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Series 9
Série 9

WITHDRAWAL

February 2021

Paper and paper products

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Février 2021

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CAN/CGSB

Paper and paper products

No. 9.70-2016

Permanence of paper for records, books and other documents (ICS 85.080.99)

CAN/CGSB

Papier et produits de papier

No. 9.70-2016

Permanence du papier pour dossiers, livres et autres documents (ICS 85.080.99)

Government of Canada
Gouvernement du Canada

Canadian General Standards Board
Office des normes générales du Canada

CAN/CGSB-9.70-2016

Supersedes CAN/CGSB-9.70-2000

National Standard of Canada

Permanence of paper for records, books and other documents

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NATIONAL STANDARD OF CANADA **C**/CGSB-9.70-2016**

Supersedes CAN/CGSB-9.70-2000

Permanence of paper for records, books and other documents

CETTE NORME NATIONALE DU CANADA EST DISPONIBLE EN VERSIONS FRANÇAISE ET ANGLAISE.

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Introduction

This standard was developed by the Canadian General Standards Board Subcommittee on Permanence of paper. This Subcommittee was established in November 1991 and was harmonized with the Canadian Advisory Committee on ISO/TC 46/SC 10 *Requirements for document storage and conditions for preservation* for the review and development of standards relating to the permanence of paper, and was approved by the CGSB Committee on Printing and writing paper.

As in other nations, Canadian librarians, archivists and conservators have long observed the rapid deterioration which threatens much of our paper-based heritage. While storage conditions and environmental factors contribute to this deterioration, scientists also recognized that some of the components and chemical processes used in the manufacture of paper play a large role in its decomposition. Deacidification, microfilm and digital technology can help forestall the loss of deteriorating materials but are costly solutions for libraries and archives. The simple preventative strategy of printing records and publications on permanent paper can help ensure that our heritage is still usable hundreds of years from today.

In drafting this standard, the Committee began with the definition of paper permanence found in the ANSI and ISO standards: the ability of paper to last at least several hundred years without significant deterioration under normal use and storage conditions in libraries and archives. The Committee recognized that two aspects of permanence are involved: *mechanical* permanence or the maximum retention of the paper's strength properties; and *optical* permanence, which is not scientifically defined but is generally assumed to mean the maximum retention of the paper's original brightness and colour.

Librarians and archivists are concerned about those parameters of permanence which affect the long-term usability of paper and the legibility of the information it contains. While mechanical permanence is essential in all cases, the need for optical permanence is variable. For many applications, a degree of change in appearance can be tolerated provided it does not have a negative impact on the legibility or reproducibility of the information. For some documents with high aesthetic or artifactual value, any degree of visible change is undesirable.

While permanent paper standards exist in other countries, the debate in Canada centered on the limitation on lignin content common to these standards. This resulted in Canada's decision to submit an abstaining vote on the Draft International Standard DIS 9706. Both ANSI/NISO Z39.48:1992 and ISO 9706:1994 standards contain references to the fact that some alkaline papers with levels of lignin higher than those specified in their standard passed the accelerated aging tests used in their standard development process. However, alkaline papers containing more than 1 % lignin were subsequently excluded due to the expressed need for further research to define more precisely the conditions under which higher levels of lignin are compatible with paper permanence. ISO also indicated concern over the lack of scientific certitude around the effects of oxides of sulphur and nitrogen in the atmosphere on lignin-containing fibres.

Addressing the need to learn more about the impact of lignin on paper permanence before work could begin on a Canadian standard, the CGSB Subcommittee on Permanence of paper developed a research program for which Government and industry sponsorship was obtained. The requirements in this standard are based upon the results of this Canadian Co-operative Permanent Paper Research Project[1], which concluded its three-year examination of the impact of lignin on paper permanence in April 1997. This research which confirmed earlier work on mechanical properties, found that an alkaline reserve is very effective in reducing the negative impact of airborne pollutants and accelerated aging in both lignin-containing and lignin-free

[1] Zou, X., Gurnagul, N., Deschâtelets, S., Bégin, P., Iraci, J., Grattan, D., Kaminska, E., and Woods, D., "Canadian Co-operative Permanent Paper Research Project: The impact of Lignin on Paper Permanence", Final report, January 1998.

sheets[2]. The key finding of this project was that in alkaline papers buffered with calcium carbonate (those with a pH of 7.0 or higher), the presence of lignin has no negative impact on their mechanical permanence. An adequate alkaline buffer is, therefore, the main determinant of mechanical permanence of paper. The CGSB standard responds to questions raised about the inclusion of lignin in permanent papers by providing a scientifically-based specification for mechanical permanence.

