

Specifications for Low Lignin Flat Photograph Storage Box

October 2015

I. Scope

This specification covers the requirements for a low lignin storage box for documents or, with the addition of passing the PAT, photos, which is one piece, shipped flat, self locking, and made from low lignin corrugated board as shown in the figures:

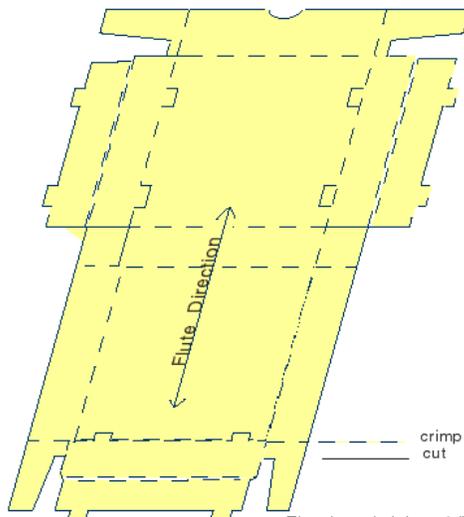


Figure 1-1

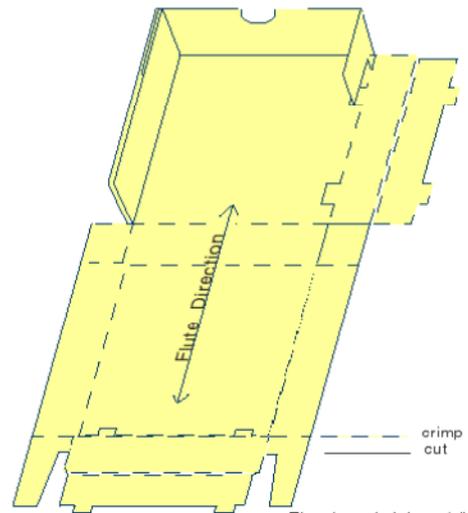


Figure 1-2

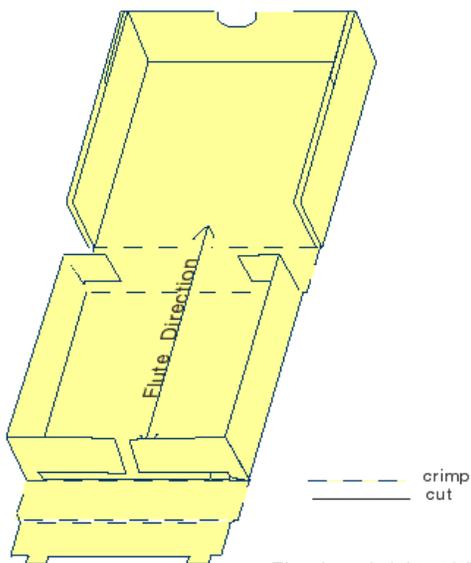


Figure 1-3

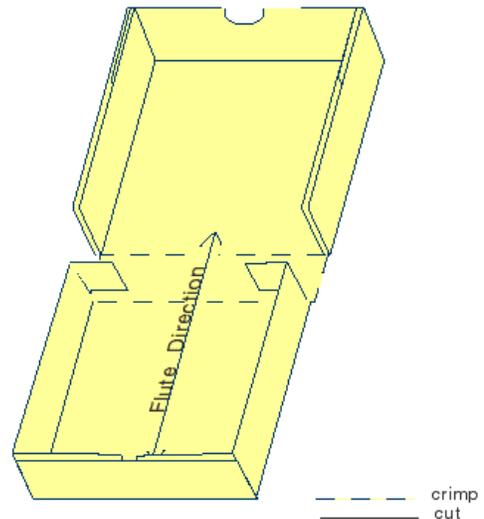


Figure 1-4



II. Requirements

Construction

The shipped flat clam shell box shall consist of one B- or E-flute corrugated single wall (double-faced) board, comprised of two facings (liners) adhered to one fluted medium with fluting running perpendicular with the spine of the box as indicated in Figure 1-1. Assembly shall be self locking. Assembly shall not include adhesive or metal fasteners. Construction shall be such that the self locking walls are double thickness and alternate. That is, when the box is closed both side walls and front wall shall be double thickness. The self locking assembly shall be such that the tabs fit snugly into "U" shaped incisions cut in the top and bottom of the box as in Figure 1-2. All fold lines are to be scored or crimped, with no perforations. When the paperboard is scored twice to assemble a double wall, the space between parallel scores shall not exceed two board thicknesses. A shallow thumb cut shall be centered on the outside foreedge. The thumb cut shall not exceed ¼ inch in height as shown in each figure. The distance between the lower edge of the extension flaps at the spine and the tray of the box shall not be greater than 1/8 inch. The spine of the box shall be cut so that it is flush with the side walls when the assembled box is closed. Drawings are not to scale.

