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Standard Guide for Selection of Permanent and Durable Artist's Paper[1]

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1. Scope

1.1 This guide covers artist's papers used in the preparation of permanent or semipermanent artwork. Some works of art are expected to last several hundred years, and others might be expected to last 50 years, or less.

1.2 In selecting artist's papers for a given life expectancy, papers with acceptable strength are evaluated for life expectancy through accelerated aging.

1.3 This guide is to be used for guidance in the purchase of permanent artist's paper.

1.4 As a great variety of artist's papers are to be found in the market place, extensive information on the various kinds of paper in use by artists is beyond the scope of this guide. This guide is concerned mostly with life expectancy of the paper.

1.5 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*

D 585 Practice for Sampling and Accepting a Single Lot of Paper, Paperboard, Fiberboard, and Related Products[2]

D 589 Test Method for Opacity of Paper[2]

D 644 Test Method for Moisture Content of Paper and Paperboard by Oven Drying[2]

D 645 Test Method for Thickness of Paper and Paperboard[2]

D 646 Test Method for Grammage of Paper and Paperboard (Mass per Unit Area)[2]

D 689 Test Method for Internal Tearing Resistance of Paper[2]

D 774/D 774M Test Method for Bursting Strength of Paper[2]

D 776 Test Method for Determination of Effect of Dry Heat on Properties of Paper and Board[2]

D 828 Test Method for Tensile Properties of Paper and Paperboard Using Constant-Rate-of-Elongation Apparatus[2]

D 985 Test Method for Brightness of Pulp, Paper, and Paperboard (Directional Reflectance at 457 nm)[2]

D 1030 Test Method for Fiber Analysis of Paper and Paperboard[2]

D 1968 Test Method for Terminology Relating to Paper and Paper Products[2]

D 3424 Test Methods for Evaluating the Lightfastness and Weatherability of Printed Matter[3]

D 4714 Test Method for Determination of Effect of Moist Heat (50 % Relative Humidity and 90°C) on Properties of Paper and Board[2]

D 4988 Test Method for Determination of Alkalinity of Paper as Calcium Carbonate (Alkaline Reserve of Paper)[2]

D 5634 Guide for Selection of Permanent and Durable Offset and Book Papers[2]

2.2 *TAPPI Test Methods:*

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 403 Bursting strength of paper[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 and paperboard[4]

T 414 Internal tearing resistance of paper[4]

T 425 Opacity of paper (15°/diffuse illuminant A, 89 % reflectance backing and paper backing)[4]

T 452 Brightness of pulp, paper, and paperboard (directional reflectance at 457 nm)[4]

T 453 Effect of dry heat on properties of paper and board[4]

T 459 Surface strength of paper (wax pick test)[44]

T 479 Smoothness of paper (Bekk method)[4]

T 480 Specular gloss of paper and paperboard at 75 degrees[4]

T 494 Tensile breaking properties of paper and paperboard[4]

T 509 Hydrogen ion concentration (pH) of paper extracts (cold extraction method)[4]

T 538 Smoothness of paper and board (Sheffield method)[4]

T 544 Effect of moist heat on properties of paper and board[4]

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[2] *Annual Book of ASTM Standards*, Vol 15.09.

[3] *Annual Book of ASTM Standards*, Vol 06.02.

[4] Available from the Technical Association of the Pulp and Paper Industry, TAPPI Press, Technology Park, Atlanta, GA 30348.

2.3 *ISO Standard:*

ISO 5630/1 Laboratory Aging of Paper—Aging in a Dry Oven at 105°C[5]

ISO 5630/3 Laboratory Aging of Paper—Aging in a Moist Oven at 80°C, 65 % Relative Humidity[5]

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

3. Terminology

3.1 *Definitions:*[6]

3.1.1 *acid-sized paper*, *n*—paper that has been manufactured using a procedure or process at pH values below 7 (usually 4.0 to 6.5) that results in a paper that has resistance to *aqueous-liquid* 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 formed in the paper or acidic gases sorbed from the atmosphere.

