

**INTERNATIONAL STANDARD GUIDE****Expanded Guide to Permanence in Paper, Mat and Mounting Boards**EXPMMB-2000
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This is a guide to the composition and characteristics of paper, mat and mounting boards used for preservation applications. As would be used with, artworks, documents and keepsake when they are framed, stored, and display. This document includes a standard, information, and terminology, so that it may be more easily understood by those not familiar with paper and/or mat and mounting board manufacture.

Introduction

Not all paper, mat or mounting boards are alike, their composition and characteristics may greatly vary. Content or characteristics maybe very important to avoid material conflicts. To assure that the material meets your requirements this standard "Permanence in Paper, Mat and Mounting Boards" covers those content and characteristics questions.

The (P.O.) specifications of the US Library of Congress for mat and mounting board. (Library of Congress Specification Number 400-401-Feb. 18, 1997, Specifications for Mat/Mounting Board for Non-Photographic Materials; and Specification Number 400-402-Feb. 18, 1997, same for Photographic Materials.) have a good technical foundation. However, they are incomplete as a workable guide due to the great variety of materials selection. The standard FRM-2000 allows for a broad range of papers, mat and mounting boards. The user is free to determine composition, color, surface textures and characteristics base upon their individual requirements, using the standard to determine their preservation requirements.

Paper mat and mount board are used in a wide range of applications from temporary use to permanent displays. These materials are also used with a variety of artwork, art on paper, textiles, photographs, memorabilia and keepsakes all that may require preservation.

This Guide to "Permanence in Paper Mat and Mounting Boards" sets the standard for these materials used for preservation.

This document describes the properties in terms that will facilitate communication among buyer, seller and consumer. This is especially important for those who may not be familiar with manufacturing procedures, and who need enough information to make an intelligent decision concerning their needs in relation to what is available in the marketplace.

FACTS Standard Guide

Permanence in Paper Mat and Mounting Boards

1.00 Scope

1.01 A standard guide for determining permanence in paper products when used with artworks, keepsakes and memorabilia.

1.02 A method of identifying and describing the composition and characteristics of the many types of paper mat and mount board products.

1.03 This guide is directed to the composition, combinations and characteristics of papers and paperboards so to aid in the selection of the best material for each application

2.00 Terminology

- 2.01 FACTS Standard Terminology,(latest revision) and/or Random House Webster's Dictionary, 1999
- 2.02 Terminology Format-The following words are defined to clarify the importance of the articles, sections or formats, and to identify those that are mandatory.
 - 2.02.1 "Shall"-indicates that a provision is mandatory.
 - 2.02.2 "Should"- indicates that a provision is recommended as good practice.
 - 2.02.3 "May"- indicates that a provision is optional.
- 2.03 "Consensus"-majority of opinion.
- 2.04 "Unbuffered"¾shall mean no alkaline filler
- 2.05 "Buffered"¾shall mean the addition of alkaline filler

3.00 Pulp

- 3.01 Fiber-The product shall be made from cotton, new rag or other high alpha-cellulose content virgin pulp. It shall not contain post consumer waste (TAPPI T 401).
- 3.02 Lignin-The stock shall have a Kappa number of 5, or less (TAPPI T 236).
- 3.03 Impurities-The product shall be free of metal particles, waxes, plasticizers, residual bleach, peroxide, or other components that could lead to the degradation of paper and artifacts in contact with, or in the immediate vicinity of, the paper or board.
- 3.04 The product shall contain less than 0.0008 % of reducible sulfur (TAPPI T 406).
- 3.05 Free Metallic Impurities-Iron shall not exceed 150 ppm and copper should not exceed 6 ppm (TAPPI T 266).

4.00 pH (TAPPI T 509)

- 4.01 No alkaline filler-unbuffered-usually in the range 7.0 to 7.5.
- 4.02 Alkaline filler, calcium carbonate, buffered usually in the range 8.5.

5.00 Filler-Alkaline Reserve (ASTM 4988)

- 5.01 Filler may or may not serve as an alkaline reserve; an alkaline reserve is also a filler.
- 5.02 The minimum alkaline reserve should be about two-percent and the maximum about five-percent by weight.
- 5.03 As carbonate filler may be a source of impurities, excess is not desirable, but excess has not been defined.
- 5.04 Zeolites and activated charcoal may be used as fillers.

6.00 Sizing

- 6.01 Only neutral or alkaline sizing shall be used.
- 6.02 Rosin-alum sizing-shall not be used (TAPPI T 408).

7.00 Photographic Activity Test (P.A.T.) (ANSI IT9 16-1994, or latest revision).

- 7.01 This test shall be required when the product is to be used for mounting photographs.
- 7.02 In the US, the Image Permanence Institute in Rochester, NY or any other pre-approved laboratory should perform tests.

