

# Repair and allied processes for the conservation of documents — Recommendations

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# Committees responsible for this British Standard

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- BCS — British Computer Society
- British Library
- British Museum
- British Records Association
- Chartered Institution of Building Services
- Conservation Centre, Camberwell College
- D. Allsopp
- Institute of Paper Conservation
- London College of Printing
- M.M. Foot
- Museums and Galleries Commission
- Public Record Office
- Royal Commission on Historical Manuscripts
- Royal Institute of British Architects
- Society of Archivists
- Storage Equipment Manufacturers Association

The following bodies were also represented in the drafting of the standard through panel IDT/2/9/2, Binding materials:

- Bodleian Library
- Cambridge University Library
- Cedric Chivers Ltd
- National Library of Scotland
- National Library of Wales
- National Preservation Office
- Riley Dunn and Wilson Ltd
- Scottish Record Office
- Sheffield Archives
- Trinity College Dublin

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## Foreword

This British Standard has been prepared by Subcommittee IDT/2/9. It supersedes BS 4971-1:1988 and BS 4971-2:1980, which are withdrawn.

The continuing awareness of the value and need to conserve archives and other documentary information sources of long term value is evident in the institutions that have a responsibility for the care of such materials, in the development of the National Preservation Office and in the professional organizations serving conservation. The sheer quantity of documents known to be in need of treatment continues to be a problem and conservators remain concerned about the limited durability of materials, inks and colours of the documents, as well as some of the materials and methods available for their treatment.

The first edition of BS 4971 was published in 1973 and revised in 1988. This revision has been prepared to take account of research and advances made in document conservation treatments and knowledge gained since the last revision. It has been structured differently to provide a more logical approach to the assessment and provision of treatment and attempts to address treatment differences for paper and parchment by having separate clauses covering the repair of each material. Also, the recommendations are given in a single standard instead of two parts. This is because the revision panel felt that binding, previously covered in BS 4971-2, was too large and complex a subject to be adequately dealt with by incorporation into this standard. A new clause on books and codices has been introduced, as has a clause on protective housings. The methods recommended reflect current thinking in the conservation profession and can be safely undertaken by a trained conservator.

It has been assumed in the drafting of this standard that the execution of its provisions will be entrusted to appropriately qualified and competent people, for whose use it has been produced.

**WARNING.** This British Standard calls for the use of substances and/or procedures that may be injurious to health if adequate precautions are not taken. It refers only to technical suitability and does not absolve the user from legal obligations relating to health and safety at any stage.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

**Compliance with a British Standard does not of itself confer immunity from legal obligations.** Attention is drawn to the statutory regulations listed in 5.1.

### Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 36, an inside back cover and a back cover.

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## 1 Scope

This British Standard gives recommendations for remedial treatments and allied processes for use in the conservation of documents that have a long term value and are held in archives, libraries or private collections. It is not applicable to photographs, works of art on paper or electronic media.

NOTE Information about the storage of various kinds of photographic material is given in BS 1153. Photographic film of archival quality is specified in BS 5699-1 and BS 5699-2.

The standard is applicable to treatments that might be necessary to ensure the continued preservation of paper, parchment and seals. Methods of treatment are explained in detail only if information about them is not easily available elsewhere.

These recommendations apply to the conservation of documents in the United Kingdom but might be appropriate for other countries with similar, temperate climates.

## 2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this British Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. For undated references, the latest edition of the publication referred to applies.

BS 2924-1, *Aqueous extracts of paper, board and pulp — Part 1: Method for determination of pH.*

BS 5454, *Recommendations for the storage and exhibition of archival documents.*

BS 7258-2, *Laboratory fume cupboards — Recommendations for the exchange of information and recommendations for installation.*

BS EN 149, *Respiratory protective devices — Filtering half masks to protect against particles — Requirements, testing, marking.*

BS EN ISO 2062, *Textiles — Yarns from packages — Determination of single-end breaking force and elongation at break.*

BS EN ISO 3696:1995, *Water for analytical laboratory use — Specification and test methods.*

BS EN ISO 9706, *Information and documentation — Paper for documents — Requirements for permanence.*

BS EN ISO 20534, *Method for determination of thickness and apparent bulk density or apparent sheet density of paper and board.*

## 3 Terms and definitions

For the purposes of this British Standard the following terms and definitions apply.

