

**Library of Congress Preservation Directorate**  
**Specification Number 100-133 – 16**  
**Specifications for Paper Enclosures**  
**For the Storage of Microfiche**

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

### **1.1 Fiber**

The stock must be made from rag or other high alpha-cellulose content pulp, minimum of 87%. It must not contain any post consumer waste recycled pulp.

### **1.2 Lignin**

The stock must give a negative reading for lignin as determined by the phloroglucinol test when tested according to TAPPI T 401, Appendix F, and shall have a Kappa number of 5 or less when tested according to TAPPI T 236.

### **1.3 Impurities**

The stock must be free of metal particles, waxes, plasticizers, residual bleach, peroxide, sulfur (which will be less than 0.0008% reducible sulfur as determined by TAPPI T 406), and other components that could lead to the degradation of the enclosure itself, or the artifacts stored therein.

### **1.4 Metallic Impurities**

Iron must not exceed 150 ppm and copper shall not exceed 6 ppm when tested according to TAPPI T 266.

### **1.5 Optical Brighteners**

The stock must be free of optical brightening agents.

### **1.6 pH**

The stock must have a pH value within a range of 8.0 - 9.5 as determined by TAPPI T 509, cold extraction (modified by slurring sample pulp before measurement).

### **1.7 Alkaline Reserve**

The stock must contain an alkaline reserve with a minimum of 2% and a maximum of 5% calculated as CaCO<sub>3</sub> when tested according to TAPPI T 553 (modified by slurring sample pulp before measurement).

## **1.8 Sizing**

Only neutral or alkaline sizing shall be used. No alum rosin or rosin sizing should be used, as determined by TAPPI T 408.

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

### **2.1 Thickness**

The thickness should be  $0.0045 \pm 0.001$  inch, as determined by TAPPI T 411, unless otherwise specified on the purchase order.

### **2.2 Color**

The color of the stock should be white, off-white, or as specified on the purchase order.

### **2.3 Color Bleeding**

The color must show no bleeding when soaked in distilled water for 48 hours while held under suitable weight in contact with white bond paper. The color must not rub off.

### **2.4 Color Retention**

The color of the stock must not change more than 5 points of brightness as measured by directional reflectance at 457 nm (TAPPI T 452), when exposed 24 hours to a Xenon arc lamp in an Atlas Weatherometer under the following conditions: Irradiance Level: 1.0 watts/m<sup>2</sup> at 420 nm. Inner filter: Borosilicate glass. Outer filter: clear soda lime glass. Black panel temperature: 50°C. Wet bulb depression: 8.5°C.

### **2.5 Photographic Activity Test**

The stock, and any adhesives used, 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. 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.

### **2.6 Surfaces and Smoothness**

The surfaces of the stock must be free of fingerprints, dirt, bubbles, knots, shives and other imperfections. The stock should be smooth, e.g., calendered, hot-rolled, and/or water polished.

### **2.7 Creases and Folds**

The stock must not fray, crack or split when folded and/or creased.

### **2.8 Folding Endurance**

The stock must meet the minimum requirement of 75 double folds for fold endurance in the machine direction. Tests will be conducted according to TAPPI T 511, after conditioning according to TAPPI T 402, using a 1 kg load.

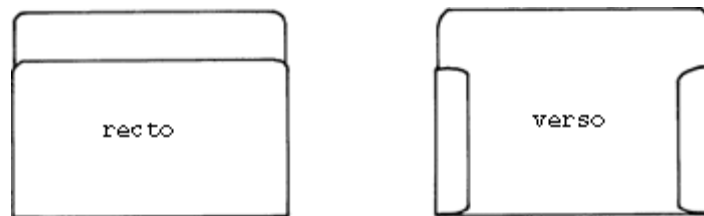
## 2.9 Adhesive

If an adhesive is required, it must not soften or run. The adhesive must not cause the stock to become transparent or alter the color of the stock. The adhesive must not yellow, discolor, or fail (causing delamination) over time. The adhesive should not contain sulfur, iron, copper or other ingredients that may be detrimental to photographic materials, and is required to pass the P.A.T. The adhesive should not contain or generate oxidants. Pressure-sensitive or rubber-based adhesives are not acceptable. When used, the adhesive must not extend beyond the joined area.

## 3. Product Requirements

### 3.1 Construction

The enclosures should be constructed from a single piece of paper with side seams of folded flaps of paper adhered to the outside. Center seams are not acceptable. The full drop between the front and the back sheet of each enclosure should be 3/4 inch. The seams must be sealed along the complete length of the seam by an adhesive that is at least 1/8 inch away from the fold edge. The gap between the fold of the seam flaps and the back of the sheet of the enclosure must not be more than 1/16 inch on the inside. Corners of seams and open end should be rounded. There must be no thumb cuts. (Illustration below)



Recto and verso of enclosure

### 3.2 Workmanship

The enclosures must be cut straight with squared sides and smooth edges. The sizes must be accurate. The seams must be smooth and flat with no puckering. The adhesive must not extend beyond the seam on either the inside or outside of the enclosure. The enclosures must lie flat without curling or gaping.

### 3.3 Dimensions

Dimensions should follow standard microfiche sizes allowing for insertion without binding and fit into standard sized containers for storage, unless otherwise specified on the purchase order.

### 3.4 Marking

Each enclosure must be marked with the name of the manufacturer, year of manufacture, and the actual pH.

#### 3.4.1 Placement and Size

The identifying information must appear on the outside of the enclosure, on a seam flap, using a 10 point type size.

### 3.4.2 Marking Method

The information must be stamped in ink. The ink must pass the Photographic Activity Test as described in ISO 18916. The ink must not smear, fade, or rub off after drying. The ink must not run, bleed through or transfer to other materials if it becomes wet. There must be no ink on the inside of the enclosure.

## 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 quick reference table of the physical and chemical requirements and test methods used to ascertain compliance is provided 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
Lignin	Negative / Kappa 5	TAPPI T 401, Appendix F or TAPPI T 236
Reducible Sulfur	< 0.0008%	TAPPI T 406
Iron	≤ 150 ppm	TAPPI T 266
Copper	≤ 6 ppm	TAPPI T 266
pH	8.0 – 9.5	TAPPI T 509, cold extraction, slurried pulp
Alkaline Reserve	2 – 5%	TAPPI T 553, slurried pulp
Alum Rosin Sizing	Negative	TAPPI T 408
P.A.T.	Pass	ISO 18916
Thickness	0.0045 ± 0.001"	TAPPI T 411
Folding Endurance	75 MD	TAPPI T 511
Color Bleeding	No bleed in 48 hours	See section 2.3
Color Retention	≤ 5 pts	TAPPI T 452

## Configuration Management

Date	Revision History
19-Jun-2002	Initial release of document on website, html format.
14-Dec-2009	Revised and reformatted for release as PDF document.
30-Sept-2016	Revised Sections 1.1, 1.2, 2.5, 2.6, 2.9, 5.5. Editorial update to footer.