

**Library of Congress Preservation Directorate**  
**Specification Number 700-704 – 09**  
**Specifications for Pressure Sensitive Adhesive Labels**  
**For Application to Single Paper Sheets and Text Pages of Bound Books**  
**For Use in Laser Printers**

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## **Scope**

Labels that meet the requirements set forth in this specification are intended for use on paper used for printed or written documents or the text pages of bound books designated as *General Collections* materials only. *These labels are not intended for use on rare or highly valuable materials, or application to photographic materials.*

## **1. Composition and Chemical Requirements**

### **1.1 Face Stock**

The type of face stock will be specified on the purchase order, selected by the user for the intended application, from the following list of options. The selected material must meet the composition requirements as stated.

#### 1.1.1 Polyester

The polyester must be a white opaque film, 1 – 2 mil thick. The polyester must be biaxially oriented, non-recycled film, with no plasticizers added.

#### 1.1.2 Polypropylene

The polypropylene must be a white opaque film, 1 – 2 mil thick. Biaxial orientation is preferred.

### **1.2 Adhesive**

The pressure-sensitive adhesive layer must possess high permanence characteristics such that labels, once applied, remain attached permanently and can be removed only with difficulty. The adhesive must be clearly identifiable as an acrylic polymer or copolymer by its infra-red spectrum.

## **2. Physical and Performance Requirements**

### **2.1 Brightness**

The face stock must have a minimum brightness of 82% as measured by directional reflectance at 457 nm, as described in TAPPI T 452.

## **2.2 Brightness Retention**

The brightness of the face stock must not change more than 10 points when subjected to 28 days of dark aging at 90°C and 50% RH. The change in brightness will be measured according to TAPPI T 452.

## **2.3 Bond Strength**

The adhesive must demonstrate sufficient initial bond strength for the label to support a test weight of 200 grams for 10 minutes.

### **2.3.1 Test Method**

This procedure is a 90 degree peel test, modified from ASTM D 2860. The bonding strength of the adhesive to two different substrates is assessed. Test Panels used in this test are LC Standard Test Panels PP-1 and PP-2, and consist of two different papers applied to 3 x 6 inch sections of 40 pt. board stock meeting LC Specification 300-300. The materials used for these LC Standard Test Panels have been selected to represent the surface characteristics of coated and un-coated papers, such as those that might be used for text pages in General Collection books. Information on the composition of LC Standard Test Panels can be obtained from the Library of Congress Preservation Research and Testing Division.

#### **2.3.1.1 Application and Curing**

A set of three labels, size 1 x 2 1/2 inches is applied to each of the two Test Panels over a Mylar window that permits only a one inch square area of the adhesive side of the label to be in contact with the substrate, as illustrated in ASTM D 2860, procedure B. The labels are set in place by applying firm pressure with the edge of a 3M plastic applicator, model no. P.A.-1., to the labels in four downward strokes. The test samples are then allowed to cure for 7 days in an environmental chamber conditioned to 23°C and 50% RH.

#### **2.3.1.2 Test and Evaluation**

At the end of this dwell time a 200 gram weight is suspended from the free end of the label and timed for 10 minutes. At the end of this test period, labels must not have peeled away from the substrate by more than 10 millimeters. Failure of this test with either of the test panels will disqualify the stock and no further testing need be performed.

## **2.4 Bond Strength after Accelerated Aging**

The adhesive, once set after the initial 7-day dwell time, must remain permanently affixed to both the face-stock and the substrate with no loss of adhesive strength for the life of the object to which it is applied, under conditions of normal use.

### **2.4.1 Test Method**

This procedure is a 90 degree peel test, modified from ASTM D 2860. Test Panels for this test will be the same as that used to test initial bond strength.

#### 2.4.1.1 Application and Exposure

A set of three labels is applied to each of the two Test Panels in the same manner as described in section 2.3.1.1. The labels are then subjected to accelerated aging at 80°C and 50% RH for 28 days. At the end of the aging period the test samples are placed in an environmental chamber conditioned to 23°C and 50% RH for 24 hours.

#### 2.4.1.2 Test and Evaluation

At the end of the conditioning period the peel test is performed as in section 2.3.2.2. At the end of this test period, labels must not have peeled away from the substrate by more than 10 millimeters.

### 2.5 Curling, Lifting, Ooze

The labels must not show any sign of curling, lifting, buckling, or puckering, nor any evidence of the adhesive oozing beyond the label edges.

#### 2.5.1 Test Method

A set of three labels, size 1 x 1 inch, is applied to the each of the Test Panels selected for use in section 2.3 so that the entire adhesive side of the label is in contact with the substrate. The labels are set in place by applying firm pressure with the edge of a 3M plastic applicator, model no. P.A.-1, to the labels in four downward strokes. The labels are then subjected to accelerated aging at 80°C and 50% RH for 28 days. At the end of the aging period, the labels are examined visually.

### 2.6 Print Fastness

The label stock must be able to accept and retain a clean, legible image from a laser printer.

#### 2.6.1 Test Method

The label stock will be printed with a test pattern consisting of a sample phrase or barcode centered on each label using a printer selected by the Library. The printer model to be used in this test will be noted on the purchase order.