8.00 Thickness (TAPPI T 411)

- 8.01 Reference to thickness as number of plies shall only be a descriptive term.
- 8.02 Thickness shall be expressed in metric units-millimeters-mm.
- 8.03 Thickness may also be expressed in points (0.001 inch) or inches-in.
- 8.04 For papers, a basis weight may be used.

9.00 Dimensions (length, width)

9.01 Dimensions may be expressed in metric units-millimeters-mm, or centimeters-cm. Dimensions may also be expressed in inches-in.

9.02 Tolerance-zero minus tolerance, 3 mm plus tolerance-(0.125 in.-1/8"-one eighth inch).

9.03 Size, squaring, and tolerance for length and width (ASTM D5625).

10.00 Added Color

10.01 The color of the product is a matter of agreement between buyer and seller.

10.02 Dyes and/or pigments shall be non-bleeding, lightfast and resistant to abrasion.

10.03 Bleeding-Any dye or pigment in the matboard shall show no bleeding when soaked in distilled water for 48 hours at room temperature while held down with a weight against a sheet of white bond paper.

10.04 Lightfastness-The color of the stock should not change more than 5 points of brightness (TAPPI T 452) after exposure in Sunlighter II for 96 hours, or when exposed in a standard fadometer for 36 hours (ASTM D3424).

10.05 Abrasion-With about one pound of pressure, rub the surface of the board about ten times, back and forth, with a white cotton towel. Nothing should transfer or rub off. Obviously, this is a very empirical and subjective test.

11.00 Surface Characteristics

11.01 The type of surface, and texture, shall be specified.

11.02 If the surface is designed to accept decoration and embellishments, it should conform to FACTS Mat Decoration Test No. 6-97. See Section 16.04.

11.03 The product should be free of fingerprints, dirt, bubbles, knots, shives and other abrasive particles.

12.00 Adhesive

12.01 Any adhesive used shall not soften or run under normal environmental conditions and use.

12.02 Any adhesive used shall not cause the product to become transparent, or alter the color of the board.

12.03 Any adhesive used shall not discolor, or fail, causing delamination.

13.00 Identification Marking

13.01 Any markings on the product shall be permanent with no bleed or transfer.

14.00 Moisture Content

14.01 In order to prevent warping, waving or curling, the equilibrium moisture content of the product should be in the range between 4 and 7% at time of manufacture.

15.00 Packaging

15.01 The product should be packaged so that it will maintain the moisture content that it had at the time of manufacture.

15.02 The product should be packaged securely for transit, and the packages have proper identification marks.

16.00 Workmanship

16.01 Edges should be cut square and clean.

16.02 The product should be free of bent corners and delamination of plies.

17.00 Inspection

17.01 It is the responsibility of the purchaser to examine the shipment of the product, and determine whether it complies with the above-suggested requirements.

18.00 Referenced Documents-Standards-Test Methods-Definitions

18.01 ASTM Standards

D-3424-Test Methods for Evaluating the Lightfastness and Weatherability of Printed Matter

D-4988-Test Method for Determination of Calcium Carbonate Content of Paper

D-5625-Standard Test Method for Measuring Length, Width, and Squareness of Sheeted Paper and Paper Products

D-6043-Standard Guide for Selection of Permanent and Durable Artist's Papers

18.02 TAPPI Standards

T-236-Kappa Number of Pulp

T-266-Determination of Sodium, Calcium, Copper, Iron and Manganese in Pulp by Atomic Absorption Spectroscopy

T-401-Fiber Analysis of Paper and Paperboard

T-406-Reducible Sulfur in Paper and Paperboard

T-408-Rosin in Paper and Paperboard

T-411-Thickness (caliper) of Paper, Paperboard, and Combined Board

T-452-Brightness of Pulp, Paper, and Paperboard (directional reflectance at 457 nm)

T-509-Hydrogen Ion Concentration (pH) of Paper Extracts (cold extraction method)

18.03 ANSI Standards

IT9.16-1994-Photographic Activity Test (P.A.T.)

18.04-FACTS Suggested Test Procedures

18.04.01-Wet Bleed-A drop of colored watercolor is placed on the flat surface of the product and allowed to dry. When dry, the watercolor should show only a spot of color. Clean sharp edges no bleeding or feathering should have occurred.

