



National Preservation Office

Specifying Library and Archive Storage

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Preservation in Practice Series



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Introduction

The standards required for the storage of archives and library special collections are described in a British Standard, *BS 5454:2000, Recommendations for storage and exhibition of archival documents*, London: BSI, 2000. It is recommended that the companion publication, Kitching, C. et al, *Guide to the interpretation of BS 5454:2000, Storage and exhibition of archival documents*, London, BSI: 2001 is also consulted.

Without the establishment of a secure and controlled environment, incorporating appropriate high-quality storage, all other actions to preserve the collections will have limited impact. It is very important that this issue is fully understood by governing bodies, trustees, and senior managers. It is especially vital to draw to the attention of those who carry overall responsibility for collections the level of commitment required for their administration. It must be demonstrated that any investment made has a direct effect on supporting the continuing availability of material by controlling or halting deterioration, and will reduce the need for expensive remedial conservation.

The need to focus on the detail of storage can be a stumbling block for many of the committed professionals who have to provide day-to-day access to the collections, since this level of analysis of building, storage furniture and environmental control may be unfamiliar and confusing. This leaflet focuses on specifications for storage furniture and equipment, and attempts to demystify and to be pragmatic about what is needed and how to achieve it.

It is not the purpose of this leaflet to advise on packaging. It should be assumed that material is packaged to archival standards or has other appropriate protection as necessary.

The purpose of a specification

Developing a full and detailed specification is essential, as it is the basis on which storage is designed and procured. The full specification is also a means of examining and controlling risk. The analysis of risk is a first step in broadening

an appreciation of the needs of the collections within a preservation and collections care framework. This process requires that collection specialists liaise with other departments with the shared objectives of raising the profile of the collections and negotiating for scarce resources. An archival standard store is an expensive resource that once established continues to be an ongoing cost. The detail that we need to consider is often at odds with the expectations of those we need to work with – especially maintenance or facilities departments and suppliers – as the standards are much more exacting than for any other kind of office storage. The fittings and fitments must meet various specialised standards and these details, to the outsider, can seem very inflexible. The need for specification detail puts the whole activity in context with the needs of other departments and/or activities within the organisation that may have much stronger cases or claims for the resources, and emphasises that preservation is a specialised area. It is vital to set out the strategy clearly.

Buildings

Whether old or new, adapted or purpose-built, buildings that store library and archive collections should, as far as possible, conform to BS 5454:2000. The primary issues to consider are:

- location – not near a river or lake, a military installation or airport or any other high-risk location.
- construction – aim for long-term sustainability and internal environmental stability. Floor loading capacity is a key issue.
- materials – should support internal environmental stability. Materials must not produce harmful levels of pollutants and volatile organic compounds (VOCs). The effect of pollutants is particularly intense when the general environmental conditions are poor and/or the material is stored in an enclosed space or poor quality container.

Other important issues to consider are:

- lighting – specify both the intensity (not less than 100 lux, not more than 300 lux at floor level) and type of lighting (tubular fluorescent lights are recommended). Lights should be turned off when not in use or timer switches installed. Position lighting above aisles to ensure that bays are suitably lit to

enable safe access. Some shelving has integral lighting. In the case of mobile shelving, lighting may be positioned parallel to aisles in order to illuminate the opening that is in use.

- physical access¹ – sufficient space must be provided to retrieve items. Ensure that drawers can be fully opened and that enough space is provided for the retrieval of outsize items such as long rolls. Risk of damage to collection items and to personnel during retrieval and replacement must be minimised. BS 5454:2000 recommends that gangways are not less than 1100mm wide and that aisles are not less than 750mm wide².
- cleaning – the storage area should be clean and dust-free. Careful consideration should be given to cleaning arrangements when designing the layout of the storage area. Build-ups of dust in awkward or inaccessible spaces can attract insects and lead to mould outbreaks.

Careful consideration will also need to be given to ensuring that the standards are met for:

- fire detection and suppression
- security
- environmental monitoring and control.

Storage components

The library or archive may need to accommodate a range of different formats, but in general terms, there will need to be appropriate storage for:

- boxed archives
- books and bound documents
- large flat items
- rolled material
- photographic material
- magnetic media
- digital media.

