Designation: D 3460 – 98

Standard Specification for White Watermarked and Unwatermarked Bond, Mimeo, Spirit Duplicator, Reprographic, and Laser Printer Cut-Sized Office Papers[1]

This standard is issued under the fixed designation D 3460; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This specification describes minimum requirements to ensure performance of cut-sized white office papers, including bond, mimeo, spirit duplicator, reprographic, and laser printer papers. Grades of brightness and standards for labeling are described.

1.2 This specification covers virgin, recycled, and recycled content paper products (X1.2).

NOTE 1—There is currently no similar or equivalent ISO standard.

2. Referenced Documents

2.1 *ASTM Standards:* [2]

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

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

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

D 685 Practice of Conditioning of Paper and Paper Products for Testing

D 774 Test Method for Bursting Strength of Paper

D 1030 Test Method for Fiber Analysis of Paper and Paperboard

D 1968 Terminology Relating to Paper and Paper Products

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

2.2 *TAPPI Standards:*

T 400 Sampling and Accepting a Single Lot of Paper, Paperboard, Fiberboard, or Related Products[3]

T 401 Fiber Analysis of Paper and Paperboard[3]

T 403 Bursting Strength of Paper[3]

T 410 Grammage of Paper and Paperboard (Weight Per Unit Area)[3]

T 411 Thickness (Caliper) of Paper, Paperboard and Combined Board[3]

T 412 Moisture in Paper[3]

T 425 Opacity of Paper (15°/Diffuse Illuminant A, 89 % Reflectance Backing and Paper Backing

T 435 Hydrogen Ion Concentration (pH) of Paper Extracts-Hot Extraction Method[3]

T 437 Dirt in Paper and Paperboard[3]

T 452 Brightness of Pulp, Paper and Paperboard (Directional Reflectance of 457 nm)[3]

T 538 Smoothness of Paper and Paperboard (Sheffield Method)[3]

2.3 *ISO Standard:*

ISO 9706 Information and documentation—Paper for documents—Requirements for permanence[4]

3. Terminology

3.1 *Definitions*—Definitions shall be in accordance with Terminology D 1968. For terms used in this specification which are not provided by Terminology D 1968, see the *Dictionary of Paper*.[5]

4. Classification

4.1 Types, basis weight (grammage), dimensions and grades shall include, but not limited to the following:

4.1.1 *Types*—Bond, mimeo, spirit duplicator, reprographic, and laser printer.

4.1.2 *Nominal Basis Weight*—Illustrative range of equivalent values.

lb/ream (Ream size of 17 by 22 in. - 500 sheets)	g/m^2
16	60
20	75
24	90

Other basis weights may be available, such as, but not limited to, 28 and 32 lb/ream.

[1] This specification is under the jurisdiction of ASTM Committee D06 on Paper and Paper Products and is the direct responsibility of Subcommittee D06.90 on Executive.

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[2] 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.

[3] Available from the Technical Association of the Pulp and Paper Industry, P.O. Box 105113, Atlanta, GA 30348.

[4] Available from the International Standards Organization, 1 Rue de Varembo, Case Postale 56, CH-1211 Geneve 20, Switzerland.

[5] Available from TAPPI, 5th ed., 1996.

4.1.3 *Nominal Sheet Dimensions*:

8 1/2 by 11 in. (216 by 279 mm)
8 1/2 by 14 in. (216 by 356 mm)
11 by 17 in. (279 by 432 mm)

4.1.4 *Grades* :

Grades[6]
25 % Cotton fiber
No. 1
No. 4
No. 5
″N″

5. Ordering Information

5.1 Orders for paper to this specification shall specify the type, grade, basis weight (grammage), size, color, grain direction, and may specify recycled fiber content. See X1.2 and X1.3.

5.2 Any drilling or punching requested shall be as specified. All holes are to be round, smooth or serrated, clean, free of lint and torn or ragged edges.

6. Composition

6.1 If specific paper composition is felt to be necessary to ensure paper performance, including permanence, the required composition and the test method whereby that composition shall be verified shall be agreed upon between the buyer and the seller.

