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An American National Standard

Standard Specification for File Folders for Storage of Permanent Records[1]

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1. Scope

1.1 This specification covers file folders used in the storage of records and documents that are expected to have maximum, or substantial, life expectancy.

1.2 It has been shown (**1, 2, 3, 4, 5**)[2] that the life expectancy of paper is at least an approximate function of the pH of an aqueous extract of the paper. Three pH levels, reflecting three levels of life expectancy, are specified.

1.3 The following would be expected to contribute significantly to the life and usefulness of folders: the use of folders with controlled acidity, or of folders manufactured under neutral or alkaline conditions, especially with an alkaline filler, such as calcium carbonate, that absorbs acidic gases from the atmosphere and can neutralize acidic materials formed during aging.

1.4 This specification is based on fiber sources used in the production of paper that contains no more than 1 % lignin, for papers used in archives, libraries, and other permanent records. However, under proper conditions, (see X1.5), fiber sources containing more than 1 % lignin may be employed for many other end uses in paper for records that are required to have a substantial life expectancy.

1.5 As indicated in Appendix X1.4 and X1.5, this specification may be used as a guide.

2. Referenced Documents

2.1 *ASTM Standards:* [3]

D 585 Practice for Sampling and Accepting a Single Lot of Paper, Paperboard, Fiberboard, and Related Product

D 646 Test Method for Grammage of Paper and Paperboard (Mass Per Unit Area)

D 1030 Test Method for Fiber Analysis of Paper and Paperboard

D 1968 Terminology Relating to Paper and Paper Products

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

D 4714 Test Method for Determination of Effect of Moist Heat (50 % Relative Humidity and 90°C) on Properties of Paper and Board

D 4988 Test Method for Determination of Alkalinity of Paper as Calcium Carbonate (Alkaline Reserve of Paper)

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

D 5634 Guide for Selection of Permanent and Durable Offset and Book Papers

2.2 *TAPPI Standards:*

T 236 Kappa Number of Pulp[4]

T 400 Sampling and Accepting a Single Lot of Paper, Paperboard, Fiberboard, or Related Product[4]

T 401 Fiber Analysis of Paper and Paperboard[4]

T 410 Grammage of Paper and Paperboard (Weight Per Unit Area)[4]

T 411 Thickness (Caliper) of Paper and Paperboard[4]

T 412 Moisture in Paper[4]

T 414 Internal Tearing Resistance of Paper[4]

T 452 Brightness of Pulp, Paper and Paperboard (Directional Reflectance at 457 nm)[4]

T 489 Stiffness of Paper and Paperboard (Taber-type Stiffness Tester)[4]

T 509 Hydrogen Ion Concentration (pH) of Paper Extracts—Cold Extraction Method[4]

T 511 Folding Endurance of Paper (MIT Tester)[4]

T 544 Effect of Moist Heat on Properties of Paper and Board[4]

2.3 *ANSI Standard:*

IT9.16 American National Standard for Imaging Media—Photographic Activity Test[5]

2.4 *ISO Standard:*

ISO 9706 Paper for Documents—Specifications for Permanence—Normative Annex—Special instructions for determining kappa number[5]

[1] This specification is under the jurisdiction of ASTM Committee D06 on Paper and Paper Products and is the direct responsibility of Subcommittee D06.92 on Test Methods.

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[2] The boldface numbers in parentheses refer to the list of references at the end of this specification.

[3] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

[4] Available from the Technical Association of the Pulp and Paper Industry, 15 Technology Parkway South, Norcross, GA 30092.

[5] Available from The American National Standards Institute, 25 W. 43rd St., 4th Floor, New York, NY 10036.

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3. Terminology

3.1 *Definitions*—Terms used in this Specification are defined in accordance with Terminology D 1968.

3.1.1 *acid-sized paper*, *n*—paper, or paper product, that has been manufactured using a procedure or process at pH values below 7 (usually from 4.0 to 6.5) that results in paper that has resistance to water penetration.