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

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

3.2 *Description of Terms Specific to Standards for Paper for Permanent Records:*

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 *life expectancy, LE*[7], *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 *life expectancy designation*, *n—for paper records*, a rating in years for the life expectancy of paper when stored under prescribed conditions.

3.2.3.1 *maximum life expectancy LE-1000, n—for paper*, a paper is expected to be usable for 1000 years when stored under prescribed conditions.

3.2.3.2 *high life expectancy LE-100, n—for paper*, a paper is expected to be usable for 100 years when stored under prescribed conditions.

3.2.3.3 *medium life expectancy LE-50, n—for paper*, a paper is expected to be usable for 50 years when stored under prescribed conditions.

3.2.4 *paper with a minimum pH value*, *n*—as the stability of paper is an approximate function of pH, one approach in describing a stable 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 will eventually be replaced with maximum, high, and medium life expectancy, or with LE designations LE-1000, LE-100, and LE-50.

4. Significance and Use

4.1 As there is no completely foolproof method for determining the life expectancy of paper, one must rely on observations made on historical records and on current knowledge of factors, in terms of paper properties and paper composition, that increase life expectancy, and on retention of selected properties after accelerated aging.

4.2 Acidic materials incorporated in paper during manufacture (for example, rosin-alum sizing) contribute to deterioration. It has been shown **(1–5)**[8] that the life expectancy of uncoated papers is an approximate function of the pH of the aqueous extract of the paper.

4.3 The use of papers with controlled acidity, or of papers manufactured under neutral or alkaline conditions, especially papers with a calcium carbonate filler that can absorb acidic gases from the atmosphere or can neutralize acidic materials formed during the aging of paper, would be expected to contribute significantly to the life expectancy of works of art on paper.

4.4 Three pH levels, reflecting three levels of life expectancy, are outlined in this guide. As one cannot rely on pH alone as an indicator of stability, minimum retentions of properties after accelerated aging at 90°C and 50 % relative humidity are suggested for the three levels of life expectancy.

4.5 This guide covers the following:

4.5.1 Physical tests to identify potential durability in service.

4.5.2 A minimum percentage retention of selected properties after accelerated aging for 12 days at 90°C and 50 % relative humidity.

4.5.3 Tests related to composition of paper that are indicative of stability.

4.5.3.1 A pH test, for screening only.

4.5.3.2 For maximum life expectancy, the presence of an alkaline filler, such as calcium carbonate, to serve as a buffering agent against attack by acidic contaminants from the atmosphere, and from the paper during aging.

4.5.3.3 Fiber analysis, or a certificate from the supplier concerning fiber composition.

4.6 Although data from tests that may be performed in the laboratory do not correlate perfectly with use situations, several tests are available that should be useful to estimate the durability of paper. Examples of such tests are tearing force,

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

[6] See also the *Dictionary of Paper*, TAPPI Press.

[7] Adapted from American National Standards Institute Committee IT9.1; approved December 1991.

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

tensile properties (tensile strength, elongation, and tensile energy absorption) and burst.

4.7 Papers buffered with a calcium carbonate filler, and with fiber composition as described in 7.1.2, are considered to have maximum life expectancy **(1,4,6)**.

4.8 Papers with a neutral or alkaline pH without a calcium carbonate filler, and acid papers with a surface size formulation containing calcium carbonate, may or may not have the expected life expectancy. An acid paper may have been treated with a surface size containing enough calcium carbonate to give an alkaline extract pH, but an acid paper may or may not have been neutralized. Also, an acid paper may have been coated with a formulation containing calcium carbonate pigment. Therefore, an accelerated aging procedure is necessary to ensure the exclusion of such papers. If a paper is not coated with a formulation containing calcium carbonate, or if it is not surface sized with a sizing agent that contains calcium carbonate, the pH test should be valid.