### 3.1

#### **alkaline reserve**

compound that has been added to paper to counteract or neutralize subsequent acid attack

### 3.2

#### **analytical grade**

grade of chemical used for laboratory work which has a higher degree of purity than reagent grade

### 3.3

#### **aqueous cleaning**

process of cleaning a document with water either by immersion or supported on the surface of water

### 3.4

#### **archival quality**

quality of materials which have been produced to a standard that makes them appropriate for use in the conservation or preservation of archive and library materials

### 3.5

#### **archival specification material**

material which contains no substances that will harm the original and which has long term stability

**3.6**

**archive**

collection of documents intended for long term preservation because of their continuing intrinsic value

**3.7**

**bifolium**

sheet folded in half to form two leaves (four pages)

**3.8**

**blast freezing**

process that uses a current of air to cool material rapidly to a temperature not higher than  $-10^{\circ}\text{C}$

**3.9**

**bullae**

round leaden papal seal attached to a document

NOTE The term can also refer to the whole document of a papal edict.

**3.10**

**BP quality**

quality specified in a monograph in the British Pharmacopoeia

**3.11**

**chemical sponge**

dense sponge made from vulcanized rubber used for collecting surface dirt, particularly smoke particulates

**3.12**

**collagen fibre material**

prepared natural membrane from the appendix of cattle, or fish swim bladder membrane, or sausage casing made from reconstituted cattle skin, bone or cartilage

NOTE The membrane from the appendix of cattle is commonly known as “gold-beater’s skin”.

**3.13**

**colophony resin**

pale yellow, orange or brown resin consisting of abietic and dehydroabietic acids used as a consolidant when combined with wax

**3.14**

**conservation**

practical treatments and processes used to protect archive documents from further deterioration without adversely affecting the integrity of the original

**3.15**

**controlled tension**

method of eliminating distortion in a document when reducing the moisture content of the document during drying, or while in storage

**3.16**

**deacidification**

process of removal and neutralization of acids present in paper by using aqueous, non-aqueous or gaseous alkaline substances and depositing alkaline salts as a buffering agent

**3.17**

**deep freezing**

freezing documents below  $-18^{\circ}\text{C}$

**3.18**

**document**

combination of a carrier, the information recorded on it, and the medium used to record it

**3.19****dye**

substance in solution which can be used to impart colour to a variety of materials such as paper, leather and parchment

**3.20****encapsulation**

process by which a document sheet is protected by placing it between two sheets of transparent polyester film subsequently joined around the edges

**3.21****enzyme**

naturally occurring, complex proteinaceous substance that acts as a catalyst in a biochemical reaction

**3.22****evidential hole**

hole in a document that provides evidence of its history

NOTE Examples include worm holes, holes for filing thongs and, in parchment, holes that were in the skin before text was applied.

**3.23****felt mark**

impression remaining in paper after being pressed using papermaker's felts

**3.24****fixative**

substance that is applied to an ink or dye before treatment when it is believed that the medium or its binder will be fugitive or liable to change when exposed to a treatment solvent

**3.25****fixing**

process of rendering stable or permanent

**3.26****fluorescence**

reaction of a substance emitting rays of greater wavelength than those received

**3.27****friable**

easily crumbled or reduced to powder

**3.28****fugitive**

movement or change of an ink, dye or pigment on its carrier when a solvent is applied

**3.29****fumigation**

gaseous process carried out under controlled conditions to inhibit fungal growth or insect infestation

**3.30****gutta percha**

coagulated latex of various Malaysian trees of the sapodilla family

**3.31****heat-set**

thermoplastic adhesive coating that sets after heat and pressure have been applied

NOTE This is usually a blend of hard and soft acrylic emulsions in water, made either in the workshop or commercially.

**3.32****humidification**

process to increase the moisture content of a material by increasing the amount of water vapour in the environment in which it is temporarily placed

**3.33**

**hydration**

process of increasing the water content of a document

NOTE This is usually done to make it more flexible (see also **3.57** relaxation).