6.2 The fiber content of cotton fiber paper shall be 25 % minimum cotton fiber with the remainder being fiber derived from bleached chemical pulp.

6.3 All grades may contain cellulose fibers derived from recovered material.

6.4 The recycled fiber content of a recycled content paper shall be determined between the buyer and the seller based on total fiber weight. See X1.2 and X1.3.

7. Physical Requirements

7.1 The paper shall be in accordance with reasonable industry practice with regard to texture, formation, finish, caliper, lint, dust, slime spots, wrinkles, folds, and scuff marks. Paper shall be cut squarely on all sides, and be free of knife markings and ragged or torn edges.

7.2 If cleanliness or dirt content is important or critical to the end use, the buyer should establish acceptance standards in the purchase or bid document. See X1.7.

7.3 Each specification and the bid sample shall represent the quality of paper that will be produced and shipped to fulfill the bid. When requested, statistically representative samples of the bid lot shall be submitted for user performance tests prior to formal bid acceptance.

7.4 Paper shall perform satisfactorily for the use designated in the invitation bid, in accordance with criteria agreed upon between the purchaser and the seller.

7.5 The paper supplier shall adjust the material and processes and make such tests as may be required, in order to ensure the delivery of finished paper complying with the applicable specification and standard sample.

7.6 The paper shall meet requirements as set forth in Table 1, Table 2, and Table 3.

8. Dimensions, Weights, and Permissible Variations

8.1 The paper shall be of the dimensions and weights listed in Table 1 and Table 2.

8.2 For proper performance, length or width variation must not exceed ±1/32 in. (0.8 mm) within a shipment, and must not exceed ±1/64 in. (0.4 mm) within a ream. For routine control and monitoring of compliance with this specification, length or width dimensions may be determined using a steel rule which has (*1*) a length exceeding the dimension to be measured, and (*2*) a certified accuracy calibrated at least to the required tolerance of the measurements to be made (1/32 or 1/64 in.).

8.3 For referee testing of length and width for compliance with this specification, Test Method D 5625 shall be used.

8.4 For proper performance, squareness variation must not exceed 1/32 in. in the longer dimension of the sheet.

8.5 For routine control and monitoring of compliance with this specification, squareness may be determined using a steel carpenter's square whose long arm is longer than the longer dimension of the sheet, and a small steel rule of certified accuracy calibrated in (at least) 1/32-in. intervals as follows: Place the short dimension of the sheet carefully and exactly adjacent to the short arm of the square. Carefully slide the sheet toward the long arm of the square until either end, or both, of the long dimension of the sheet just touches the long arm of the square. For a sheet that is "square", the long and short dimensions of the sheet will be exactly coincident with the long and short arms of the square, and when the procedure in the preceding sentence is followed, both ends of the long dimension of the sheet will touch the square. For a sheet deviating from squareness, when the long dimension of the sheet is brought into contact with the square (and the short dimension of the sheet is exactly against the short arm of the square), one end of the long dimension will touch, and the other will not. Using the small calibrated rule, measure the distance between the square and the tip of the end of the sheet which does not touch the square. If this measurement exceeds 1/32 in., the paper does not comply with this specification.

8.6 For referee testing of squareness for compliance with this specification, Test Method D 5625 shall be used.

8.7 For routine control and monitoring for length, width, and squareness compliance with this specification, the humidity conditions during measurement must comply with 7.7. For referee testing, the test specimen must be conditioned as in Practice D 685 prior to testing.

8.8 Average basis weight (grammage) for each shipment shall be the labeled basis weight/grammage ±5 %.

9. Bid Samples

9.1 When requested, the bidder shall submit a representative sample for test purposes, comprised of one ream or more as specified of each grade and type offered. All samples shall be clearly marked with the bidder's name and address, bid number, commodity number, brand name, and when required, recycled fiber content. (See X1.2 and X1.3.)

[6] Grades of paper are classified based on brightness levels. Different grades of paper have the same functional performance characteristics. For additional information regarding properties of various grades, see Table 1, Table 2, and Table 3.