3.1.2 *alkaline-filled paper*, *n*—a paper containing an alkaline filler, such as calcium carbonate, having a pH value in excess of 7 (extract pH usually in the range from 7.5 to 10.0), and containing a reserve buffering capacity that can neutralize acidic materials in the paper or acidic gases sorbed from the atmosphere.

3.1.3 *alkaline-sized paper*, *n*—paper or paper product that has been manufactured using a procedure or process at a pH value above 7 (usually from 7.5 to 10.0) that results in a paper that has resistance to liquid penetration.

3.1.4 *base paper*, *n*—the fiber network existent prior to the application of any material onto the surface of that fiber network.

3.1.4.1 *Discussion*—An example is paper, internally sized in preparation for a coating or surface size operation.

3.1.5 *folder stock*, *n*—a paperboard used for the manufacture of folders for filing purposes.

3.1.5.1 *Discussion*—It usually is made of wood pulp and reclaimed paperstock, although some grades are made from rope or jute stock. It may be surface sized to provide better wearing qualities. It is characterized by high values for tearing resistance, stiffness, and folding endurance.

3.1.6 *neutral sized paper*, *n*—paper that has been manufactured using a procedure or process at a pH value of 7 (with a normal range from 6.5 to 7.5) that results in a paper that has resistance to water penetration.

3.1.7 *tag board*, *n*—a paperboard used for shipping tags, file folders, printed forms, envelopes, etc.

3.1.7.1 *Discussion*—It is made from rope, jute, chemical wood pulp or mechanical wood pulp, or combinations of these. It usually has a manila color and a smooth finish. It is characterized by high values for folding endurance, bursting strength, tensile strength, tearing resistance, and water finish.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *durability*, *n—of paper*, the capacity of paper or paperboard to resist the effects of wear in performance situations.

3.2.1.1 *Discussion*—Durability should not be used interchangeably with permanence. For example, paper money should be durable, but maximum permanence is not essential.

3.2.2 *high-usage*, *adj—in paper folders*, descriptive of any grade of paper designed for use in situations involving frequent handling.

3.2.3 *life expectancy*[6] , *LE*, *n—for paper*, length of time a product can be expected to maintain its functional, that is, physical, chemical, appearance and so forth, characteristics when stored under prescribed conditions.

3.2.3.1 *high life expectancy, LE 100, n—for paper*, the document is expected to be usable for 100 years under prescribed conditions.

3.2.3.2 *LE designation, n—for paper records*, a rating in years for the life expectancy of paper, under prescribed conditions, primarily for records.

3.2.3.3 *maximum life expectancy, LE 1000, n—for paper*, the document is expected to be usable for 1000 years under prescribed conditions.

3.2.3.4 *medium life expectancy, LE 50, n—for paper*, the document is expected to be usable for 50 years under prescribed conditions.

3.2.3.5 *Discussion*—These terms in 3.2.3 were developed for records and records substrates. One could substitute the word “folder” for the word “document” in this situation.

3.2.4 *paper with a minimum pH value*, *n*—as the life expectancy of paper is an approximate function of pH, one approach to describing a permanent paper is to specify a minimum pH value, for example, 5.5. This value can be achieved with a rosin-alum sizing system.

3.2.5 *permanence*, *n— of paper*, the tendency to resist changes in any or all of its properties with the passage of time.

3.2.5.1 *Discussion*—It is expected that the terms maximum, high, and medium permanence eventually will be replaced with maximum, high, and medium life expectancy, or with the LE designations LE-1000, LE-100, and LE-50.

4. Significance and Use

4.1 The only completely valid way to check the life expectancy of paper, or a paper product, is to store it under the relevant conditions for its expected lifetime, perhaps several hundred years. As this is not feasible, one must rely on observations made on old materials, and on our current knowledge of factors, in terms of paper properties and paper composition, that increase life expectancy. Accelerated aging also may be used.

