

Recommendations for the storage and exhibition of archival documents

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- British Records Association
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- Conservation Centre, Camberwell College of Arts
- Institute of Paper Conservation
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- Museums & Galleries Commission
- Public Record Office
- Royal Commission on Historical Manuscripts
- Royal Institute of British Architects
- Society of Archivists
- Storage Equipment Manufacturers Association

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Foreword

This British Standard has been prepared by Technical Subcommittee IDT/2/9. It supersedes BS 5454:1989, which is withdrawn.

Although originally conceived as being applicable only to documents in archive repositories, most of the recommendations in this standard apply equally to the storage or exhibition of unique, rare or “archival” library materials. The wording of this standard has accordingly been changed in places for this edition to reflect this wider applicability. Archives are irreplaceable. They are in authorized custody and are to be preserved permanently. The recommendations in this British Standard are designed to help the creation and maintenance of appropriate conditions for archival document storage and exhibition and to enable a repository for archival documents to be built, or converted, to the highest standards.

In the decade since the previous edition of this standard, knowledge of archival materials and of the chief hazards and threats to which they are exposed has grown considerably. Account has also been taken in the drafting of this standard of ISO 11799 which was being developed as this revision was in preparation. This International Standard is, however, of a more general character.

Greater emphasis has been placed on the provision of stable environments for archival storage within recommended ranges of temperature and relative humidity, with minimal mechanical intervention. These ranges have also been revised. Another significant change, made in response to both national and international research, is that the standard now recommends the use of water sprinklers among possible fire-suppressants. Matters of repository management have been more rigorously excluded than in the previous edition and the opportunity has been taken to present some of the information in a revised order for the sake of consistency and the avoidance of repetition.

These recommendations apply henceforth to new buildings, whether purpose-built or adapted, and to existing buildings. Where existing buildings already achieve reasonable environmental stability within the parameters recommended in BS 5454:1989, any changes to meet the recommendations of this new edition should be introduced only cautiously or as the appropriate opportunity arises.

Documents on open access, in short-term storage or in use in reading rooms, conservation workshops or staff offices will benefit if they are kept in conditions as near as possible to those recommended in this standard.

This British Standard takes the form of guidance and recommendations. It should not be quoted as if it were a specification and particular care should be taken to ensure that claims of compliance are not misleading.

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.

Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 25 and a back cover.

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1 Scope

This British Standard makes recommendations for the storage and exhibition of archival documents, including library materials.

These recommendations apply to the long-term, permanent storage of archival documents. The temporary storage of such documents in restricted access and their display in exhibitions is also covered. The recommendations apply to new buildings, whether purpose-built or adapted, and to existing buildings.

The recommendations mainly concern traditional materials, i.e. paper and parchment, although some guidance on more modern media is given in clause 11. This guidance is intended for the storage of modern media in general-purpose repositories and further specialist advice may also be required.

This standard is for use by archivists, librarians, conservators, museum curators, architects, designers, contractors, engineers and others concerned with the planning, construction, equipment, maintenance and working of such repositories.

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 476, *Fire tests on building materials and structures*.

BS 1153, *Recommendations for processing and storage of silver-gelatine-type microfilm*.

BS 1449-1, *Steel plate, sheet and strip — Part 1: Carbon and carbon-manganese plate, sheet and strip*.

BS 3621, *Specification for thief resistant locks*.

BS 4066-3, *Tests on electric cables under fire conditions — Part 3: Tests on bunched wires or cables*.

BS 4737-1, *Intruder alarm systems — Part 1: Installed systems with local audible and/or remote signalling*.

BS 4971, *Recommendations for repair and allied processes for the conservation of documents*.

BS 5266-1, *Emergency lighting — Part 1: Code of practice for the emergency lighting of premises other than cinemas and certain other specified places used for entertainment*.

BS 5306-1, *Fire extinguishing installations and equipment on premises — Part 1: Hydrant systems, hose reels and foam inlets*.

BS 5306-2, *Fire extinguishing installations and equipment on premises — Part 2: Specification for sprinkler systems*.

BS 5306-3, *Fire extinguishing installations and equipment on premises — Part 3: Code of practice for selection, installation and maintenance of portable fire extinguishers*.

BS 5544, *Specification for anti-bandit glazing (glazing resistant to manual attack)*.

BS 5588-9, *Fire precautions in the design, construction and use of buildings — Part 9: Code of practice for ventilation and air conditioning ductwork*.