Definitions and Terminology from FACTS Standard Terminology, (latest revision)

Activated Carbon (Activated Charcoal)-Carbon that has been treated with high-temperature steam to produce a porous structure; it is an excellent adsorbent. (Handbook of Pulp & Paper Terminology)

Alkaline Reserve-A paper additive such as calcium carbonate that serves to counteract the deleterious effects of the paper's own natural degradation, acidic inks, and any other acidic components in the environment that may contact the finished sheet of paper. Also commonly called "buffer," a less appropriate term.

ANSI-An acronym for the American National Standards Institute.

ASTM-An acronym for the American Society for Testing and Materials.

Bleed-Bleeding-Giving up color in water or other solvent. (Handbook of Pulp & Paper Terminology)

Buffering Agent-Chemical added to regulate the pH. The most common buffering agent is calcium carbonate (CaCO₃).

Colorfast-A color that is resistant to the action of external agents, such as light, acids, and alkalis. Paper color that is resistant to change from aging or from exposure to light, heat, or other adverse conditions. Nonfading over long exposure to daylight. Lightfast and Sunfast are variations of the term.

Conservation Board-One that is considered to have good conservation or archival qualities. Usually non-cotton. See Museum Board and Conservation Board.

Cotton Linters-The short fibers that adhere to the cottonseed after ginning. Linters are cut from the cottonseed by a second "saw gin" operation. If all linters are removed in the same operation, the product is called "mill run linters." The technology for processing linters into usable pulp was developed in the 1950's. It involves mechanically removing the fuzz left on the seed after the long fibers for textile production have been removed. This is a necessary step to optimize the recovery of cottonseed oil, which is a major by-product. No cotton is

grown specifically for papermaking. Cotton fiber and cotton linters are almost 100% pure cellulose yielding a minimum of waste.

Dye-Colored soluble substance that imparts a more or less permanent color to another material by staining or by chemical reaction with substrate.

Fiber-A slender, elongated threadlike body or filament, of any of various elongated cells or threadlike structures many times longer than its diameter. A natural or synthetic filament, as of cotton or nylon. Paper pulps are composed of fibers, usually of vegetable origin, but sometimes animal, mineral, or synthetic, for special types of papers.

Filler-In paper, an inert finely divided material added to a paper making furnish to modify the sheet properties by filling in the void spaces between fibers, most commonly a mineral filler.

High-Alpha Pulp (Alpha Pulp)-Bleached wood pulp that has an alpha cellulose content above 88%.

Kappa Number-A test for the degree of lignification of pulps. Specifically, the number of milliliters of tenth-normal potassium permanganate solution consumed per gram of moisture-free pulp under standardized conditions. (The Dictionary of Paper)

Lightfast-See Colorfast

LC-An acronym for the US Library of Congress.

Museum Board-This generic term refers to quality matboard, and the properties required for this product are generally the same as any "permanent" paper. Usually all cotton.

Museum Board and Conservation Board-These terms have traditionally been used in both the US and UK to refer to composition, and not necessarily to performance. Museum board has been made from cotton, and Conservation board from high quality wood pulp. If properly made, the two boards may be used interchangeably. In Europe museum board may be defined as made from fully bleached cellulose, sized, and very hard. Their Conservation board is made from cotton and is much softer, so it is important to note how the supplier defines his board. The two types of board may be combined into a multi-ply board.

New Rag-Cotton fabrics and mill cuttings from the textile industry that have never been used.

Pigment-A finely powdered coloring material used in paints and inks. Pigments are used in paper to alter physical properties as well as to add color and improve brightness and opacity. A pigment is insoluble in the liquid vehicle with which it is mixed, imparting its color effect by being spread over a surface.

Postconsumer Waste Paper-Paper and/or paperboard products that have gone through their intended use and have been discarded. Includes used corrugated boxes, old newspapers, old magazines, mixed waste paper and tabulating cards. Paper waste created in converting operations is generally but not always excluded from postconsumer waste paper. (The Dictionary of Paper)

"Properly made"-A pulp that has not been degraded during manufacture, has been minimally exposed to degrading chemicals, no aluminum salts have been used during manufacture, acid groups in the cellulose have been neutralized with calcium ions, rosin sizing has not been used, and the pH is at least 7.0. If alkaline filler is used, degradation should be minimal.

Rag Pulp-Papermaking fibers made from new or old cotton textile cuttings. The term may also apply to cotton, flax, hemp, or ramie in the form of textile waste, textile returns or cotton linters, i.e., the short fibers that adhere to the cottonseed after the ginning process.

Sizing-Treatment of paper to resist liquid penetration, either by means of wet-end additives (e.g., rosin and alum) or surface application (e.g., starch). Any material used for sizing (i.e., reducing liquid penetration), an extremely dilute dispersion of a gluey or resinous substance applied to a surface in order to reduce its absorbency or porosity and make it more suitable for the application of paint or other coating material.