4.2 In this specification, requirements are given in terms of the following:

4.2.1 Physical tests to identify potential durability in service,

4.2.2 Tests related to composition of the folder that are indicative of stability,

4.2.2.1 For maximum life expectancy, the presence of an alkaline filler, such as calcium carbonate, to serve as a buffering agent,

4.2.2.2 Fiber analysis, or a certificate from the supplier concerning fiber composition, and

4.2.2.3 A test for pH, within the limits described in 7.2.4.

4.3 Folders with neutral or alkaline pH generally are stable. However, an acid folder may have been treated with a surface size containing enough calcium carbonate to give an alkaline extract pH. An acid folder may be coated with a formulation containing calcium carbonate, although folders seldom are coated. In cases of uncertainty, the supplier should provide an affidavit concerning the extract pH of the base folder.

4.4 An optional accelerated aging procedure is described in X1.3.

[6] Adapted from American National Standards Institute Committee IT9.1, approved December 1991.

5. Classification Types

5.1 Three types of file folder stock are described, according to life expectancy level. These life expectancy levels are differentiated by pH and type of filler or sizing, or both. For situations where the folders will be handled frequently the grade is specified as "high usage." A higher folding endurance requirement is specified for this category, and the purchaser may wish to specify all or part cotton or fully bleached wood pulp, or a mixture.

5.2 *Type I, Maximum Life Expectancy, LE-1000*—Neutral or alkaline-sized folder stock made with an alkaline filler, such as calcium carbonate, which will give an extract pH usually in the range from 7.5 to 10.0.

5.2.1 *Grade 1*—Ordinary use.

5.2.2 *Grade 2*—High usage.

5.3 *Type II, High Life Expectancy, LE-100*—Neutral or alkaline-sized folder stock with an extract pH usually in the range from 6.5 to 7.5.

5.3.1 *Grade 1*—Ordinary use.

5.3.2 *Grade 2*—High usage.

5.4 *Type III, Medium Life Expectancy, LE-50*—Folder stock with a minimum extract pH of 5.5.

5.4.1 *Grade 1*—Ordinary use.

5.4.2 *Grade 2*—High useage.

6. Ordering Information

6.1 Orders shall specify type and grade, dimensions, color, and, if necessary, folder stock, and printing requirements.

7. Composition and Chemical Requirements

7.1 *Fiber Analysis, (see Test Method D 1030)*—The paper shall be made from cotton, linen, or fully bleached chemical pulp. Virgin or recycled fiber may be used in any proportion as agreed upon between the buyer and the seller at the time of purchase, as long as the paper meets the requirements of this specification. The kappa number (from ISO 9706) shall not exceed five.

7.2 *Hydrogen Ion Concentration (pH) Cold Extraction*—See T APPI T 509.

7.2.1 *Type I, Maximum Life Expectancy, LE-1000*—7.5 to 10.0.

7.2.2 *Type II, High Life Expectancy, LE-100*—6.5 to 7.5.

7.2.3 *Type III, Medium Life Expectancy, LE-50*—Minimum 5.5.

7.2.4 Some folders may have been given an alkaline surface size or an alkaline coating. The base paper of these folders may be acid and, therefore, of questionable stability, but would exhibit an alkaline extract pH. *There is no known procedure for measuring the extract pH of the base paper of a paper to which an alkaline surface size, or alkaline coating, has been applied.* The manufacturer should furnish an affidavit that the pH of the base paper conforms to the limits set forth. The pH test is valid if the analyst can be ensured that the folder does not have an alkaline surface size or an alkaline coating. The accelerated aging procedure, as described in X1.3 may be used as an indicator of stability.

7.3 *Filler*—Type I folder shall contain an alkaline filler such as calcium carbonate. The minimum shall be 2 %, calculated as calcium carbonate and based on the oven-dry weight of the finished paper. Test for the presence and amount of carbonate in accordance with Test Method D 4988.

8. Physical Properties

8.1 *Grammage (Weight per Unit Area)*—Use Test Method D 646 or TAPPI T 410. Weight per unit area is not a requirement of this specification, but for convenience, the nominal weights per unit area are given in Table 1 for the various nominal thicknesses specified.

8.2 *Thickness*—Use TAPPI T 411. Thickness shall be expressed as micrometres (1×10^{-6} m) or as mils (1×10^{-3} in.). The average thickness normally will be within the ranges given in Table 1. The variation of test unit averages within a shipment (or lot) shall be not more than 5 % above or below the average value.