¹ BS 5454:2000 section 5.8 *Storage space*

² BS 5454:2000 section 9.5 *Gangways and aisles*

Photographic material, magnetic and digital media may be stored in separate climate-controlled areas, but they are still likely to be stored in boxes on shelves.

Storage furniture options are as follows:

- shelves to accommodate standard boxes
- shelves to accommodate books stored upright
- deep shelves for large flat documents or books
- plan chests for flat maps
- deep shelves for rolled material
- wall-mounted racking for very long rolled items.

The list is relatively simple. If it is possible to store material by format/type then the process becomes even easier. This is heavily dependent on a high standard catalogue and location system. In this case different formats can be allocated to specific areas and the storage furniture arranged accordingly, using appropriate shelf depth, height and shelf intervals or special storage furniture such as plan chests.

Space management

The way in which storage space is managed, calculated and apportioned for the different types/formats of collection material is very important. The layout must ensure efficient and economic use of the available space. The processes of calculating and managing the space will require close collaboration with buildings staff, and where appropriate, architects.

Standardisation is a key requirement for this process; the shelving configuration must reflect the formats and sizes of the collection material. As a general rule, shelving capacity should be expressed as linear metres and the generally accepted standard shelf length is 1m. Packaging and specifically box sizes also need to be standardised. Ideally a size should be chosen and used as standard which will make best use of the shelving capacity. Material that will not fit in the selected standard size will need to be stored within another type of packaging or storage furniture.

The future growth of the collections must also be considered during the planning process. Precise calculations may be possible for fairly static collections but for others only estimates can be provided. BS 5454:2000 recommends an expansion capacity of 15 to 20 years, but many new archive buildings are aiming for 25 years

minimum³. The following table suggests a way to identify shelving and storage furniture needs.

Type/format of material	Type of storage furniture	Shelf depth (max)
Archival documents (maximum Foolscap)	Shelving	450mm
Archival documents (larger than Foolscap)	Plan chest or Deep shelving	965mm(D) ⁴ x 705mm(H) x 1400mm(W) Shelving 500 – 600mm
Books (average size)	Shelving	350 – 400mm
Books (large or heavy)	Deep shelving; stored flat and frequent shelf intervals	500 – 600mm exceptionally large material may need up to 750mm
Large flat material	Plan chest or Deep shelving; stored flat or frequent shelf intervals	965mm(D) x 705mm(H) x 1400mm(W) Shelving 600 – 1000mm
Rolled material (up to 1500mm)	Deep shelving; frequent shelf intervals	1500mm
Rolled material (above 1500mm)	Wall-mounted shelving; one roll per shelf lengthwise	To suit longest rolled item
Photographic material	Shelving	450mm (average archival box depth)
Magnetic media	Shelving	450mm (average archival box depth)

³ BS 5454:2000 section 4.2 *Size*

⁴ An average size 7-drawer plan chest

Shelving

The most effective way of protecting the collections and ensuring the most economic use of space is good shelving. BS 5454:2000 specifies that 'the dimensions of the shelf should be long enough and deep enough to support the material fully'⁵. Shelving can come in many forms and choice may depend on the resources available:

- pallets on the floor
- planks on breezeblocks
- proprietary office shelving in wood or metal
- tailor-made and wooden shelving specially integrated into the building fabric
- wooden shelving
- metal shelving
- heavy-duty industrial metal shelving.

Pallets and planks should only be considered as temporary expedients. Proprietary office shelving may be suitable for some collection material but may have a restricted range of sizes and components. Tailor-made shelving is more commonly found in libraries and requires individual planning. Wooden, metal and heavy-duty industrial shelving are the most common types of shelving found in libraries and archives and are usually available in the following formats:

- wall-mounted
- static/free-standing
- mobile.

Generally, it is not advisable to store material (especially unprotected material) on wall-mounted shelving as the close proximity to external walls, and the resultant lack of air circulation, increases the risk of damp and the associated risks of mould and insects. However, if space is really at a premium it can be used for rolled material.

The maximum height of the shelving will be controlled by the ceiling height; the higher the shelving, the greater the storage capacity. BS 5454:2000 advises that 'for health and safety reasons, the height of the highest shelf should be such

⁵ BS 5454:2000, Section 9.2.1 *Shelves*

that it can be reached with ease by a person of normal height, unless either suitable arrangements are made for the safe retrieval of documents from a greater height or there is sufficient ceiling height for a multi-tier system⁶. In most cases the health and safety issue can be addressed by the provision of manual handling training for staff and appropriate equipment – ladders and/or lifting devices. One solution is to mark all shelves over the manual handling limit in a different colour (usually red), to make it clear when extra equipment is required.