BS 5720, *Code of practice for mechanical ventilation and air conditioning in buildings*.

BS 5839-1, *Fire detection and alarm systems for buildings — Part 1: Code of practice for system design, installation and servicing*.

BS 6206, *Specification for impact performance requirements for flat safety glass and safety plastics for use in buildings*.

BS 6399-1:1996, *Loading for buildings — Part 1: Code of practice for dead and imposed loads*.

BS 6651, *Code of practice for the protection of structures against lightning*.

BS 7176, *Specification for resistance to ignition of upholstered furniture for non-domestic seating by testing composites*.

BS 7671, *Requirements for electrical installations — IEE Wiring Regulations — Sixteenth edition*.

BS EN 3, *Portable fire extinguishers*.

BS EN 671, *Fixed firefighting systems — Hose systems*.

BS EN 779:1993, *Particulate air filters for general ventilation — Requirements, testing and marking*.

BS EN 1838, *Lighting applications — Emergency lighting*.

NOTE This standard is dual-numbered with BS 5266-7.

BS EN 60529, *Specification for degrees of protection provided by enclosures (IP code)*.

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

ANSI IT 9.16:1993, *American National Standard for Imaging Media (Photography)*.

The Munsell book of color, Munsell Color., New Windsor, New York, USA.

3 Definitions

For the purposes of this British Standard, the following definitions apply.

3.1

air-conditioning

system that maintains predetermined control of temperature, humidity, cleanliness, air distribution and fresh air

3.2

air infiltration

uncontrolled leakage of air through unsealed points into a building envelope

3.3

aisle

subsidiary passageway between runs leading from a gangway and affording access to shelves for the withdrawal or replacement of documents

3.4

archives

documents, irrespective of form, medium or age, intended for long-term preservation because of their continuing value

3.5

bay

unit of shelving, single- or double-sided, consisting of horizontal shelves between uprights or upright frames

3.6

bund

structural upstand that will contain a leak of water within the space defined by the bund in the event of a flood

3.7

conservation

specific treatments and techniques applied in protecting archival and library material from deterioration and involving interference with the object itself

3.8

cooling load

load (measured in kilowatts) that is imposed upon an air-conditioning system in maintaining the repository at the required level of temperature and relative humidity

3.9

custody

responsibility for the care of documents based on their physical possession

3.10

deflection limit

degree of bending in a shelf under the imposed load, usually expressed as a ratio of measured deflection to shelf width

3.11

document

combination of a medium and the information recorded on or in it

3.12

drop-spine box

single-piece book box with its lid and spine-wall hinged at the base to allow access to the bound volume from the spine side

3.13

fire resistance

ability of a component or construction of a building to satisfy for a stated period of time the appropriate criteria specified in the relevant part of BS 476

3.14

gangway

principal route in a storage room providing for access to aisles and the passage of people and trolleys

3.15

hydrolysis

decomposition of organic compounds by interaction with water where the degradation reaction weakens or breaks molecular bonds, leading to embrittlement and discolouration

3.16

medium

material on or in which information is recorded

3.17

membrane

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

3.18

modern media

materials or supports of more recent invention or archival application than paper and parchment, in particular photographic, audio-visual and machine-readable materials

3.19

Munsell value

estimated lightness of any surface colour on a scale of ten equal sensation intervals, extending from ideal black (value = 0) to ideal white (value = 10) as specified objectively for values from 1 to 9

NOTE See the *Munsell Book of Color* for further information.

3.20**pre-action sprinkler**

dry sprinkler system or one in dry mode in which the alarm valve can be opened by an independent fire detection system in the protected area

3.21**preservation**

all managerial, financial and technical issues involved in preserving all formats of archive and library materials and/or their information content in order to maximize their useful life

3.22**records**

documents created, received or generated in the course of a transaction and forming part of that transaction

3.23**repository**

building, part of a building, or area within a building designated for the storage of documents and constructed and maintained to minimize the risk of damage, decay and unauthorized access and to furnish proper conditions of custody

NOTE For the purposes of this standard, the repository is specifically the place where the documents are stored. The term is not intended to embrace other associated functions such as reading rooms and offices within the same building.

3.24**run**

two or more connected bays of single-sided or double-sided shelving joined end-to-end

3.25**sprinkler system**

automatic system of water pipes fitted with sprinkler heads at suitable intervals and heights and designed to detect, control or extinguish a fire by the discharge of water

3.26**thermal inertia**

characteristic of building materials and exposed room surfaces to absorb and hold heat and so reduce swings in room temperature

NOTE Dense materials maximize this effect.