4.9 In order to estimate the relative life expectancy of paper, it is necessary to develop a database on the accelerated aging of several papers covering a spectrum of life expectancies. This information is summarized in Guide D 5634. Retentions of selected physical properties after accelerated aging are used as indicators of probable longevity. Examples of such tests include tearing force, tensile strength, elongation, tensile energy absorption (TEA), burst, and brightness.

4.10 Although arbitrary retention limits are suggested for various properties in Table 1, these suggested retention limits are for guidance only. There are no limits to properties that can be measured in the laboratory above which a paper is acceptably durable or permanent, or both, and below which it is not acceptable. Selections must be made on the basis of the potential value of the object, resources, cost, and what is available in the marketplace.

4.11 The parameters known to promote instability in paper also cause degradation in moist accelerated aging. Moist aging is a useful technique for comparing the relative stability of several papers. Paper usually degrades much faster during moist aging than during dry aging.

4.12 Coated papers present a special problem with respect to stability. Formulations for bindings in coatings may be developed from a large number of polymeric materials. These formulations are proprietary, and little is known about their stability.

4.13 More study is needed on the effect of coatings on the stability of paper. This is another reason why an accelerated aging procedure is useful in the evaluation of most papers for permanent records, especially coated papers.

TABLE 1 Guidelines for Selection of Permanent Paper

NOTE 1—These suggested retention values are based on aging of papers at 90°C and 50 % relative humidity, mentioned in Table 1 of Guide D 5634.

Test	Retention Values Related to Permanence,%		
	Medium Life Expectancy	High Life Expectancy	Maximum Life Expectancy
Tensile	85	90	95
Tensile Energy Absorption	70	80	90
Tear	75	85	90
Burst	80	90	95
Brightness	90	92	95

5. Classification—Types

5.1 Three types of artist's papers, according to life expectancy, are described. These life expectancy levels are differentiated by pH and type of filler. One cannot rely on pH alone as an indicator of stability, and it is suggested that accelerated aging be used as described in Section 7. A good relationship with the supplier could render accelerated aging unnecessary.

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

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

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

6. Tests for the Evaluation of Papers

6.1 Tests usually associated with the description of papers, with evaluating papers for durability, for life expectancy, and accelerated aging are given in Table 2.

7. Evaluation of Papers for Life Expectancy

7.1 *Composition Variables*:

7.1.1 The pH requirements and accelerated aging recommendations are in Table 3.

7.1.1.1 All papers required to have a longevity of LE-1000 should be tested by accelerated aging. Others are optional. However, it is suggested that coated papers also be tested, due to the nonpredictable effects on aging of the proprietary coating formula that may be used.

7.1.2 *Fiber Analysis*—See Test Method D 1030. The paper shall be made from virgin or recycled cotton, linen, or fully bleached chemical fiber in any proportion as agreed upon

TABLE 2 Tests Potentially Useful For Evaluation of Artist's Papers

NOTE 1—This is a preliminary list of tests germane to the evaluation of artist's papers. Other tests will surface as more information on the requirements of artist's papers become known.

Test	Description	Durability	Accelerated Aging	Life Expectancy
Color	*		*	*
Brightness	*		*	*
Tear index	*	*	*	*
Tensile strength	*	*	*	*
Elongation	*	*	*	*
Tensile Energy Absorption (TEA)	*	*	*	*
Burst	*	*	*	*
Thickness	*			
Grammage	*			
Smoothness	*			
Pick	*			
Specular gloss	*			
Fluorescence	*			
pH	*			*
Fiber Analysis	*			*
Buffer Capacity	*			*

TABLE 3 pH Requirements and Accelerated Aging Recommendations

Paper	Sizing	pH[A]	Calcium Carbonate Filler, %, min	Longevity Type	Accelerated Aging
Uncoated	alkaline	7.5–10.0	2	LE-1000	yes
Uncoated	neutral	6.5–7.5	—	LE-100	optional
Uncoated	acid	>5.5	—	LE-50	optional
Coated	alkaline	7.5–10.0	2	LE-1000	yes
Coated	neutral	6.5–7.5	—	LE-100	suggested
Coated	acid	>5.5	—	LE-50	optional
Papers with coatings containing calcium carbonate and papers containing an alkaline surface size.					yes

[A] Use spot pH test as in 10.2.1.

between buyer and seller at time of purchase, as long as the paper meets the requirements of this guide. The kappa number (from ISO 9706) shall not exceed five.