8.3 *Internal Tearing Resistance*—Use TAPPI T 414. The average internal tearing resistance in each direction shall be not less than the values given in Table 1 for various nominal thicknesses of file folder stock.

8.4 *Folding Endurance*—The minimum folding endurance for Grade 1 folder stock, average of weaker direction, and for Grade II folder stock, average of weaker direction, are given in Table 1.

8.5 *Color*—The folders shall be white or colored and the hue shall be as specified at the time of purchase.

9. Dimensions, Trim, and Grain

9.1 *Dimensions and Trim*—The folders shall be furnished in the size, or sizes, specified at the time of purchase. The folders shall not be undersize, shall not be more than 1/16-in (1.6-mm) oversize in either direction, and shall be trimmed square. If squareness is especially important, tolerances shall be specified by the purchaser. Dimensions and trim shall be measured by Test Method D 5625.

TABLE 1 Requirements for File Folders for Storage of Permanent Records

Nominal Thickness, µm[A] (mil)	Nominal Weight Per Unit Area[B] (Basis Weight), g/m²(lb)[C]	Thickness Range, µm (mil)	Tearing Resistance		Folding Endurance, MIT (Double Fold) 1 kg, min	
			min, gf	min, mN	Grade I Average in Weaker Direction	Grade II Average in Weaker Direction
200 (8)	180 (110)	190 to 210 (7.6 to 8.4)	180	1775	300	500
240 (9.5)	210 (130)	230 to 250 (9.0 to 10.0)	260	2550	300	500
280 (11)	235 (145)	260 to 300 (10.5 to 11.5)	340	3325	300	500
260 (14)	295 (180)	340 to 380 (13.3 to 14.7)	500	4900	300	500

[A] To the nearest 10 µm.
[B] Weight per unit area is not a requirement of this specification.
[C] Basis weight = 24 × 36-500.

9.2 *Grain*—The folder stock shall be supplied grain long or grain short at the option of the seller, unless otherwise specified by the buyer.

10. Additional Requirements

10.1 *Sizing*—The folder stock shall be internally sized and surface sized so that it shall be suitable for the intended purpose, as indicated by the purchaser.

10.2 *Printing Properties*—If the folders are to be used in a printing process, a stipulation that the folder be suitable for this purpose shall be included in the requirements.

10.3 *Erasing Quality*— If erasing quality is important to the buyer, it shall be evaluated as follows: Visible feathering shall not be apparent after the folder has been written on with aqueous ink, erased, and written on again in the erased area with aqueous ink.

10.4 *Finish*—The finish of file folder stock is important to durability, but a requirement has not been developed. The purchaser might wish to specify a finish suitable for the specific end use.

10.5 *Stiffness*—If stiffness is important to the purchaser, a minimum stiffness value determined by T APPI T 489 should be agreed upon between the buyer and the seller.

10.6 *Photoactivity*— If the folders are to be used for storing photographs, they should pass the photographic activity test described in ANSI IT9.16.

10.7 *Lighfastness*— If lightfastness is of concern to the purchaser, use Test Method D 3424, Procedures 3 and 7, as agreed upon between the buyer and the seller.

11. Sampling

11.1 The shipment shall be sampled in accordance with Practice D 585, using Plan II for all properties, or TAPPI T 400.

12. Inspection

12.1 Inspection of the folders shall be agreed upon between the buyer and the seller as part of the purchase contract.

13. Certification

13.1 Upon request of the buyer, a manufacturer's certification that the folder stock was manufactured and tested in accordance with this specification, together with a report of the test results, shall be furnished at the time of shipment.

13.2 Test results obtained by both the buyer and the seller shall be made available, upon request, to either party.

13.3 As the extract pH of a folder would be influenced by an alkaline surface size or by an alkaline coating, it is desirable to request an affidavit from the manufacturer that the extract pH of the base paper conforms to the limits specified in 7.2.