Wooden shelving

There is much professional discussion about using metal shelving as opposed to wooden shelving. Good quality wooden shelving that has been in place for a number of years should not be regarded as high risk. The primary concerns regarding wooden shelving are:

- susceptibility to insects
- combustibility
- the risk of emission of VOCs by the wood itself and varnishes: this can be a particular danger for photographic materials.
- the widespread use of Medium Density Fibreboard (MDF)⁷.

The risk of damage caused by off-gassing can be reduced by placing acid-free board or paper on each shelf⁸. The protecting board/paper will need to be monitored and replaced when necessary.

Metal shelving

The primary concerns regarding metal shelving are:

- the variable quality of manufacture
- the risk of rust in poor environmental conditions
- the risk of buckling during a fire.

⁶ BS 5454:2000 section 9.2.3 *Bays*

⁷ The main concern with MDF is the residual formaldehyde used in the manufacturing process. Formaldehyde-free MDF is now available:

www.advancedbuildings.org/main_t_finishes_formaldehyde.htm

⁸ Microchamber paper is also suitable:

www.conservationresources.com/Main/S%20CATALOG/MicroChamber.htm

Metal shelving is normally steel that has been powder-coated with enamel paint that does not off-gas⁹. Metal is seen as an archival industry standard (especially for mobile shelving), and has a stringent specification within BS 5454:2000.

Mobile shelving

The advantages of mobile shelving are:

- maximisation of storage capacity within a given area
- shelf sizes are standardised for use in libraries and archives
- static shelving units can be incorporated within runs of mobile shelving
- the number of access aisles is reduced
- generally metal in construction, sometimes with plywood shelves
- can incorporate plan chests and storage for other formats
- produced as manually assisted (hand-driven) or electric powered
- improved security as bays can be locked.

The disadvantages of mobile shelving are:

- if mobile shelving is to be installed in an existing building, it requires either a track sunk into the floor (complex, noisy and costly) or a false floor (which may reduce the overall height of the proposed shelving due to the available ceiling height)
- long runs can be prone to ‘snaking’ and instability (this needs to be discussed with the supplier and included within the shelving specification), and require regular maintenance to ensure that mechanical function and health and safety considerations are met
- health and safety issues regarding crushing between two runs have been recorded
- older units can slip the rails (dangerous and costly). It is not recommended that old mobile units be dismantled and reassembled elsewhere
- requires specialist suppliers and assembly of the main units and tracking etc
- not appropriate for fragile material formats (such as glass-plate negatives or gramophone discs) because of the risk of damage or displacement due to the impact of two shelves meeting or protruding material becoming crushed
- unused areas of the collections remain in closed and dark spaces – this can encourage moulds and insects in poor environmental conditions¹⁰.

⁹ Finely divided, synthetic polymers are fused onto the steel to produce a chemically stable finish

¹⁰ Many archives instigate a cyclical programme of opening unused areas overnight to encourage air circulation

Static shelving

The advantages of static shelving are:

- easily available
- can be constructed and adjusted by staff
- useful for material that is at risk on mobile shelves (fragile formats such as glass-plate negatives or gramophone discs)
- useful for heavy/large format items that require deep storage.

The disadvantages of static shelving are:

- requires aisles between facing runs so cannot use storage space economically
- there are many suppliers; difficult to ensure standardisation.

Wooden cabinets

In some cases, the requirement may be for a more aesthetic arrangement which enables the books to be seen but to be secure. The solution, primarily amongst library collections, has been to store book material in glazed wooden cabinets. Whilst this solution achieves the objective, it does present some specific conservation problems. The glass can be a source of condensation in a poor environment, and this supply of water when linked to unstable temperatures and dark, poorly ventilated cabinets can favour mould growth and encourage insects. In some cases, there will be no alternative storage, so it is advised that holes be drilled in the back of the cabinet to increase air circulation. If possible cabinets should be moved away from external walls. Shelves can also be lined with acid-free board.