7.1.3 *Buffer Capacity (Alkaline Reserve)*—See Test Method D 4988. Type I paper, LE-1000, shall contain an alkaline filler, such as calcium carbonate. The minimum shall be 2 %, calculated to calcium carbonate, based on the oven-dry weight of the finished paper.

7.2 *Accelerated Aging*—The conditions selected in this guide for accelerated aging are 90°C and 50 % relative humidity. This decision is based on the work of Graminski **(7)**, Du Plooy **(8)**, Bansa **(9)**, Wilson **(10, 11)**, and "standard practice." ISO 9706 specifies 80°C and 65 % relative humidity. TAPPI T544 and Test Method D 4714 specify 90°C and 50 % relative humidity. As much more research will be required to select the ideal accelerated aging procedure, the only practical approach is to select one aging procedure, develop a background of information by aging several representative papers covering a range of stability. This has been done for 90°C and 50 % relative humidity (see Guide D 5634), **(10, 11)**.

7.3 *Useful Tests after Accelerated Aging*:

7.3.1 As indicated in Table 2, tearing force, tensile properties (tensile at break, elongation at break, tensile energy absorption), burst, brightness, and color change are useful tests for the evaluation of the life expectancy of artist's papers. Although it is desirable to run all of them, compromises may be made.

7.3.2 Suggested limiting values for retention after accelerated aging that might be useful in selecting papers for various levels of life expectancy are given in Table 2. These suggestions are for guidance only. They are based on data obtained from accelerated aging, for 12 days, at 90°C and 50 % relative humidity of a collection 61 papers, as described in Guide D 5634.

7.4 *Aging Patterns*—Different papers frequently do not retain physical properties and brightness uniformly after aging. One paper may pass all suggested guidelines for LE-1000 except burst, and another paper may have high burst and limited tear. Therefore, it must be kept in mind that judgment be used in the evaluations.

8. Procedure for Selection of Paper for Permanent and Durable Records

8.1 *Durability*—From the group of papers that are available for selection, test for properties related to durability, as indicated in Table 2. Using the data from these tests, select a number of papers, depending on need, for evaluation by accelerated aging.

8.2 *Composition Variables*—Evaluate these papers on the basis of composition as in Section 7.

8.3 *Stability Toward Accelerated Aging*—Age the papers from this selection procedure at 90°C and 50 % relative humidity for 12 days. Test the unaged and aged specimens at the same time, preferably for tear, tensile properties, burst, and brightness. Calculate the percent retention of the property.

8.4 Compare the percent retention for each property with the suggested retentions in Table 1 for various levels of permanence, bearing in mind that Table 1 is a guide, and that no paper is likely to meet all of the guidelines for maximum stability. Selection of specific papers becomes a matter of judgment, based on availability, technical requirements, price, and availability of funds.

8.5 In recognition of what is available in the marketplace, the guidelines probably will need to be relaxed for coated papers.

9. Considerations Other Than Permanence and Durability

9.1 *Physical Properties*:

9.1.1 *Grammage (Weight per Unit Area)*—It is customary to request that the variation of test unit averages within a shipment (or lot) be not more than 5 % above or below the specified value.

9.1.2 *Thickness*—It is customary to request that the caliper, or thickness, of a shipment (or lot) of paper should be not more than 6 % above or below the specified value.

9.1.3 *Smoothness*—This is a measure of surface levelness. This is an important printing property with the smoothness range being dictated by the specific printing process.

