

**NELSON NAMEPLATE
COSMETIC INSPECTION STANDARD
FOR FRONT PANELS**

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1.0 Revision History

Rev.	Date	Description of Changes
NC	10/86	Initial release of document
A	6/90	Sections 1 & 9 augmented Section 4.2.1 deleted
B	4/92	Complete rewrite to facilitate Nelson's education process and to train Nelson's inspectors.
C	6/92	Modified to facilitate Nelson's education process.
D	7/95	Updated Section 6.0

2.0 PURPOSE

The purpose of this document is to establish a common cosmetic inspection procedure for use by Nelson and Nelson's customers. By using the same inspection method we can insure that the requirements are understood the same way.

Some of Nelson's customers have their own inspections requirements. We encourage them to specify their cosmetic requirements in terms of an inspection procedure similar to this document. Mutually agreed upon customer supplied requirements always take precedence over this document.

3.0 SCOPE

This document is intended for use during in-process and final inspection of front panels and overlays at Nelson. It is intended that Nelson's customers will also use this document for their incoming inspection.

4.0 DEFINITIONS

Adhesive Imperfections – Any variation in the adhesive that is visible under the prescribed viewing conditions. This may be caused by a lack of opacity in the ink which allows the adhesive imperfection to be visible. It may also be a ball of adhesive which causes a bump in the overlay.

Apparent Color Variation – Any unintended variation in the perceived color that is visible under the prescribed viewing conditions.

Color Coupons – A series of rectangles with objects printed within them. They are designed so that one rectangle is set up for each color. If the object inside the rectangle touches a side of the rectangle, the printing registration for that color does not meet the requirement for registration. Color coupons are usually printed outside the part and are not present in finished parts.

Dent – A crease in the material caused by bending the material sharply. The mark has been described as a "fingernail" mark.

Ink Delamination – The condition when the ink comes off the substrate. It is often noticed on the corners of parts or where the ink appears lighter.

Non-Window Contamination – Foreign particle (s) located in the part in an area other than a window. These are usually airborne materials that became lodged in the ink during printing.

Opacity – The amount of light that passes through a part. A part is typically rejected if unintended features are visible when viewed under the prescribed viewing conditions.

Pin Hole – A small void in the ink that allows light to pass through.

Polycarbonate – A plastic resin used to manufacture much of the plastic film Nelson uses for printing overlays. This film is easily embossed and die cut.

Polyester – A plastic resin used to manufacture much of the plastic film Nelson uses for printing overlays. Polyester offers excellent chemical resistance and long life when used as a membrane switch overlay.

Printing Defects – Any defect in the image that is different from the film from which the part was printed. Printing defects may be stray smears of ink, smeared or filled in letters or other defects that appear in one of the printed color.

Printing Misregistration – In this condition the printed color does not line up in the planned manner. The condition can be evidenced by obvious misalignment or by color coupons not printed within tolerance.

Scratches – Marks in the printed sheet caused by some sort of abrasion. This type of defect is typically long and narrow.

Stray Spots – This type of defect is typically a dark colored spot on a light colored background. It can be caused by the printing process, but is more commonly caused by a defect in the material. Several small spots close enough together as to appear as a single spot, without magnification, shall be considered one stray spot.

U.V. Hardcoat – A coating that is cured by subjecting it to ultraviolet light. These types of coatings are hard and offer abrasion and chemical resistance. They can be produced in a variety of finishes from gloss to velvet. Nelson's proprietary U.V. Hardcoats are called "Neltex".

U.V. Hardcoat Peeling – This type of defect is evident when one of the hardcoats that is applied to the top surface of the material begins to separate from the base material. This condition is most common in and around the areas where two hardcoats meet. This condition also occurs on pre-coated materials (ie: Marnot XL polyester and occasionally polycarbonate, HP-series). This condition is evidenced by the hardcoat being a lighter color in the areas where peeling is taking place.

Window – Any area that is intentionally transparent or translucent allowing light or a display to be visible for the purpose of displaying information.

Window Contamination – the presence of foreign particle (s) that detract from the functional nature of the window.

Window Scratches – Damage to the window area normally caused by abrasion. This type of defect is usually long and narrow.

5.0 APPLICABLE TOOLS

Under this specification, parts are viewed under the prescribed viewing condition with an unaided eye. Inspection tools may be used to measure the size of defects once they are noted under the outlined procedure.