Dimensions

The dimensions of the box shall be specified in the contract as inside measurements in the following order: length, width, and depth with a tolerance of plus or minus 1/16 inch; and the specified maximum outside dimensions. All box sizes shall be constructed from the same corrugated board type.

Paperboard

Composition

All layers of the corrugated paperboard laminate shall be made from cotton or linen pulp, fully bleached chemical wood pulp, or a mixture that meets the following specifications:

- Free of groundwood:
 - test negative in ASTM D1030 phloroglucinol test with X5 Spot Stains (ASTM has withdrawn this standard in 2011. NARA is following 2007 version)
 - or Kappa # ≤ 5 in TAPPI T-236 test.
- Free of alum-rosin sizing (ASTM D 549 or TAPPI T-408)
- Contain $<0.0008\%$ reducible sulfur (TAPPI T-406).



- Free of optical whitening agent and fire retardant.
- Free of particles or other impurities such as:
 - metals,
 - waxes,
 - plasticizers (i.e. wet strength additives),
 - plastics,
 - residual bleach,
 - peroxide

The corrugated paperboard and adhesive used, shall pass the Photographic Activity Test (PAT) described in ISO 18916 (or the latest version), with a modification that the sample be tested directly against the detectors (without interleaf) for both fade and stain.

Sizing

Alkaline sizing shall be used (both surface and/or internal).

Alkaline Reserve

The corrugated paperboard shall contain an alkaline reserve of calcium carbonate, magnesium carbonate, or a combination of both, within a range of 3–6% (calculated as CaCO_3) when tested according to TAPPI T-553 or modified by slurring the sample pulp prior to measurement, and shall be evenly distributed throughout all plies and layers. NARA will provide slurry method procedure upon request

Hydrogen Ion Concentration (pH)

The pH value of the corrugated paperboard shall be between 8.0 and 9.5 when tested according to cold extraction method TAPPI T-509 or modified by slurring the sample pulp prior to measurement.

Lignin

To demonstrate the adequacy of bleaching or lignin removal, all layers of the corrugated paperboard shall have a negative reading in the phloroglucinol test when tested according to ASTM D1030, or shall have a KAPPA number ≤ 5 when tested according to TAPPI T-236.

Abrasion Resistance

The outer surfaces of the paperboard must show <0.3% total weight-loss (mounting card and sample) when tested according to TAPPI T-476 with a #CS10 wheel and 100 wear cycles.

Label Adhesion

The surface of the paperboard shall hold a piece of weighted pressure sensitive tape securely in place for at least 10 minutes in 6 out of 9 trials, when tested according to ASTM D2860, Procedure B modified as follows:

- use a 3/4", 3M Scotch[®] Magic[™] 810 pressure sensitive tape to conduct the test
- adhere the tape to the paperboard surface with 2 rolls of a 10kg steel roller
- suspend a 2oz weight from the tape

Surface Smoothness

Smoothness shall be 250-400 Sheffield units as determined by TAPPI T-538.

Thickness

When tested according to TAPPI T-411, the corrugated paperboard thickness shall be:

B-Flute: 0.115 - 0.125 inches

E-Flute: 0.062 - 0.073 inches.

Bending Resistance

The corrugated paperboard shall be tested for bending resistance in accordance with TAPPI T-836, and shall satisfy the following requirement:

E-Flute: $\geq 1.6 \text{ N}\cdot\text{m}$ (MD) and $\geq 0.9 \text{ N}\cdot\text{m}$ (CD).

B-Flute: $\geq 6.2 \text{ N}\cdot\text{m}$ (MD) and $\geq 2.9 \text{ N}\cdot\text{m}$ (CD).

Or

The corrugated paperboard shall be tested for bending resistance by adapting TAPPI T-556 to confirm that minimum acceptable stiffness, listed below, is met, except that for each specimen tested the corrugations shall run in the long direction of the specimen. Test conditions shall include 7.5 degrees deflection.

E-Flute: $\geq 4100 \text{ mN}$

B-Flute: $\geq 7000 \text{ mN}$

Delamination

The corrugated paperboard shall have sufficient folding strength, especially along the score lines. It shall show no continuous visual break of the plies when the board is flexed 180°, both parallel and perpendicular to the flutes, or along the score lines, when testing according to ASTM D 4727, section 9.3 (for singlewall corrugated fiberboard).