9.1.4 *Pick*—This test is a measure of the strength of a paper in the "Z" direction, that is, perpendicular to the plane of the sheet. Data from the pick test have been correlated with performance in printing presses. The Dennison wax test (TAPPI T459) is commonly used for uncoated papers, and the IGT Pick Test (now useful method 591) for coated papers.

9.2 *Optical Properties*

9.2.1 *Specular Gloss*—This is the ratio of the intensity of the light reflected from the specimen to that similarly reflected from an arbitrary standard for specified and equal angles of incidence and reflection. It is an important measure of gloss or glare of paper and is usually evaluated for incident and reflected rays of light making a small angle with the surface of the paper.

9.2.2 *Color*—The paper may be white or colored. The hue, if defined, should be specified at time of purchase.

9.2.3 *Fluorescence*—This is the fluorescent component of

directional reflectance of white papers. If fluorescence is objectionable to the end use of the paper, the units and measurement are a matter of discussion between buyer and seller.

9.3 *Other Considerations*:

9.3.1 Finish—Many "finishes" (surface textures) are available; this is a matter of personal or institutional choice.

9.3.2 Sizing—The paper may be internally sized or surface sized, or coated, so that it will be suitable for the intended purpose, as defined by the purchaser.

9.3.3 Printing properties—If the paper is to be used in a printing process, a stipulation that the paper shall be suitable for the particular type of printing may be necessary.

9.3.4 Dimensions and trim—The paper shall be furnished in the size, or sizes, specified at time of purchase. Tolerances required for sheet dimensions and squareness should be negotiated with the supplier.

9.3.5 Grain—The paper shall be supplied grain long or grain short at the option of the seller, unless otherwise specified by the purchaser.

9.3.6 Lightfastness—If lightfastness is of concern to the purchaser, use Test Methods D 3424, Sections 3 and 7, as agreed upon between buyer and seller.

10. Test Methods

10.1 Applicable ASTM and TAPPI methods are listed in Section 2.

10.2 *Other Test Method*:

10.2.1 *Spot Indicator for pH Screening Test*—Dissolve about 1.0 g of the sodium salt of chlorophenol red in distilled water and dilute to one liter. Immerse a Q-tip or cotton swab in the indicator solution and squeeze almost dry. A small brush may be used instead of a Q-tip. The objective is to wet the fibers of the interior of the paper without contact with any coating or surface size that may be present. Tear the paper to be tested diagonally to expose the inner surface. Touch the applicator to this exposed inner surface of the paper. No color development indicates that the pH is below about 6.5. A purple color indicates that the pH is above about 7.0. This is a very subjective test, and the analyst should first practice with known samples.

11. Certification

11.1 If agreed upon between buyer and seller, a manufacturer's certification that the paper was manufactured and tested in accordance with this guide, together with a report of the test results, would be furnished at the time of shipment.

11.2 If agreed upon between buyer and seller, the manufacturer would certify that the paper was manufactured at a wet end pH of 7 or above, when satisfying the life expectancy requirements of Type I papers.

11.3 If agreed upon in advance between buyer and seller, the results obtained by both the seller and the purchaser would be made available, upon request, to either party.

12. Keywords

12.1 artist's paper; life expectancy; maximum life expectancy; permanent artist's paper; permanent paper

APPENDIX

(Nonmandatory Information)

X1. ADDITIONAL INFORMATION

X1.1 As there are many variables in the manufacture of paper and in the use and storage of records, it is impossible to place definitive values on the number of years that various categories of records will endure.

X1.2 It has been established that the rates of both natural and accelerated aging are approximate functions of the pH of paper. However, determination of the pH of paper is not a simple task. For an uncoated paper, an extraction pH test is suitable unless the surface size contains calcium carbonate. There is no way to test the pH of the base paper of a coated sheet if the coating contains calcium carbonate. One can tear the sheet to expose the base paper and perform a spot test, but this is qualitative only. Therefore, one must rely on accelerated aging to evaluate the potential stability of a paper that contains calcium carbonate in the coating or the surface size.