14. Packaging and Marking

14.1 The folders shall be packaged, wrapped, and securely sealed, or packaged in boxes or cartons, in order to provide adequate protection during shipment and storage. Each package shall be marked to show the type of paper, quantity, color, size, basis weight (weight per unit area), and the name of the manufacturer.

14.2 Packaging in exterior containers for shipment shall be adequate to avoid damage during shipment and storage.

15. Keywords

15.1 file folders; life expectancy; maximum life expectancy; permanent file folders

APPENDIX

(Nonmandatory Information)

X1. ADDITIONAL INFORMATION

X1.1 As there are many variables in the manufacture of paper and paper products and in the use and storage of records, it is impossible to place definitive values on the number of years that various categories of paper products and records will endure. It has been established that the rates of both natural and accelerated aging are approximate functions of the pH of the paper. The following information may be used as guidance.

X1.1.1 *Type I Papers, Maximum Life Expectancy, LE-1000*—Machine-made papers with an alkaline filler have existed, apparently with little change, for 100 years. Handmade papers containing an alkaline filler have survived for almost 400 years (**6**). Acid papers have survived this long, but their condition is, relatively speaking, not as good, and is a function of acidity.

X1.1.2 *Type II Papers, High Life Expectancy, LE-100*—The probable life expectancy of these papers should lie somewhere between the life expectancy Type I and Type III papers.

X1.1.3 *Type III Papers, Medium Life Expectancy, LE-50*—The relative condition of paper in old books and documents has been correlated with pH. Barrow (**1**) has shown that the condition of naturally aged paper definitely is a function of pH. Manifold papers in U.S. Government files with pH values as low as 4.2 have survived over 60 years (**5**), and the physical properties of these papers are an approximate function of pH. A minimum pH of 5.5 should ensure longevity of 50 years or more.

X1.2 Papers containing cotton or linen, or both, are considered to be more durable than wood pulp papers. As both rag and wood pulp papers may cover a broad spectrum of life expectancy and durability, generalizations on the basis of fiber content alone are not useful. Cotton linters are not as strong as cotton fiber.

X1.3 During the development of Guide D 5634, and during the development of a National Information Standards Organization (NISO) standard for permanent paper, about 60 papers were aged for 12 days at 90°C and 50 % relative humidity (Test Method D 4714, T APPI T 544). The selection of percent retention values after aging for various levels of life expectancy is subjective, but enough information is available to make this approach attractive. The retention of tensile energy absorption, and of tearing strength, after aging for 12 days at 90°C and 50 % relative humidity should be 90 % or higher for maximum life expectancy, about 80 % or higher for high life expectancy, and about 70 % or higher for medium life expectancy. File folder stock was not included in this study.

X1.4 Paper may be procured on the basis of a standard sample, on the basis of requirements other than those listed in this specification, or one or more of the requirements may be waived. In order to obtain the degree of life expectancy required, it is very important that the pH requirements of this specification, or the aging requirement in X1.3, be met for the type and grade of paper purchased.

X1.5 Historically, specifications for paper for permanent records have limited fiber sources to those that would result in no more than 1 % lignin in the papers. The use of alkaline papermaking technologies, including the use of alkaline sizing and alkaline fillers, may change the situation for some applications. Although yellowing occurs during light exposure and dark storage, laboratory data indicate that the strength properties of papers containing substantial quantities of lignin do not change appreciably during accelerated aging in a moist atmosphere.

X1.5.1 There are many other end uses where alkaline papers with alkaline size and containing an alkaline filler and substantial quantities of lignin, would be suitable for long-term use and, for economic reasons, desirable. The user would decide whether yellowing during light long-term storage, or both, would be acceptable. These needs should be agreed upon between the buyer and the seller and written into standards intended for the purpose.

X1.6 Appearance properties, such as color and reflectance (brightness, and whiteness, etc.) that might be affected by light and by dark aging may be important to the user. The traditional use of bleached chemical wood or cotton has been recognized as a way to preserve appearance properties.

X1.6.1 As fiber sources are less uniform than in the past, it is desirable to measure the effect of light and of dark storage on the appearance properties of paper.

X1.6.2 Test Method D 3424, Procedures 3 and 7, may be used for evaluating fading properties.

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