TABLE 1 Functional Requirements for Grades 1, 4, 5, and N Cut-Sized Office Papers

NOTE 1—Mimeo grades are available at thickness 15 % greater than bond grades. Any other requirements deemed to be important should be agreed upon between buyer and seller.

Property	Test Method	Bond			Reprographic/Laser Printer		
		16 lb	20 lb	24 lb	16 lb	20 lb	24 lb
Weight per unit area:							
lb (17in. by 22 in./500 sheets± 5 %)	D 646	16	20	24	16	20	24
g/m^2± 5 %	T 410[A]	60	75	90	60	75	90
Opacity, min; %							
Grade 1	T 425[A]	80	85	88	80	85	88
Grades 4, 5, N	T 425[A]	74	84	86	79	84	86
Bursting Strength, min:							
Grade 1							
psi	D 774	16	20	24	. . .	. . .	. . .
kPa	T 403[A]	110	138	165	. . .	. . .	. . .
Grades 4, 5, N							
psi	D 774	13	17	21	13	17	21
kPa	T 403[A]	90	117	145	90	117	145
Thickness:[B]							
in. ± 0.0004	T 411[A]	0.0032	0.0040	0.0047	0.0032	0.004	0.0047
mm ± 0.013	T 411[A]	0.081	0.102	0.120	0.081	0.102	0.120
Smoothness, Sheffield (avg. each side)	T 538[A]		235 to 100			200 to 50	
Moisture content, %	D 644	3.5 to 6.2	3.5 to 6.2	3.5 to 6.2	3.8 to 5.5	3.8 to 5.5	3.8 to 5.5
Extract pH, minimum	T 435[A]	4.7	4.7	4.7	4.7	4.7	4.7
Nominal sheet dimensions:[C]							
Length ± 1/32 in. (0.8 mm)							
Width ± 1/32 in. (0.8 mm)							

[A] TAPPI Standard.
[B] Variation within a lot shall not exceed ± 5 %.
[C] The grades in this table are commonly available in the following width by length combinations:
8 ½ by 11 in. (216 by 279 mm),
8 ½ by 14 in. (216 by 356 mm), or
11 by 17 in. (279 by 432 mm).

TABLE 2 Functional Requirements for 25 % Cotton Content Cut-Sized Office Papers

Property	Test Method	Bond 20lb	Reprographic/Laser Printer 20lb
Weight per unit area:			
lb (17 by 22 in./500 ± 5 %)	D 646	20	20
g/m^2± 5 %	T 410[A]	75	75
Opacity, min; %	T 425[A]	85	85
Bursting Strength, minimum:			
psi	D 774	25	...
kPa	T 403[A]	172	...
Thickness:[B]			
in. ± 0.0004	T 411[A]	0.0045	0.0042
mm ± 0.013	T 411[A]	114	107
Smoothness, Sheffield (avg. each side)	T 538[A]	250 to 100	200 to 50
Moisture content, %	D 644, T 412[A]	3.5 to 6.2	3.8 to 5.5
Mechanical pulp, maximum %	D 1030, T 401[A]	0	0
Extract, pH, minimum	T 435[A]	4.7	4.7
Cotton fiber content, minimum %	D 1030, T 401[A] D 5625	25	25
Nominal sheet dimensions:[C]			
Length ± 1/32 in. (0.8 mm)			
Width ± 1/32 in. (0.8 mm)			

[A] TAPPI Standard.
[B] Variation within a lot shall not exceed ± 5 %.
[C] The grades in this table are commonly available in the following width by length combinations:
8 ½ by 11 in. (216 by 279 mm),
8 ½ by 14 in. (216 by 356 mm), or
11 by 17 in. (279 by 432 mm).