This standard recognizes that there are no specifications and thus no optical permanence assurances offered in any of the permanent paper standards published at the time of this writing. Because there is an absence of usable science on which to base specifications, in order to give a greater level of assurance to paper buyers and users, the Committee concluded that the CGSB standard would offer guidance that will potentially provide for a high level of optical permanence based on accumulated practical experience (see Annex B). In addition, several ISO standards (ISO 5630 series) on accelerated ageing are available to evaluate the effect of thermal treatment, atmospheric pollutants, or exposure to light.

As a result of these discussions, two categories of permanence have been established: 1) mechanical and 2) mechanical and optical.

[2] Zeisler, P., Hamm, U., and Gottsching, L., “The Effect of Air Pollutants on the Permanence of Paper. Part I: Graphic Papers”, Das Papier 10: 616-628 (1995).

C/CGSB-9.70-2016**

Supersedes CAN/CGSB-9.70-2000

Permanence of paper for records, books and other documents

1 Scope

This National Standard of Canada defines permanence requirements for paper in a broad range of coated and uncoated paper grades. When used in conjunction with other CGSB paper standards specifying each grade's performance and physical requirements, this standard defines additional requirements necessary to provide a high degree of certainty that a paper will remain usable for several hundred years without significant deterioration, under normal use and storage conditions in libraries and archives.

A key objective of the standard is to ensure that paper buyers and specifiers have clear information on the permanence of any paper product meeting the requirements of this standard.

The standard applies to a broad range of paper grades commonly used in the production of records, books and other documents, which could be retained by archives and libraries, such as GCS 9.1 and GCS 9.29 or any other paper standard.

The testing and evaluation of a product against this standard may require the use of materials and/or equipment that could be hazardous. This document does not purport to address all the safety aspects associated with its use. Anyone using this standard has the responsibility to consult the appropriate authorities and to establish appropriate health and safety practices in conjunction with any applicable regulatory requirements prior to its use.

2 Normative references

The following normative documents contain provisions that, through reference in this text, constitute provisions of this National Standard of Canada. The referenced documents may be obtained from the sources noted below.

NOTE The addresses provided below were valid at the date of publication of this standard.

An undated reference is to the latest edition or revision of the reference or document in question, unless otherwise specified by the authority applying this standard. A dated reference is to the specified revision or edition of the reference or document in question.

2.1 Canadian General Standards Board (CGSB)

GCS 9.1 – *Bond paper*

GCS 9.29 – *Opaque litho book paper.*

2.1.1 Source

The above may be obtained from the Canadian General Standards Board, Sales Centre, Gatineau, Canada K1A 1G6. Telephone 819-956-0425 or 1-800-665-2472. Fax 819-956-5740. E-mail ncr.cgsb-ongc@tpsgc-pwgsc.gc.ca. Web site www.tpsgc-pwgsc.gc.ca/ongc-cgsb/index-eng.html.

2.2 ASTM International

D4988 — *Standard test method for determination of alkalinity of paper as calcium carbonate (Alkaline Reserve of Paper)* (withdrawn 2010).

2.2.1 Source

The above may be obtained from ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959, U.S.A., telephone 610-832-9585, fax 610-832-9555, Web site www.astm.org, or from IHS Global Canada Ltd, 200-1331 MacLeod Trail SE, Calgary, Alberta T2G 0K3, telephone 613-237-4250 or 1‑800-267-8220, fax 613-237-4251, Web site www.global.ihs.com.

2.3 Technical Association of the Pulp and Paper Industry (TAPPI)

T 509 – *Hydrogen ion concentration (pH) of paper extracts (cold extraction method).*

2.3.1 Source

The above may be obtained from the Technical Association of the Pulp and Paper Industry (TAPPI), 15 Technology Parkway South, Suite 115, Peachtree Corners, GA 30092, U.S.A. Telephone 1-800-446-9431 (toll-free Canada), 1-800-332-8686 (toll-free U.S.A.), 1-770-446-1400 (Worldwide). Fax 1-770-446-6947. Web site www.tappi.org.