Inspection tools that may be used are:

- 7 loop with graticule
- Vernier calipers
- Films with standard defects portrayed
- 285 line 65% standard litho halftone pattern (Appendix A)

6.0 INSPECTOR QUALIFICATIONS

Inspectors are to have either unaided, or corrected, 20/20 vision.

7.0 VIEWING CONDITIONS

This section describes the required viewing conditions for inspecting parts under this specification.

7.1 LIGHTING

Inspection will be performed with fluorescent lighting between 100 and 175 foot candles.

7.2 VIEWING DISTANCE

Inspection for all types of cosmetic defects will be initially performed without the use of magnification. Inspection shall begin and be performed at a distance of 24 inches. Magnification can be used to confirm the size of defects.

7.3 VIEWING ANGLE

Parts shall be viewed stationary on a fixture or held at 4 degrees to horizontal. The part should be located at approximately the height of the inspector's shoulders. Parts shall not be manipulated to reflect the light source off the surface of the part.

7.4 SPECIAL WINDOW VIEWING CONDITIONS

Windows are to be inspected under conditions similar to the conditions the panel will experience in its end use. If possible, a display to be used as an inspection fixture, should be obtained from the customer. If the appropriate inspection fixture is unavailable, then Nelson has established the following window classifications and viewing conditions that are intended to approximate the end use conditions.

Window Type	Background or Backlighting
I. Clear Enunciator Small clear windows usually round or rectangular.	No special requirements.
II. Emissive Display Windows Printed with transparent ink, may have deadfront. Usually used with an LED or VF display.	Inspected on a light table with 100 – 150 foot candles.
III. Reflective Display Windows Clear display windows with either a gloss or anti-Glare finish. Usually used with an LCD display.	Place 285 line 60% standard litho half tone “ ” away from backside of window.

8.0 VIEWING TIME

Viewing time will be a function of part size as follows:

<u>Part Size</u>	<u>Viewing Time</u>
0 to 25 square inches	5 seconds
26 to 50 square inches	10 seconds
51 + square inches	15 seconds

For parts with special window viewing conditions as described in Section 7.4 an additional 5 seconds may be used.

9.0 ALLOWABLE DEFECTS

The following sections outline the acceptance criteria for parts inspected under this specification. It should be noted that parts should not be rejected for flaws that were not observed under the prescribed time of viewing conditions.

9.1 “APPARENT” COLOR VARIATION

No noticeable color variation within a part is allowable.

9.2 STRAY SPOTS/VOIDS/PRINTING DEFECTS

These types of defects can be caused by many things. They are generally round or oblong. This section outlines the accept/reject criteria.

NOTE: Any group of extremely small spots that appear as one spot, without magnification, will be evaluated as one defect.

No visible defects greater than .015" measured along its greatest dimension are allowable. Visible defects .015" or smaller will be termed minor defects. Allowable minor defects are as follows:

<u>Part Size</u>	<u>Allowable Minor Defects</u>
0 to 4 square inches	0
5 to 20 square inches	3
21+ square inches	4

No defects (spots, smears, or missing letters) that affect the meaning or legibility of the part are allowable.

9.3 SCRATCHES

The surface of the part shall contain no more than three light scratches. A light scratch is defined as being no greater than .010" x .50". No scratches greater than .010" x .50 are allowed.

9.4 SURFACE DEFECTS

Any nicks, gouges, dents or other surface imperfections in the finished panel, which are readily apparent at the standard viewing distance of 24 inches, are cause for rejection.

9.5 INK DELAMINATION

Any ink Delamination that is apparent under the standard viewing conditions is cause for rejection.

9.6 ADHESIVE IMPERFECTIONS

Any imperfection in the adhesive that is observed during inspection under the standard viewing conditions is cause for rejection.

9.7 WINDOW DEFECTS

Window areas shall contain no major flaws. Major flaws are larger than minor flaws. A minor flaw is defined as contamination less than .010" along its greatest dimension or a scratch and/or linear flaw less than .010" x .050". window defects are counted separately from other types of defects.

<u>Window Size</u>	<u>Allowable Minor Window Defects</u>
0 to 4 square inches	2
5 to 20 square inches	4
21+ square inches	8