3.27**zeolite molecular sieves**

microporous crystalline aluminosilicate structures that absorb and trap other chemical species

4 Site of the building**4.1 Avoidance of hazards**

The site for a repository should not be:

- a) liable to subsidence, earthquake, landslides or flooding whether of natural or man-made origin;
- b) at risk from fire or explosions in adjacent sites, in adjacent parts of the same building, or from water or chemicals used to deal with such hazards;
- c) near a strategic installation which could be a target in an armed conflict;
- d) near a plant or installation emitting harmful gases, smoke, dust etc.;
- e) in an area where the air is known to be especially polluted for any other reason;
- f) on or immediately adjacent to contaminated land, including landfill sites;
- g) near a place or a building that attracts rodents, insects and other pests.

In order to minimize the harmful effects of exposure to sunlight and to strong winds that affect air infiltration, careful attention should be paid to orientation, landscaping and the site's microclimate.

If these recommendations cannot be met, a risk assessment should be performed and special provisions should be made in the construction of the building to protect it against these hazards.

4.2 Size

The site or, in the case of a conversion, the building should be large enough to accommodate a repository to meet current and projected storage requirements for 15 yr to 20 yr from the date of occupation. There should preferably be space for subsequent extension.

4.3 Security of the site

The repository, where it is not part of a larger building, should preferably be on a standalone or island site with free access round the whole perimeter. The perimeter should be clearly illuminated in the hours of darkness and security-gated and fenced.

The repository should be within a short attendance time of the emergency services.

NOTE See also 5.7 for security.

5 Building construction and protection

5.1 General

5.1.1 Advice

Expert advice should be sought from appropriately experienced building design professionals when the design of the repository is planned. The fire and police authorities should also be consulted to ensure that there is no conflict between the recommendations for security and fire protection and the safety of both people and documents.

5.1.2 Self-containment

The repository and associated rooms provided for the processing, conservation, study and exhibition of documents and for administrative work and repository staff should preferably be in a purpose-built detached building or, if they form part of a larger building, in a self-contained unit separated from the remainder of the building by a fire-resisting construction.

5.1.3 Whole-life costing

As the documents are to be preserved permanently, repositories will normally be expected to have a long life. Whether considering a new building or the refurbishment of an existing building, in addition to the capital cost, the long-term (“whole-life”) operational cost in terms of energy consumption, water consumption and maintenance should be taken into account. For guidance on the service life of the building, see ISO 15686-1.

5.2 Promotion of environmental stability

5.2.1 High thermal inertia

The construction should be heavy enough and air infiltration rates low enough (see 5.2.2) for the temperature and relative humidity to remain stable within recommended ranges (see 7.3) for a minimum of 24 h in the event of exceptional weather conditions or the failure of the plant.

5.2.2 Reducing air infiltration

For quality construction and to prevent uncontrolled air changes, a new repository should be built to an air infiltration rate not greater than one to two air changes per day. A repository in an older building should preferably meet the same standard but in any case should aim to have an air infiltration rate not greater than three to four air changes per day.

NOTE Air-tightness in a building can be measured either by pressurizing the building and measuring the air flow rate through a fan or by using a tracer gas technique and measuring the decay time of the gas. For both techniques, specialist advice may need to be sought.

5.2.3 Materials

Walls, floors and ceilings inside the repository should be made of a material such as brick or from combinations of materials that have a high thermal and hygroscopic capacity, with insulation materials appropriate to the system of construction selected. Internal finishes should not impede the function of the thermal and hygroscopic capacity of the building to stabilize conditions.

NOTE See also 5.5 for internal surfaces.

5.2.4 Environmental equilibrium

Expert advice should be sought about the best means of enclosing the repository to assist in the establishment of environmental equilibrium. An enclosed space, with a door at either end, should be provided between compartments which have different environments.

5.2.5 Building acclimatization.

In the case of newly constructed buildings, a suitable time should be allowed to elapse for the building to dry out and its internal environment to stabilize before any archival documents are introduced.

NOTE The time necessary for the building to dry out and for the internal environment to stabilize varies from building to building.

5.3 Protection against damage by fire

5.3.1 General

NOTE This subclause addresses only structural issues. For fire precautions, see clause 6.