TABLE 3 Additional Requirements of 25 % Cotton Content and Grades 1, 2, 3, 4 and N Cut-Sized Office Papers

Type		Bond			Reprographic/Laser Paper		
Property	Test Method	16 lb	20 lb	24 lb	16 lb	20 lb	24 lb
Brightness, minimum %:[A,B]							
25 % Cotton	T 452	86-97	86-97	86-97	86-97	86-97	86-97
Grade No. 1 Super Premium	T 452	94-96	94-96	94-96	94-98	94-98	94-98
Grade No. 1 Premium	T 452	90-93	90-93	90-93	90-93	90-93	90-93
Grade No. 1	T 452	87-89	87-89	87-89	87-89	87-89	87-89
Grade No. 4 Super Premium	T 452	85.5-86.5	85.5-86.5	85.5-86.5	85.5-86.5	85.5-86.5	85.5-86.5
Grade No. 4 Premium	T 452	83.5-85	83.5-85	83.5-85	83.5-85	83.5-85	83.5-85
Grade No. 4	T 452	80-83	80-83	80-83	80-83	80-83	80-83
Grade No. N	T 452	Buyer/Seller	Buyer/Seller	Buyer/Seller	Buyer/Seller	Buyer/Seller	Buyer/Seller
Dirt Count (See X1.7)	T 437	Optional	Optional	Optional	Optional	Optional	Optional

[A] Brightness levels are specified by the customer to meet the end-use requirements of the paper such as contrast and color retention of the finished product. Papers of the same type, but different grade, will have similar functional performance.
[B] Grades of lower brightness than Grade 5 are covered by Grade N.

10. Number of Tests and Retests

10.1 The number of tests called for in the test methods in Table 1, Table 2, or Table 3 shall be made on each bid sample and on each test unit of randomly selected samples of delivered items in accordance with Practice D 585, Plan II or TAPPI T400 Plan II.

11. Conditioning

11.1 Prior to any testing with the exception of moisture, all samples shall be conditioned in accordance with Practice D 685.

12. Test Methods—Bid Samples

12.1 *Bid Sample*—Sample sheets in accordance with Practice D 585, and evaluate tests for each characteristic listed in Table 1, Table 2, or Table 3 to determine compliance with requirements.

12.2 Sample testing and reporting shall be in accordance with the methods listed in Table 1, Table 2, or Table 3. Failure of any one characteristic shall constitute failure of the item.

13. Inspection

13.1 When inspection is made at the point of delivery, the paper shall be sampled in accordance with Practice D 585 Plan II, or TAPPI T400 Plan II, and tested in accordance with the test methods in Table 1, Table 2, or Table 3 to determine compliance with requirements.

13.2 When agreed upon between the purchaser and the seller, machine-use tests to ensure satisfactory performance shall be carried out in the equipment designated in the invitation to bid.

14. Rejection and Rehearing

14.1 If samples selected in accordance with 13.1 fail to meet the bid award specifications, the entire shipment is subject to rejection, and the seller shall be notified immediately. Further procedure is subject to prior agreement between the purchaser and the seller.

15. Packaging and Package Marking

15.1 Paper shall be securely packaged in moisture-resistant wrapping material, unless otherwise specified. Carton containers, when used, shall meet ICC standards for carton quality, with no loose sealing or strapping, and shall be free of bulges and distortion.

15.2 The paper, as packaged, shall be labeled to show grade or trade name, dimension, color, type, grain direction, sheet count, basis weight (grammage) and when required, recycled fiber content. Dimensions and weight shall be in both inches and pounds, and SI units. Recycled fiber content labeling shall include the percentage of total recycled fiber content in a format to be determined by the manufacturer. See X1.12 and X1.13.

16. Keywords

16.1 bond paper; cut size paper; laser printer paper; mimeo paper; recycled content paper; recycled fiber; recycled paper; reprographic paper; spirit duplicator paper

APPENDIXES

(Nonmandatory Information)

X1. ADDITIONAL INFORMATION

X1.1 This specification is not intended to supply all the information that would allow for complete purchasing specifications for cut-sized office papers. It is essential that other information be supplied to the bidders in the invitation for bid.

X1.2 A comparison of recycled fiber weight to the total fiber weight of the paper product is the most common method of calculation used to determine the recycled content. The buyer and the seller may agree to calculate the recycled content in other manners.