**3.34**

**illuminated manuscript**

manuscript decorated or illustrated with coloured pigments, gold or silver

**3.35**

**ink**

fluid or viscous compound used for writing, drawing or printing

NOTE It can be in the form of a dye or pigment, the viscosity of the medium varying depending on the intended use.

**3.36**

**iron gallotannate ink**

ink produced by the reaction of tannins in conjunction with an iron salt such as ferrous sulfate

NOTE After application, for example to paper, the ink is darkened by oxidation.

**3.37**

**lamination**

process of fastening sheets of tissue, paper or transparent plastics material with a transparent adhesive to one or both sides of a sheet of paper to strengthen and protect it

NOTE This is achieved by using either a solvent, or heat and pressure.

**3.38**

**leaf-casting**

process that uses a suspension of paper pulp applied by vacuum suction or gravity, to fill in missing areas of a document

**3.39**

**lignin**

non-carbohydrate substance which, together with cellulose, forms the woody cell walls of plants

NOTE It adds mechanical strength and bonding to the plant.

**3.40**

**machine direction**

direction in which paper pulp travels through a paper making machine and the direction in which a significant proportion of the fibres lie

**3.41**

**make-up**

method and order of fastening membranes or sheets together to constitute a complete document or volume, or the manner in which a single sheet is folded

**3.42**

**mechanical cleaning**

surface cleaning of a document using physical methods

NOTE These methods include use of a brush, eraser and chemical sponge.

**3.43**

**mechanical wood pulp**

pulp produced from disintegrated or ground wood, usually spruce, from which impurities have not been removed

**3.44**

**medium**

ink, dye, pigment or other substance attached to the surface of a carrier to provide visual information content or decoration

**3.45****membrane**

single skin, or part of a skin, of parchment or vellum

**3.46****non-ionic detergent**

synthetic chemical which reduces the surface tension of water thus enabling it to penetrate paper easily

**3.47****non-woven polyester**

open, heat-sealed web of polyester fibres used to support documents during treatment

**3.48****parchment thong**

long narrow strip of twisted parchment on which loose parchment or paper documents are threaded, or narrow strips of parchment on which sections of books can be sewn

**3.49****pH value**

point on a logarithmic scale showing the concentration of hydrogen ions in a solution

NOTE This is used to denote acidity or alkalinity on a scale of 1 to 14, neutral being pH 7.

**3.50****pigment**

insoluble particles of a coloured material in suspension in a fluid which, after application, evaporates leaving a solid surface coating of the particles

**3.51****pressure sensitive adhesive**

adhesive that produces a tacky film which readily adheres to a material after a brief application of pressure

**3.52****propolis**

reddish resinous substance collected by bees from the buds of trees to consolidate the interior of their hives

**3.53****preservation**

all management, financial and technical issues involved in preserving archive and library materials in all formats, and/or their information content, so as to maximize their useful life

**3.54****reagent grade**

grade of chemical commonly used for laboratory work when small amounts of impurities will not harmfully affect the behaviour of the reagent

**3.55****reconstituted collagen**

re-hydrated natural protein of skin, bone and connective tissues used in parchment repair

**3.56****relative humidity**

ratio of the absolute humidity to the maximum possible density of water vapour in the air at the same temperature, expressed as a percentage

**3.57****relaxation**

process of making a document more flexible to rectify over-tight folding, creasing, cockling or distortion, without strain or damage

**3.58**

**release paper**

paper coated with a stable layer of material, such as a silicone resin, to which other substances, including adhesives, do not stick permanently

**3.59**

**repair**

techniques and/or materials applied to a document in order to make it usable

**3.60**

**reprographic method**

process which allows reproduction from an original

NOTE The most common reprographic methods are electrostatic copying, photography and microfilming.

**3.61**

**restoration**

process used in reconstructing damaged archive and library materials to a perceived original form

NOTE It does not necessarily include good conservation practices.

**3.62**

**reversible**

status that will allow certain treatments to be reversed, as far as is possible, allowing a document to be returned to its pre-treatment condition

**3.63**

**size**

substance used to strengthen paper and to decrease its absorbency

**3.64**

**spanish wax**

compound of cinnabar and colophony resin

**3.65**

**substrate**

carrier holding the information media

**3.66**

**surfactant**

substance that alters the interfacial tension of water and other liquids or solids

**3.67**

**tub-sized paper**

newly formed paper which has been immersed in gelatin size, as opposed to surface coating

**3.68**

**ultrasonic humidification**

production of a fine cold mist of water using ultrasonic equipment which is then used for relaxing parchment or paper without directly wetting it

**3.69**

**vacuum desiccator**

glass container connected to a vacuum pump

NOTE This is used during treatment to evacuate air from a friable seal.