3 Terms and definitions

For the purposes of this National Standard of Canada, the following terms and definitions apply.

3.1
alkaline reserve
compound in paper (such as calcium carbonate) that neutralizes acid that might be generated from natural ageing or atmospheric pollution.

3.2
document
paper upon which information is recorded.

3.3
mechanical permanence
maximum retention of strength properties.

3.4
optical permanence
maximum retention of original brightness and colour.

3.5
permanence
resistance of paper to changes in any or all of its properties with the passage of time.

3.6
pH
negative logarithm of the hydrogen ion concentration in an aqueous solution or the logarithm of the reciprocal of the hydrogen ion concentration, measured on a scale of 0-14. Numerically expressed, pH 7.0 is neutral, lower numbers are acidic and higher numbers are alkaline.

3.7
record
information on paper that has been created, collected or received in the initiation, conduct and completion of an activity. This includes correspondence, memorandums, plans, maps, drawings, diagrams, pictorial or graphic work and any other documentary material, and any copy thereof.

4 Requirements for permanence

4.1 General requirements

4.1.1 Alkaline reserve

The paper shall contain a minimum of 2% by weight of alkaline reserve calculated as calcium carbonate. This reserve is based on the oven-dry weight of the finished paper (as described in ASTM D4988, with optional modifications given in Annex A).

4.1.2 pH value

The paper shall have a pH value in the range of 7.0 to 10.0 (cold-water extract) when tested in accordance with TAPPI T 509.

NOTE This test gives the average pH value of the paper. However, in a permanent paper, no single layer should have a pH value below 7.5. The manufacturer's warrant of the use of an alkaline process may be accepted as an indication that the paper meets this requirement.

4.1.3 Strength and performance properties

The paper shall meet all requirements for paper strength and performance that have been established for individual grades in GCS 9.1 and GCS 9.29.

4.2 Mechanical permanence

4.2.1 Paper furnish

In addition to meeting the requirements of 4.1, the paper furnish shall have no restrictions with regard to the cotton, linen or wood fibre type or lignin content thereof.

4.3 Mechanical and optical permanence

4.3.1 Paper furnish

In addition to meeting the requirements of 4.1, the paper furnish shall not contain more than 1% lignin. (For more details, see Annex B.)

5 Statement of compliance

5.1 Statement of compliance for mechanical permanence

"This paper meets the requirements of CAN/CGSB-9.70 – Permanence of paper for records, books and other documents – Mechanical permanence."

5.2 Statement of compliance for mechanical and optical permanence

"This paper meets the requirements of CAN/CGSB-9.70 – Permanence of paper for records, books and other documents – Mechanical and optical permanence."

5.3 Placement of the statement of compliance

5.3.1 Producers and users of paper meeting the requirements of this standard should use the appropriate statement of compliance, (see 5.1 or 5.2) in order to help identify and enhance awareness of permanent paper.

5.3.2 Advertising, packaging and promotions

For all paper that complies with this standard, the appropriate statement of compliance, where applicable, should be used in advertising, packaging, promotions, and sales catalogues.

5.3.3 Printed materials

The appropriate statement of compliance, where applicable, should appear on the verso of the title page of a book or on the masthead or copyright area of a periodical publication.

Annex A
(*informative*)

Modifications to the alkaline reserve test method

A.1 The determination of the end-point of the titration using methyl red indicator as described in ASTM D4988 has been modified for this standard. The end-point is determined potentiometrically rather than by coloured indicator. The titration is carried out to a pH of 7.0 with nitrogen bubbling through the solution to displace carbon dioxide.

Annex B
(*informative*)

Notes on optical permanence

B.1 Regardless of its composition, the optical permanence of any paper product can be assessed using one of several ISO standards (ISO series 5630) on accelerated ageing to evaluate the effect of thermal treatment, atmospheric pollutants, or exposure to light. Accelerated ageing tests can be particularly useful when specific changes are to be made to the papermaking conditions or to paper composition. In this case, papers can be compared side by side, minimizing the need for conducting extensive accelerated ageing tests.