Color & Dye Bleed/Transfer

The color shall be grey or tan. Dyes used to color the corrugated board shall show no bleeding or transferring when soaked in deionized water for 48 hrs. under ambient temperature while held in direct contact with white bond paper.

Adhesive Used in Laminating the Corrugated Board

A stable adhesive shall be used when adhering the two paperboard facings to each side of the fluted inner paperboard sheet. More specifically:

- Water resistant adhesive shall be used.
- When aging in a humidity chamber of 50°C and 87% RH for 4 hrs., the adhesive shall hold the components of the corrugated paperboard firmly together, not soften or run.
- The addition of adhesive shall not negatively impact the specification of the paperboard, such as reduce the pH or alkaline reserve, increase the sulfur content, decrease the stiffness, etc.
- If it is necessary to buffer the adhesive, the same buffer shall be used as those in the paperboard (calcium or magnesium carbonate, or a combination of both).
- The adhesive shall be invisible through and not alter the color of the paperboard.
- The adhesive shall not contain sulfur, iron, copper or other ingredients that may be detrimental to archival records.
- The adhesive shall not contain or generate oxidants.
- When used, the adhesive must not extend beyond the joined area.

Workmanship

The corrugated paperboard shall be assembled in accordance with good commercial practice, and shall be free of visible imperfections that may affect its utility or aesthetic appearance:

- Each sheet should be constructed with the flutes running parallel to the long dimension of the sheet.
- Fluting shall be perpendicular to the spine as in Figure 1.

- The smoothest side (felt side) of the liners should be the outer surfaces of the board.
- The wire side of the liners should be next to the corrugated medium, to promote maximum adhesion.
- The flutes must be adhered to each liner all along their tips.
- Each box shall be made to the dimensions specified. When assembled, all panels shall fit closely without gaps or warping.
- The corrugated paperboard should show no continuous visual surface break (checking) of the outer component ply, nor any facing completely split through at the score line (fracture).
- The surfaces shall be smooth and free of knots, shives, tears, punctures, wrinkles, blisters, washboarding, splices, abrasive particles and surface dirt of any kind, such as smudges, fingerprints, or scuff, marks, stains. The surfaces shall not be marred (dents, bumps, etc.) or show any other types of physical defects and imperfections or contaminations which might affect the utility or appearance of the product. The completed box shall not be marred in any way.
- The pin punch or embossing method used for identification shall not affect the smoothness of the board by passing through the board from the opposite side.
- The outer surface of the liner board shall be highly finished (calendered or 'water polished') to resist soiling.
- The paperboard shall be scored evenly. Scores shall be continuous and deep enough to permit precise folding during assembly. Perforations along fold lines are not acceptable.
- When the paperboard is scored twice to assemble a double wall, the space between parallel scores shall not exceed two board thicknesses.
- All folded edges shall be free of fraying, cracks, and breaks.
- The lid shall be able to withstand repeated opening; without cracking, splitting, fraying, or otherwise losing strength along the hinge.
- All edges shall be cut straight and shall be smooth and even, free of fraying, cracks, and breaks.
- The corners of the box shall be square.
- When assembled the top and bottom shall rest flat on a flat plane.
- When locked into place, the self locking sides shall remain in position.
- When closed the top and bottom shall fit snugly and remain closed.
- Shallow thumb cut on outer foredge shall be smooth, centered, and symmetrical.



Identification Markings (product level)

The following information shall be legibly embossed or pricked on the outside bottom of each box: name of manufacturer, pH range, year of manufacture, the words “low lignin”, and the words "passed P.A.T.". The pin punch or embossing method must not affect the smoothness of the board by penetrating the entire thickness of the board. The identification information shall not include the use of printing or media of any kind.

III. Preparation for Delivery

Packaging

The low lignin photograph storage boxes shall be shipped flat following standard commercial shipping practices that meet the following requirements: full enclosure (i.e. a box) sealed with tape to provide rigid support and protection from the elements that is non-damaging to the contents (does not bend, crimp, or fold edges or corners) so that the product arrives dry and undamaged.

The number of low lignin photograph storage boxes to be packed in each container shall be specified in the purchase order.

Marking (package level)

The outside of each packing container shall be legibly marked with:

- the purchase order and/or contract number, and
- the type of low lignin storage boxes (for photograph storage), the number of storage box packed in the container, and
- the name of supplier/manufacturer and year of manufacture.