TAPPI-An acronym for the Technical Association of the Pulp and Paper Industry.

Virgin Fiber (Primary Fiber)-Pulp used for papermaking that has not previously been used in any paper or board product. (Handbook of Pulp & Paper Terminology)

Virgin Pulp (Virgin Stock)-Pulp that has not previously been used in the papermaking process. It is distinguished from Secondary Stock. (The Dictionary of Paper)

Zeolite-An inert crystalline aluminosilicate that has an affinity for specific molecules. Naturally occurring but

often man-made to specific performance characteristics. Also called molecular sieves or traps.

Appendix

1.00 Importance of Fiber-Quality of fiber covers the complete spectrum from excellent to trash. In the excellent category is fiber derived from cotton, such as new rag. In the trash category would be low-grade recovered fiber, any fiber containing lignin, over-bleached wood pulp, etc.

Chemically, cotton consists mostly of long polymeric chains in which the building unit is the disaccharide cellobiose. Bleached wood pulp, depending on the origin and methods of purification, will contain, in addition to polymerized cellobiose; many polymers derived from sugar units other than cellobiose. In addition, it will contain chemical functional groups such as aldehyde, carboxyl and ketone. Cotton also contains these functional groups but usually to a lesser extent. For mat and mounting board, there is no real difference in permanence between cotton and wood pulp if both have been properly prepared.

Although stability can be built in with calcium carbonate filler, the latter cannot compensate for low initial strength, or prevent some discoloration.

2.00 The Limits of Alkaline Filler-The limits of two-percent minimum and five-percent maximum are subjective, but there is a basis for them. It is a matter of degree rather than kind. The little laboratory data that have been developed in this area indicate that a two-percent minimum should be enough to neutralize acidic degradation products from the deterioration of paper, and the atmospheric contaminants to which the paper might be exposed, for several hundred years.

It has been reported that calcium carbonate filler does not provide 100% protection against atmospheric contaminants. This probably means that a higher percentage of calcium carbonate filler would be more effective, and that the tolerance of the two-percent minimum should be plus-no minus tolerance.

2.01 The five-percent maximum was arrived at as follows:

- 1) At higher percentages of filler, the physical properties of paper tend to deteriorate. This is a matter of degree rather than kind. At five-percent filler, the change in physical properties would hardly be noticeable.
- 2) There is greater chance for contamination from larger amounts of filler.
- 3) There is more chance of filler "rubbing off" at higher percentages. Therefore, the limits of two-percent minimum and five-percent maximum are subjective. Suppliers should be held to the two-percent minimum, but a maximum of five-percent could be flexible.

2.02 Zeolites and activated charcoal may be used as fillers, and in this capacity they act as scavengers of pollutant gases. Their performance is not in question, but their application has not been extensively studied.

3.00 Importance of Sizing-A paper made without sizing is called waterleaf. It readily absorbs water, inks usually "feather," its surface is easily damaged, and its strength is minimal compared with what it can be when properly sized.

Until the development of alkaline sizing almost 50 years ago, paper usually was sized with rosin, which was precipitated onto the fiber with papermaker's alum (aluminum sulfate). The paper would be more or less acid, depending on the amount of alum used, so rosin is not suitable for sizing matboard. Neutral paper can be made using rosin-alum sizing, and calcium carbonate filler can be used, but this approach is not compatible with modern papermaking.

Glue and starch formerly were used as sizing agents, especially surface size, but now they must compete with a variety of polymeric materials. Depending on the requirements, sizing techniques can produce a board that is lightly sized, or a board that is very hard, water resistant, and with an abrasion-resistant surface.

4.00 Photographic Activity Test (P.A.T.)-This test is designed to determine whether a material that is meant to be used in close proximity to photographs is likely to damage the image. In this case, matboard would be incubated at an elevated temperature and relative humidity with photographic materials, and changes in the photographic reference materials would be measured with a densitometer.

5.00 Dyes and Pigments-dyes and/or pigments used in colored papers can introduce chemical impurities.

6.00 Importance of Moisture Content-The moisture content of matboard at the time of manufacture usually is in the range of four to seven-percent. In order to prevent change in moisture content during shipping, handling, and storage, it is wrapped in moisture-proof plastic film. Before use, matboard should be exposed to the atmosphere in which it is to be used. All of each sheet should be exposed in order to prevent distortion.

This FACTS Standard Guide has been developed in cooperation with concerned manufacturers. The purpose is

to present in uniform manner accurate information concerning composition and characteristics so the consumer can select the most appropriate product to meet his needs.

1996-97 Mat and Mounting Board Committee Members

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