Fire precautions, including limitations on distance of travel for means of escape, are the subject of national legislation which may be supplemented in some areas of the country by local legislation. Fire precautions should be discussed with the fire authority and fire insurers. Experts such as fire engineers, fire consultants and insurers should be asked to advise about particular problems. Guidance on insurer's recommendations can be found in *The Design Guide for the Fire Protection of Buildings 2000* [1].

5.3.2 Fire resistance

The elements of structure of the repository should be designed to provide 4 h of fire resistance against a fire occurring either inside the repository, in any adjacent compartment of the building or nearby. See 6.3 for fire risk assessment.

NOTE See also 5.5 for internal surfaces.

5.3.3 Compartments

For reasons of fire safety and/or environmental control, the repository may be divided into compartments with the advice of the respective experts. Internal/external walls, floors, ceilings and doors between single rooms and compartments and between storage and other areas of the building should be constructed so as to prevent fire (and water and smoke) from spreading into a neighbouring unit. The fire resistance of compartments should conform to the recommendations in 5.3.2.

NOTE See also 7.2 for environmental control.

5.3.4 Doors and other openings

All openings, including ducting, in fire resisting walls should be effectively fire resisting and smoke stopping to the same fire resistance as the walls that contain them. No door should have a grille or other opening that would allow the passage of air. Any doors or shutter assemblies should be self-closing in the event of a fire.

NOTE See also 5.10 on the avoidance of door sills and 5.7.6 on the security of doors.

5.3.5 Vertical openings

All stairways, lift shafts, ventilation risers and other vertical openings that might act as flues for fire, smoke or toxic gases should be enclosed by walls, partitions or dampers and doors of material with an appropriate fire resistance (see 5.3.2).

5.4 Protection against damage by water

5.4.1 Design and materials

The building should be designed and the materials for its construction chosen so the risk of damage to the documents from water, whether in the repository or any other part of the building, is eliminated. Intermediate floors in multi-storey repositories should be waterproofed.

NOTE Water may be present due to rain, snow or flooding, blocked gutters externally, leaking or burst pipes, condensation or from water used internally to extinguish a fire.

5.4.2 Drainage

Although open, untapped or unsealed drainage within the repository is unacceptable, provision should be made for the controlled rapid egress of any water that may accumulate in the repository during fire-fighting, sprinkler operation or from any other cause. Drains should be fitted with one-way valves to prevent water backing-up into the repository.

NOTE If circumstances dictate the use of basement accommodation, the accepted and traditional forms of waterproofing such as construction of a bund area should be used to prevent the ingress of water. Water-borne services, other than those associated with automatic fire suppression systems, should not pass through the repository.

5.5 Protection against dust and pollutants

The exposed surfaces of the walls and ceilings should comprise materials of limited combustibility as defined in the Building Regulations Approved Document B [2]. The substrate materials behind the facing should be non-combustible and their chemical stability tested before use. Materials, paints and coatings that will minimize the emission of harmful substances such as smoke and soot in the event of fire and avoid acidic gases and volatile organic compounds arising through the gradual degradation of the materials, should be chosen. Floors and floor coverings should be hard-wearing, neither cause dust nor be easily chipped and should be easy to clean, non-slippery, light-coloured (see 8.1.2), and of a material that deadens sound.

NOTE 1 Photographic, audio-visual, magnetic and electronic media are particularly sensitive to oxidizing pollutants, dusty air and/or other active compounds (see 11.2.3).

NOTE 2 See also 5.6.3 on cleaning, 7.4.3 on freedom from pollutants, 9.1.1 on the planning of shelving, 9.3.1 on construction recommendations for mobile shelving and 9.7.3 on hoists and lifts.

5.6 Protection against damage by pests

NOTE See also 7.7 on the avoidance of mould and insect infestation within documents.

5.6.1 General

Guidance on the treatment of infestations is provided in BS 4971 and in *Integrated Pest Management* [3].

5.6.2 Points of entry

The points at which any wiring, trunking, etc. enters and leaves the repository should be sealed against vermin and insects, as well as against air infiltration and dust. Ventilation or air-conditioning supply and extract ducts and, if the repository is so designed (see 5.7.5), any openable windows should be fitted with appropriate filters or screens to prevent the entry of pests into the repository. Doors should be installed to fit tightly in their frames.

5.6.3 Cleaning

All areas should be kept as clean as possible, and any unused space should be accessible for cleaning.

5.6.4 Food sources

Materials that may provide a food source for insects, for example wool carpets, should be minimized.

5.6.5 Monitoring

The level of insect activity should be regularly and seasonally assessed and, if necessary, a programme of pest management initiated.