IV. Quality Assurance Provisions

Tests

Test procedures and controls specified in this document shall be used to determine the quality of the product. Other procedures and controls must be approved by the National Archives before test results will be accepted.

Unless otherwise indicated, the tests shall be performed at, and the samples be conditioned to, a standard conditions of 73 ± 3.5 °F and $50\pm 2\%$ RH (TAPPI T-402).

Sampling for Tests

Sampling Method

The sampling of corrugated boards in each shipment for examination shall be carried out according to methods specified in ANSI/ASQ Z1.4, inspection level S-2.

Acceptable quality levels

- For construction and workmanship at product level, the acceptable quality level shall be $\leq 4.0\%$ defective from each lot of material delivered.
- For QC testing at product level, the acceptable quality level shall be $\leq 2.5\%$ defective from each lot of material delivered.
- For compliance with packaging and marking requirements at package level, the acceptable quality level shall be $\leq 4.0\%$ defective from each lot of material delivered.

Test Methods

The requirements for quality and characteristics shall be tested in accordance with specified test methods of the American Society for Testing and Materials (*ASTM*), the Technical association of the Pulp and Paper Industry (*TAPPI*), the International Organization for Standardization (*ISO*), and the American National Standards Institute (*ANSI*). Publications describing these tests may be ordered directly from the technical associations.

Responsibility for Tests

The Contractor is responsible for quality control to ensure the specifications of this contract are met. The Contractor shall provide test results to the Contract Specialist (CS) and/or Contracting Officer (CO), **for each production lot** used to provide supplies under this contract. The test results shall display, at a minimum, the characteristics listed below and shall be provided at least 30 days prior to shipping any items from the production lot under this contract. The Contractor may use his or her own facilities or any commercial laboratory certified to run quality assurance test methods listed below. The National Archives and Records Administration (NARA) reserves the right to perform quality assurance at any time during the contract where such tests are deemed necessary to assure that supplies and services conform to the specifications. Therefore, the test results [pH, alkaline reserve, lignin, sizing, sulfur, abrasion and bending resistances, label adhesion capability, thickness, score and fold strength, bleeding, PAT and adhesive], two samples of each item purchased, and a sample of at least 12" x 12" of the material used to make the item (for example boxboard), shall

be sent together to the CS within 14 days after award of the contract. Additionally, the Contractor shall provide a sample of at least 12" x 12" of the material from a new production lot at any time, upon request of the Government.

Table of QC Test Items and Specifications

Test Items	Spec. Targets	Notes (test methods, test conditions, etc.)
Alum-rosin sizing	Negative	TAPPI T 408 or ASTM D 549
Lignin	Negative or Kappa number ≤ 5	Phloroglucinol test, ASTM D1030 (X5 Spot Stains) TAPPI T-236
Reducible Sulfur	<0.0008%	TAPPI T-406
Alkaline reserve	3 – 6% (calculated as CaCO ₃)	TAPPI T-553 (or slurry method)
pH	8.0 – 9.5	TAPPI T-509 (or slurry method)
Abrasion Resistance	<0.3% (total weight-loss)	TAPPI T-476 (#CS10 wheel, 100 wear cycles, on outer surfaces)
Label Adhesion	Suspend a 2oz weight from the tape for ≥ 10 min. (≥ 6 passes out of 9 trials)	ASTM D2860, Method B, modified by: <ul style="list-style-type: none"> Use a 3/4" wide, 3M Scotch® Magic™ 810 pressure sensitive tape Adhere the tape to the sample surface with 2 rolls of a 10kg steel roller
Surface Smoothness	250-400 Sheffield units	TAPPI T 538
Thickness	B-Flute: 0.115" - 0.125" E-Flute: 0.062" - 0.073"	TAPPI T-411
Bending Resistance	E-Flute: ≥ 1.6 N·m (MD) & ≥ 0.9 N·m (CD). B-Flute: ≥ 6.2 N·m (MD) & ≥ 2.9 N·m (CD).	TAPPI T-836
Bending Resistance (continued)	E-Flute: ≥ 4100 mN B-Flute: ≥ 7000 mN	TAPPI T-556
Delamination	No fraying, cracking, splitting, or continuous surface break of plies (see details in page 4)	ASTM D 4727, section 9.3. Flex the sample 180° both parallel and perpendicular to the flutes, or along the score lines.
Color & Dye Bleed / Transfer	No visible transferring	See page 4 for detailed test method and conditions
Photographic Activity	Pass	ISO 18916 or the latest version



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Revision note:

This is a revision from May 2014 version, with title change.