Special storage furniture

Some material formats cannot be adequately stored in mobile shelving and require either static bays or special storage furniture. The following table suggests storage solutions for these formats.

Material format	Possible solutions	Standards required
Large flat paper items	Plan chest or static deep industrial shelving	Metal should be powder-coated or baked enamel Wood/Wood finishes should not off-gas harmful pollutants Consider the amount of space required to retrieve items
Large books	Static deep roller-fronted shelving with close shelf intervals Books stored flat no more than three high	Metal should be powder-coated or baked enamel Consider the amount of space required to retrieve items
Rolled material (below 1500mm) ¹¹	Static deep shelving with close shelf intervals	Metal should be powder-coated or baked enamel Consider the amount of space required to retrieve items
Rolled material (above 1500mm)	Wall-mounted shelf units; shallow with the rolls stored horizontally along the wall length – a good use of a wide and long corridor wall	Metal should be powder-coated or baked enamel Consider the amount of space required to retrieve items

¹¹ These are suggested lengths; an institution may decide on shorter or longer lengths based on space and/or operational requirements

Framed material	Purpose-designed vertical (and sliding) racking or static deep shelving with close shelf intervals or plan chests Items stored flat one or two high	Metal should be powder-coated or baked enamel Wood/Wood finishes should not off-gas harmful pollutants
Fragile material (including glass plate negatives, documents with seals and gramophone records)	Static shelving or plan chests Requires appropriate packaging	Metal should be powder-coated or baked enamel Wood/Wood finishes should not off-gas harmful pollutants
Magnetic media	Static shelving or mobile shelving or metal storage cabinets	Metal should be powder-coated or baked enamel Wood/Wood finishes should not off-gas harmful pollutants
Digital media	Static shelving or mobile shelving or metal storage cabinets	Metal should be powder-coated or baked enamel Wood/Wood finishes should not off-gas harmful pollutants

Plan chests

Plan chests are used to store large flat material, especially items that will not fit into the set format storage boxes. A good quality plan chest can be a real asset and serves to protect flat material and ease retrieval and replacement. The following issues need to be considered:

- the standard of the carcass construction – robust, but lightweight (usually aluminium) and ideally fire resistant
- the ability of the manufacturer to produce a range of drawer sizes – it is now possible to have very large drawers in metal (they are too heavy in wood)

- ensure that the construction has a rigid drawer construction for support when open (and filled)
- the chest will need to have anti-tilt features
- there needs to be a choice of drawer depths (it is better to have more shallow drawers than a few deep and over-filled ones)
- when planning the available storage space, due consideration must be given to the amount of space needed for opening drawers and the floor loadings required for full plan chests
- the drawers require security locks, especially if stored in public areas. Each chest will need to be placed on a plinth (to ensure that the material is above floor level and so protected from floods)
- If plan chests must be stacked, it is advised that the maximum should be two high, to prevent compression and buckling of the lower unit (this is particularly prevalent in wooden plan chests).

Hanging storage chests

Upright, hanging storage chests are available and are quite common in libraries and record office search rooms. The main advantage of this form of storage is that it is space saving, but there are a number of concerns when managing original materials, including:

- the standard of the construction and the archival quality of the chest
- the availability of an access panel at the base to retrieve maps that have fallen or been dropped
- the difficulty, with some varieties of chest, of getting access to individual maps because of the complicated hanging support structure
- possible damage from the method of hanging, which uses a self-adhesive strip attached to the item – the strip has holes punched to receive the hanging supports. This should only be used for non-unique material
- the chests are often over-filled due to overall space restrictions.

An archival enclosure, incorporating the punched holes, has been developed as an alternative to the use of the adhesive hanging strip. The map is placed within a Melinex™ sleeve (archival polyester) and then hangs on the supports. In general terms there are few risks to this method of storage – it is just the retrieval process that can cause difficulties.

Additional reading

Ogden, S., 'Storage Furniture: A brief review of current options', Northeast Document Conservation Center Technical Leaflet

www.nedcc.org/plam3/tleaf42.htm

Tétreault, J., *Coatings for display and storage in museums*,

Ottawa: Canadian Conservation Institute, 1999

Woods, C. Walker, N, 'Off the wall: removing barriers to access in a designated collection of wallpapers', NPO e-journal, no.2, November 2004

www.bl.uk/services/npo/journal/2/wallpaper.html

Suppliers

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