X1.3 With these caveats in mind, the basis for the definitions of three types of papers with a range of expected longevity is described as follows:

X1.3.1 *Type I Papers, LE-1000*—Machine-made papers with an alkaline filler have existed apparently with little change for over 100 years. Handmade papers containing an alkaline filler have survived for almost 400 years. Alkaline papers perform well in accelerated aging tests.

X1.3.2 *Type II Papers, LE-100*—The probable longevity of these papers should lie somewhere between Type I and Type III papers.

X1.3.3 *Type III Papers, 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 paper in U.S. Government files with pH values as low as 4.2 have survived more than 60 years **(5)**, and the physical properties of these papers are an approximate function of pH. A minimum pH of 5.5 should indicate longevity in excess of 50 years. This is a very conservative estimate.

X1.4 The amount of alkaline filler necessary to ensure stability has never been satisfactorily defined. Arbitrary minimum values of 2 and 3 % have been suggested. Papers

containing lignin consume more alkaline reserve during accelerated aging than papers that contain no lignin **(12)**. Paper is weakened by filler in proportion to the amount of filler in the paper **(13)**, but at 2 to 5 % filler, the weakening is negligible.

X1.5 Papers containing cotton or linen, or both, are considered by many to be more permanent and durable than wood pulp papers. Cotton and linen fibers generally have not been treated as harshly as wood pulp fibers in the pulping and bleaching process. However, as both cotton and linen, and wood pulp papers, may cover a broad spectrum of life expectancy and durability, generalizations are inappropriate. Substantial amounts of cotton linters are not appropriate for durable papers.

X1.6 An accelerated aging test is suggested in this standard in the evaluation of the suitability of a paper for use as a permanent record substrate. The three procedures in Table X1.1 have been adopted as official standards by one or more standards organizations.

X1.7 Oven aging at 100–105°C has been in existence since it was suggested by Hall **(14)** in 1925. Although not now held in high esteem, the procedure is easy to use, and there appears to be a fair correlation between dry oven aging at 100°C and natural aging **(3, 4, 15)**. Aging at 80°C and 65 % relative humidity has been suggested by Bansa **(9)**. Aging at 90°C and 50 % relative humidity is popular in the U.S.

TABLE X1.1 Procedures Adopted as Official Standards

Organization and Standard No.	Temperature, °C	Relative Humidity, %
ASTM D776, TAPPI T453, ISO 5630/1	105	low
ASTM D4714, TAPPI T544	90	50[A]
ISO 5630/3	80	65

[A] Common practice in the United States.

X1.8 A situation that has been overlooked in moist aging at elevated temperature is that the vapor pressure of water necessary to maintain the required relative humidity displaces about a third, or more, of the oxygen. This would skew the data for papers that were sensitive to oxidative degradation.

X1.9 *Art papers:*

X1.9.1 Art papers cover a very broad spectrum of types, kinds, sizes, uses and characteristics. One grouping is as follows:

(1) Watercolor paper,
(2) Printmaking and drawing papers,
(3) Exotic and decorative papers,
(4) Traditional japanese papers,
(5) Colored and pastel paper, and
(6) Boards.

X1.9.2 Another grouping is based on characteristics and use, as follows:

(1) Drawing—Pencil, pen and ink, technical pen, colored markers, crayon, and pastel, chalk, charcoal.

(2) Painting—Watercolor, Gouache, acrylic, Sumi, and airbrush.

(3) Printing—Etching and engraving (Intaglio), lithography (planographic), silkscreen, letterpress (books), and photomechanical.

(4) Conservation—Repair (light to strong), hinging (several weights, long fibers), backing (to reinforce), protection (folder/matting), patching (duplicate original).

(5) Characteristics—Erasable, clean masking tape removal, nonbleeding, smooth surface, rough surface, hot pressed, cold pressed, hard surface, soft surface. Most are a combination of these characteristics.

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