##### 2.6.1.1 Printing Samples

Inability to print the stock on the selected printer, to obtain a clear, crisp and complete image, or read the bar-code with a scanner will constitute a failure. Any failure of the label stock during the printing process will disqualify the stock and no further testing will be performed.

##### 2.6.1.2 Test and Evaluation

A strip of 3M Tape #230 is applied over the printed test pattern on the label by rubbing down the tape using three fingers in six firm strokes. The tape is then peeled back at a 180 degree angle. Legible characters visible on the test tape, and/or degradation of the printed image on the face-stock, constitute a failure. (This method is described in Archival Copies of Thermofax, Verifax and Other Unstable

Records, Technical Information Paper No. 5, Washington, D.C., National Archives and Records Administration, 1990).

## **2.7 Off-setting of Ink to Adjacent Papers**

The printed image on the label must not rub off, transfer, or otherwise disfigure the paper facing the label.

### **2.7.1 Test Method**

This procedure follows GPO Test Method P-11, Rub Resistance of the Printed Image. This method is described in GPO Publication 310.1, Government Printing Office Contract Terms Quality Assurance Through Attributes Program for Printing and Binding. This test uses LC Standard Test Papers P-1 and P-3. Information on the composition of LC Standard Test Papers can be obtained from the Library of Congress Preservation Research and Testing Division.

#### **2.7.1.1 Test and Evaluation**

Labels will be printed as described in section 2.6. Printed labels are attached to one piece each of the two LC Standard Test Papers described in section 2.7.1 that have been cut to fit the base of the Sutherland Rub Tester. The test specimen is placed on the rubber pad on the base of the Sutherland Rub Tester, and then rubbed with that same Test Paper, as described in GPO Test Method P-11. Density changes of 0.04 or above, recorded on the receptor stocks, constitute a failure.

## **2.8 Suitability for Cold Storage**

The label stock must be able to remain adhered to its substrate without lifting, curling, flagging, or peeling during long-term exposure in the Library of Congress cold temperature storage vaults, down to minimum conditions of -4°C and 30% RH.

## **2.9 Photographic Activity Test**

If specified on the purchase order for use with collections of photographic materials, the labels must pass the Photographic Activity Test (P.A.T.), meeting the criteria stipulated in sections 5.3, 6.3, and 7.2 of ISO 18916. Both the face stock and adhesive side of the label will be tested. Vendors may wish to confirm that their products pass the P.A.T. before submitting them to the Library of Congress for evaluation. The vendor may wish to send samples to the Image Permanence Institute (Rochester Institute of Technology/IPI, 70 Lomb Memorial Drive, Rochester, NY 14623-5604; Tel: 585-475-5199), or other testing laboratory, to determine conformance prior to submission.

## **2.10 Migration and Staining**

The label adhesive must not migrate into and discolor the substrate and/or cause staining of the substrate after aging.

### **2.10.1 Test Method**

This test measures the color (brightness) change of a paper substrate that may occur over time when an adhesive label has been applied to it. The change in brightness will be measured according to TAPPI T 452. This test uses LC Standard Test Papers P-3 and P-4.

Information on the composition of LC Standard Test Papers can be obtained from the Library of Congress Preservation Research and Testing Division.

#### 2.10.1.1 Application and Exposure

One label, size 1 x 1 inch, is applied to each of 3 separate strips of the LC Standard Test Papers so that the entire adhesive side of the label is in contact with the substrate. The labels are set in place by applying firm pressure with the edge of a 3M plastic applicator, model no. P.A.-1, to the labels in four downward strokes. The labels are then subjected to accelerated aging at 80°C and 50% RH for 28 days. At the end of the aging period the test samples are placed in an environmental chamber conditioned to 23°C and 50% RH for 24 hours.

#### 2.11.1.2 Measurement and Evaluation

At the end of the conditioning period a fresh label is placed on the test paper alongside, but not touching, the aged label. The side of the test paper behind the labels is measured for brightness. The area behind the aged label must not show any visual evidence of discoloration of the test paper as compared to the paper behind the fresh label. Visual evidence of discoloration, confirmed by a brightness change of more than 3 points, constitutes a failure. This brightness change must be clearly attributable to discoloration of the paper substrate, rather than to discoloration of the label face-stock or yellowing of the adhesive.

### 2.12 Damage to Adjacent Pages

Neither the face-stock nor the adhesive must cause discoloration, stick to, or otherwise cause damage to adjacent pages.

#### 2.12.1 Test Method

This test is intended to simulate the effect that placing an adhesive label on a sheet of paper in a stack of other paper sheets, or between the text pages of a closed book, may have on adjacent pages over time. Changes in color (brightness) of the test papers are measured according to TAPPI T 452. This test uses LC Standard Test Papers P-2 and P-3. Information on the composition of LC Standard Test Papers can be obtained from the Library of Congress Preservation Research and Testing Division.