Uncoated lignin-free papers are generally understood to have the highest degree of optical permanence, since they are unlikely to contain the less optically stable materials used in coated papers, and would be less susceptible to photo-yellowing. Recent trends and technical developments in the industry are making it more difficult to use such composition-based specifications. For example defining “uncoated” paper is becoming increasingly more complex as the paper industry continues to develop new paper additives and surface treatments in response to advances in printing technologies. These additives or treatments can either improve or result in the deterioration or optical permanence. Thus, there can be no assurances that the appearance of such papers will not change over time. The actual optical performance of any paper will be subject to many factors, including the type and quantity of chemical and mineral additives; any coating or surface treatment materials used in the papermaking process; a wide and unspecified variety of user applications; exposure to light and pollutant gas; and storage conditions.

Industry in general is moving towards performance-based standards. In support of this, there are a number of active research programs underway seeking to understand better the mechanisms of brightness reversion, to develop inhibitor solutions, and to develop reliable optical performance tests. In the future, users will be able to select a permanent paper based on reliable test methods rather than composition. In addition, determining the optical permanence requirements of end-user communities is a critical step in the development of performance-based standards; work needs to be initiated to quantify this aspect of user needs.

The standard will be open to review and amendment, based on relevant published research deemed to add benefits to the users of the standard.

Bibliography

[1] American National Standards Institute (ANSI), ANSI/NISO Z39.48 — *Permanence of paper for publications and documents in libraries and archives.* Available from the American National Standards Institute, Customer Service, 11 West 42nd Street, New York, NY 10036, or from IHS Global Canada Ltd, 200-1331 MacLeod Trail SE, Calgary, Alberta T2G 0K3, telephone 613-237-4250 or 1‑800-267-8220, fax 613-237-4251, Web site www.global.ihs.com.

[2] International Organization for Standardization (ISO), ISO 9706 — *Information and documentation – Papers for documents – Requirements for permanence.* Available from IHS Global Canada Ltd, 200-1331 MacLeod Trail SE, Calgary, Alberta T2G 0K3, telephone 613-237-4250 or 1‑800-267-8220, fax 613-237-4251, Web site www.global.ihs.com.

[3] International Organization for Standardization (ISO), ISO 5630-1 — *Paper and board – Accelerated ageing – Part 1: Dry heat treatment at 105 degrees C.* Available from IHS Global Canada Ltd, 200-1331 MacLeod Trail SE, Calgary, Alberta T2G 0K3, telephone 613-237-4250 or 1‑800-267-8220, fax 613-237-4251, Web site www.global.ihs.com.

[4] International Organization for Standardization (ISO), ISO 5630-3 — *Paper and board – Accelerated ageing – Part 3: Moist heat treatment at 80 degrees C and 65% relative humidity.* Available from IHS Global Canada Ltd, 200-1331 MacLeod Trail SE, Calgary, Alberta T2G 0K3, telephone 613-237-4250 or 1‑800-267-8220, fax 613-237-4251, Web site www.global.ihs.com.

[5] International Organization for Standardization (ISO), ISO 5630-4 — *Paper and board – Accelerated ageing – Part 4: Dry heat treatment at 120 or 150 degrees C.* Available from IHS Global Canada Ltd, 200-1331 MacLeod Trail SE, Calgary, Alberta T2G 0K3, telephone 613-237-4250 or 1‑800-267-8220, fax 613-237-4251, Web site www.global.ihs.com.

[6] International Organization for Standardization (ISO), ISO 5630-5 — *Paper and board – Accelerated ageing – Part 5: Exposure to elevated temperature at 100 degrees C.* Available from IHS Global Canada Ltd, 200-1331 MacLeod Trail SE, Calgary, Alberta T2G 0K3, telephone 613-237-4250 or 1‑800-267-8220, fax 613-237-4251, Web site www.global.ihs.com.

[7] International Organization for Standardization (ISO), ISO 5630-6 — *Paper and board – Accelerated ageing – Part 6: Exposure to atmospheric pollution (nitrogen dioxide).* Available from IHS Global Canada Ltd, 200-1331 MacLeod Trail SE, Calgary, Alberta T2G 0K3, telephone 613-237-4250 or 1‑800-267-8220, fax 613-237-4251, Web site www.global.ihs.com.

[8] International Organization for Standardization (ISO), ISO 5630-7 — *Paper and board – Accelerated ageing – Part 7: Exposure to light.* Available from IHS Global Canada Ltd, 200-1331 MacLeod Trail SE, Calgary, Alberta T2G 0K3, telephone 613-237-4250 or 1‑800-267-8220, fax 613-237-4251, Web site www.global.ihs.com.