**3.70**

**vacuum table**

perforated flat surface that allows documents to be supported under tension using a vacuum created below the surface

### 3.71

#### **wetting agent**

substance which lowers the surface tension of water and is used in washing to aid the removal of soluble substances from paper

NOTE Ethanol, acetone and non-ionic detergents may all be used as wetting agents.

## **4 General principles**

### **4.1 Maintaining the integrity of documents**

Custodians of archive and library materials are responsible for maintaining the integrity of the documents in their care. This means preserving the textual, pictorial and physical content and character of the documents.

Changes to the original arising from unnecessary or inappropriate conservation interventions can destroy unique and important evidence of the document's status, production, historical context and provenance. This compromises the document's value to research, and in the case of an archival document undermines its legal authenticity.

Owing to the above considerations, the option to conserve a document should be very carefully considered and taken after consultation between curatorial and conservation experts. It should be viewed as a final option in an overall collections care programme, which in the first instance should employ preventive techniques (effective environmental control, good handling practices, protective enclosures, substitutes) to prevent and reduce deterioration of the document from its original condition. An effective collections care programme should ensure that documents that have received conservation treatment are returned to a protective environment.

A collection that has remained virtually undisturbed might have a special historical value or significance and should therefore be treated as a whole, and not as a collection of individual items.

### **4.2 Principle of minimum intervention**

Minimum intervention should be used to support and stabilize items to ensure preservation of the integrity of the document and to minimize the risk of further damage during treatment. No original material should be removed during treatment, unless it threatens the long-term preservation of the whole item. Materials and techniques should be used which will not harm the item and which will not impede future examination, treatment or function of the item. Repairs should be capable of being undone without damaging the document.

Material used in the course of treatment should be distinguishable from the original document, but aesthetically acceptable. Treatment to prolong the life of an archival document is distinct from the process of restoration.

### **4.3 Selection and assessment of documents for treatment**

The assessment process should involve examination by curatorial and conservation experts and subsequent decisions should reflect the concerns of both. Consultation between the two parties should be ongoing as necessary during treatment so that account can be taken of evidence exposed and, if necessary, decisions adjusted.

Selection of documents for treatment should be structured and systematic in order to ensure that treatment is necessary and that all factors affecting treatment are identified. This is important in order to encourage appropriate and effective use of resources. It is recommended that a clear policy is in place which should include a selection procedure and clear lines for consultation and be drawn up in the light of overall conservation objectives. Decisions should be made in the context of an on-going collections care programme, a condition assessment of the material, the function of the item and its future use and storage. For example, a document that is likely to be frequently exhibited or consulted might well require different treatment from one that will rarely be exhibited or consulted. Where a document is part of a collection, it is useful to carry out a general assessment of the collection to assist in establishing priorities. Priorities for treatment should be regularly reviewed with due consideration of the resources available.

#### **4.4 Testing prior to treatment**

In order to minimize the risk of causing damage and change during treatment, and in order to identify the parameters within which treatment can proceed, it is essential that areas of the substrate and media to be treated are tested prior to commencing treatment. The contact time of the test should reflect that of the intended treatment. Consideration should be given to the effect of the test on the document, bearing in mind that treatment might not always follow. Documents that have loose or friable media require special consideration.

#### **4.5 Documentation**

See 7.4 for recommendations regarding conservation records.

### **5 Health and safety**

#### **5.1 Legislation**

**5.1.1** Under the Health and Safety at Work etc. Act 1974 [1] it is the responsibility of employers, line managers and individuals to ensure that appropriate safety measures are in place to protect themselves, colleagues and others, within and outwith the work place. This includes risk related to exposure to chemical, physical and biological agents.