X1.3 Recycled fiber is derived from recovered material or recovered paper material. Additional recycled content claims may be made based on source, contamination, or processing. All recycled content claims must meet the substantiation requirements of the FTC. See X1.12.

X1.4 Appearance properties, such as color and reflectance (brightness, whiteness, and so forth) that may be affected by light and by dark aging, may be important to the user. The traditional use of bleached chemical pulp, or cotton, has been recognized as a way to preserve appearance properties. 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. A test method for measuring the effect of light on paper is being developed by Committee D-6.

X1.5 Information such as the various types of machines the paper will be used in, and any other criteria to be agreed upon should be stipulated in the invitation to bid document.

X1.6 Since this specification covers many classifications, the grade, type, basis weight, dimensions, color, grain direction, recycled content, and any drilling or punching requirements should be supplied to the bidders in the invitations for bid.

X1.7 Higher dirt levels affect only the appearance of the paper and typically do not affect functional requirements of the paper. It is recommended that the buyer specify dirt count level if a specific application warrants.

X1.8 Curl performance of reprographic and laser printer paper after image fusing can significantly affect the paper handling reliability of copiers and printers. Due to differences in paper manufacturing practices and differences in various printers and copiers, the side of paper imaged first can impact the curl properties. It is recommended that the instructions of the paper manufacturer and the copier or printer manufacturer be consulted for best performance.

X1.9 High-speed copiers and printers with their special features place special demands on paper. The purchaser may want to consider specifying a use test (see 13.2).

X1.10 Cockle and other textured finishes may interfere with toner adhesion and image quality if used in reprographic or laser printer equipment. The purchaser may want to consider specifying a use test.

X1.11 The U.S. EPA Paper Procurement Guideline and Recovered Material Advisory Notice recommend minimum recovered paper content ranges for printing and writing papers. Current copies of these EPA documents may be obtained by calling 800-424-9346.

X1.12 The Federal Trade Commission has published guidelines for the use of environmental marketing claims which may be obtained by calling (202) 326-3753.

X1.13 The American Forest and Paper Association has prepared a brochure, Paper Recycling Symbol Guidelines.[7]

[7] Available from American Forest and Paper Association, Inc., 1111 19th St., NW, 8th Floor, Washington, DC 20036.

X2. DESCRIPTIONS OF TYPES OF PAPERS

X2.1 *Bond Paper* was originally a cotton-content writing or printing paper designed for the printing of bonds, legal documents, and the like, and distinguished by superior strength, performance, and durability. The term is applied to papers for applications such as letterheads, business forms, social correspondence papers, and the like. Typical properties include printability, erasibility, whiteness, cleanliness, freedom from fuzz, uniform finish, and good formation.

X2.2 *Mimeo* is a grade of writing paper used for making copies on stencil duplicating machines. It is characterized by good opacity, ink absorbency, and freedom from lint, plus good printing, writing, and mimeographing quality. The word "mimeograph" is a trademark applied to the stencil duplicator invented by Albert Blake Dick in 1884. A stencil duplicator is an apparatus by which reproductions of type-written and illustrative material may be produced by the use of a stencil. The principle part of the machine is a device for applying ink to the stencil, which in turn transfers it to a sheet of paper.

X2.3 *Spirit Duplicator* is a grade of paper used in a spirit duplicating process. The original copy is typewritten on a coated paper backed up with a carbon paper containing a heavy alkaline pigment coating. The prepared master is placed in a

spirit duplicator machine and copies are made therefrom contacting it with sheets of the duplicator paper that have been dampened with alcohol (spirit).

X2.4 *Reprographic Paper*, also known as *copy paper*, is a grade of paper suitable for copying by the xerographic or electrophotographic process. Reprographic papers are characterized by a smooth finish, heat stability, noncurling qualities, and good aesthetic properties.

X2.5 *Laser Printer Paper* is a grade of paper recommended for use in laser printers. A laser printer is basically a xerographic copier in which the reflected light imaging portion of the machine is replaced by a laser. Similarly, this type of paper would be recommended for use in any electrophotographic printer where the light source could be a light emitting diode (LED), liquid crystal system (LCS), laser diode, or other controlled light source.