#### 2.12.1.1 Application and Exposure

One label is applied to each of five strips of the two LC Standard Test Papers, each measuring 22 mm x 120 mm. Each of these labeled Test Papers is faced with one strip of the same paper, backed up with 4 more strips of the same paper, so that the face-stock is facing the first strip and is in contact with that strip. Each stack of samples of each of the two Test Papers is placed, together, in a stainless steel test jig to hold the papers in the stack. Each stack of paper is separated by a strip of polyester. The stack of samples will be topped with a glass slat of the same size as the strips. Enough stainless steel slats measuring 22 mm x 120 mm are placed on top of the glass slat to come to a total weight (glass and metal) of 200 grams. The samples are then subjected to accelerated aging at 90°C and 50% RH for 28 days.

#### 2.12.1.2 Measurement and Evaluation

At the end of the aging period the labeled test strips must separate cleanly and easily from the facing paper strips. First degree blocking, as defined by ASTM D 1146, is acceptable. However, if either the face stock, or edge-ooze of the adhesive, has caused second degree blocking, the label will fail the test. The brightness of the facing paper strips is measured in two separate areas. The first measurement is taken of the area of the facing paper strip that was in contact with the face-stock on the opposite paper strip. The second measurement is taken on an area that was not exposed to the face-stock on the opposite strip. The two brightness measurements must not differ by more than 3 points.

### **3. Product Requirements**

#### **3.1 Construction**

The label stock must be provided in sheet form suitable for use in standard laser printers, on a release liner that will allow for easy and complete peeling of the face-stock without shearing of the adhesive layer.

#### **3.2 Workmanship**

All edges of the sheet, and of each label on the sheet, must be cut square and clean, and sizes accurate.

#### **3.3 Dimensions**

Dimensions will be specified on the purchase order.

#### **3.4 Odors**

The label stock must not emit odors deemed objectionable or hazardous to the work environment by the Library of Congress, when evaluated as described in TAPPI T 483.

#### **3.5 Shelf-Life**

The adhesive must have a minimum one year usable shelf-life such that the initial adhesion strength will be the same for labels applied up to one year after the original delivery date under ambient storage conditions. The labels must also maintain their capacity to be printed upon.

#### **3.6 Problem-Free Print Feeding**

The label sheet must lie flat without any curling and permit problem-free self-feeding from a stacking paper tray.

#### **3.7 Non-Contamination of Printer by Adhesive Residue**

The labels must not transfer adhesive to the platens or any other parts of a laser printer under extended, but normal use. There must not be any adhesive deposits on the platens or other accessible parts of the printer that can be seen visibly or felt by stickiness to the touch.

### **4. Packaging and Identification**

#### **4.1 Inner Packages**

Each package must plainly identify the type, size and number of items within, the name of the supplier or manufacturer, year of manufacture, and manufacturing run or batch number.

#### **4.2 Outer Package**

The items must be packed in standard commercial containers that are constructed to ensure that they arrive at the Library of Congress in dry, undamaged condition. The outside of each container must be identified by type, size and number of items within; manufacturing run or batch number; LC Purchase Order / Contract number and line number.

### **5. Compliance with Specification**

#### **5.1 Quality Assurance Testing**

The Library of Congress has the right to perform any of the tests set forth in the specification where such tests are deemed necessary to ensure that supplies conform to prescribed requirements.

#### **5.2 Sampling**

To sample for testing, shipments will be sampled according to ANSI/ASQ Z1.4, inspection level S-2, AQL 2.5%.

#### **5.3 Methods**

Tests will be conducted in accordance with specified test methods of the American National Standards Institute (ANSI), the American Society for Testing and Materials (ASTM), the Technical Association of the Pulp and Paper Industry (TAPPI), and the International Organization for Standardization (ISO). Publications describing these tests may be ordered directly from the technical associations, their websites, or other on-line standards vendors.

#### **5.4 Acceptance**

Materials will be accepted when the Library of Congress has ascertained that the products comply with all parts of the specification. A partial list of the physical and chemical requirements and test methods used to ascertain compliance is provided in a quick reference table in section 5.5.

**FAILURE TO MEET ANY PART OF THE SPECIFICATION WILL BE CAUSE FOR REJECTION**

#### **5.5 Table of Physical and Chemical Requirements and Test Methods**

Property	Requirement	Test Method
Adhesive Composition	Acrylic	FTIR
Brightness, initial	≥ 82%	TAPPI T 452
Brightness Retention, after dark aging	≤ 10 pts change	TAPPI T 452
Bond Strength, 7 day dwell	200g, ≤ 10 mm peel	ASTM D 2860 (modified)
Bond Strength, aged	200g, ≤ 10 mm peel	ASTM D 2860 (modified)
Curling/Lifting/Ooze	None	Visual, after aging
Print Fastness	No image degradation	NARA T.I.P. No. 5
Off-setting of Ink	≤ 0.04 pts density change	GPO Test Method P-11
Migration/Staining, after aging	≤ 3 pts	TAPPI T 452
Damage to Adjacent Pages	No blocking, discoloration	TAPPI T 452
Photographic Activity Test	Pass	ISO 18916

## Configuration Management

Date	Revision History
22-Oct-2002	Initial release of document on website, html format.
14-Dec-2009	Revised and reformatted for release as PDF document.