**5.1.2** Some of the chemicals referred to in this standard have physical and chemical properties that present a significant health and safety risk. Attention is drawn to the Control of Substances Hazardous to Health (COSHH) Regulations 1994 [2], the Control of Pesticides Regulations 1986 [3] and the Environmental Protection Act 1992 [4] and its subordinate legislation. Attention is also drawn to The Personal Protective Equipment (PPE) Regulations 1992 [5].

#### **5.2 Fume cupboards**

Fume cupboards should have a face velocity sufficient for the chemicals used and be sited according to the recommendations given in BS 7258-2.

### **6 General recommendations**

#### **6.1 Materials used for treatment**

Materials brought into contact with the document during treatment should not cause additional deterioration to the document either immediately or in the longer term. Reagents and materials should be used which have known constituents with the minimum of impurities.

Full specifications for materials should be obtained from suppliers and spot testing should be carried out to check key constituents. Examples of spot testing are given in A.1.

#### **6.2 Erasers**

Material used for surface cleaning should not abrade the substrate or image, and should not leave any harmful residue. For example, erasers made of solid or granular material containing vulcanized fatty oil or other additions such as pumice should not be used. Suitable erasers include chemical sponges and vinyl erasers.

#### **6.3 Water**

Water conforming to grade 3 as specified in BS EN ISO 3696:1995 should be used in the preparation of reagent solutions and in analytical determinations, and should be used for all processes.

### **7 Preparation for treatment**

#### **7.1 Selection of documents for treatment**

Collection documents should be selected for treatment only after a survey has determined the overall needs, in terms of the state of the material, storage and the nature of use the document will receive. Priorities for treatment should be regularly reviewed, with due consideration of the resources available for it.

## 7.2 Examination and assessment of documents

All documents should be thoroughly examined prior to treatment. Documents should undergo an initial assessment as part of the process of selection for treatment. An examination should then be carried out before commencing treatment to ensure that what is proposed is appropriate, and to establish the parameters within which the treatment can proceed safely. Systematic and disciplined examination should be carried out to ensure that the conservator is fully familiar with the document and to enable monitoring of the effects of treatment as it proceeds.

Examination and assessment should be restricted to what is necessary to give information on the proposed treatment. This is particularly the case when techniques are destructive or involve sampling.

For routine examination and assessment, simple, non-destructive methods should be the first line of approach. These include examining the document with the naked eye in normal light and then introducing various degrees of magnification, and lightly handling the document to assess its characteristics (e.g. thickness, texture, flexibility and behaviour). The use of ultra-violet radiation, raking light and transmitted light is also recommended. This examination should provide guidance for further testing methods to be used that involve more intervention with the document, such as the measurement of pH and the solubility of inks and pigments, and determine whether certain materials require further identification. A range of analytical methods is available. Examples of methods and their uses are given in Annex B.

## 7.3 Faded and obliterated text

Advice on the treatment of faded and obliterated text is given in Annex C.

## 7.4 Documentation

All details of the document, its physical characteristics and its condition should be recorded prior to treatment. All materials, chemicals and methods used in the treatment, and the results of tests should be recorded. Where appropriate, photographs should be used to support written documentation, with photographic records made before, during and after treatment. The removal of any original material during treatment should be fully documented and the material preserved with the records. Records should be accessible on a permanent basis.

## 7.5 Materials

All materials used in conservation of documents should be of archival quality. It is essential that the strength of solutions and deacidification agents is maintained during use.

# 8 Treatment of insect infestation and fungal growth

## 8.1 General

Insect infestation and fungal growth can be largely prevented if the storage area is kept clean and the environmental conditions are in accordance with BS 5454. Documents and other materials brought into a repository or library should be examined and if necessary tested for insect infestation and fungal growth before they enter the storage area and promptly treated if any is found.

All processes that involve the use of pesticides are subject to the provisions of the Control of Pesticides Regulations 1986 [3]. The list of approved materials is given in the annual publication, *Pesticides* [6].

## 8.2 Treatment of insect infestation

### 8.2.1 Preparation of documents for treatment

Documents with insect infestation may be cleaned before or after they are treated (see 8.3.1). If they are to be frozen, they should be made into bundles up to 50 mm thick, packed in polyethylene bags or film wrap with as much air as possible evacuated, and sealed. Books should be packed separately to prevent bindings from sticking. The bundles should be packed loosely in crates.