens hardcoat - No area 0.1mm x 0.2mm or larger may wear through in less than 40 cycles of continuous abrasion.

**NOTE:** With printed materials the 0.1mm x 0.2 mm criteria is borrowed from LCD displays where black on white, actually light grey, specks in the display are to be avoided. It is fairly close to the limit of visibility for most colour combinations. The allowance for wear through of the coating in fewer than 40 cycles but without harm to the print recognizes the fact that in most cases the coating is sacrificial and only intended to increase the abrasion life, and not to add any other type of resistance. This allowance may also be applied where an outer protective coating is partially worn but polished. The strengthened criteria for printed lines, say a number on a keypad, recognizes that the eye will be more acutely aware of degradation to the features it is drawn to by the layout than features lying in the background of the layout. Protective materials intended to preserve transparency are not given any particular dispensation for wear through regardless of the condition of the underlying substrate afterwards. This follows from the view that a minimal product of abrasion resistance and thickness of the coating is required for the application. The specification requiring no wear through goes directly to this requirement.

## VII. CALIBRATION

Mount the Red Spot paint chip into position under the lever assembly, and follow the procedure detailed above for testing. Wear through of the top coat should occur between 15 to 20 continuous cycles, with a 175 gram load force.