Library and archive storage furniture

Introduction
Without the establishment of secure and well maintained storage accommodation, incorporating appropriate high-quality storage furniture and materials, all other actions to preserve library and archive collections will have limited impact. Most library and archive collections will spend a much greater proportion of time in storage than in any other form or use (such as reading rooms or exhibitions), so it is important that storage planning and priorities are prominent in the overall preservation strategy. At its broadest ‘storage’ must encompass the building, environment, storage furniture, packaging materials and housekeeping routines. This booklet focuses on furniture and equipment for storing physical library and archive collections. The principles apply whether improving or refurbishing existing storage facilities or building new storage facilities, whether you are considering off-site storage, shared storage or outsourced commercial storage. The guidance is relevant to both small and large organisations.

Storage options
Storage should support the purpose, functions and range of activities within an organisation, and will be determined by the following factors: acquisition, retention, disposal, format, condition and access to the collections, as well as sustainability, cost and resources for their management.

Before considering what type of storage furniture to use and how it is arranged, think about the storage envelope. There are many options: in-house or off-site, commercial or shared facilities, instant access or dark storage. Warehouses, underground facilities, purpose-built pods, converted buildings and bespoke stores are all now commonly available to store library and archive collections.

Whether old or new, adapted or purpose-built, buildings that store moveable heritage collections, including library and archive collections, should, as far as possible, conform to current standards. For construction these are detailed in BS EN 16893: 2018 Specifications for location, construction and modification of buildings or rooms intended for the storage or use of heritage collections, and for collections in BS 4971: 2017 Conservation and care of archive and library collections.
The primary issues to consider are:

- Location
- Construction
- Sustainability
- Environmental stability
- Security
- Fire suppression and detection
- Protection against water.

A risk assessment should be carried out to evaluate the suitability of a building for storing collections. This process will highlight potential threats and provide a sound basis for their ongoing management. Consideration should also be given to levels of use of the collection and access requirements.

**Space management**

The way in which storage space is managed, calculated and apportioned for the different collection formats is very important. The layout of storage furniture must ensure efficient and economic use of the available space. The processes of calculating and managing the space will require close collaboration with buildings and facilities staff, and where appropriate, architects. Standardisation is a key requirement for the optimization of space; the shelving configuration must reflect the formats and sizes of the collection material. Shelving capacity should be expressed as linear metres and the generally accepted standard shelf length is 1 metre. To make optimum use of space, and to reduce risk, books of a similar size should be shelved together. For archival material, packaging and box sizes can also be standardised and the sizes should be chosen to reflect the formats in the collections. This can then be used as the standard which will make best use of the storage capacity. Material that will not fit in the selected standard size, either because it is too large or too small, will need to be stored at another location either within the store or in a separate store, and be in format-specific packaging that fully protects and supports the items. The future growth of collections must be considered during the planning process, especially for new buildings (see BS EN 16893, 5.2 Site capacity). Precise calculations may be possible for fairly static collections but for others only estimates can be provided. Commonly this is calculated by assessing annual growth for a period of c.25 years.

**Collection formats**

The choice and configuration of storage furniture will be influenced by collection format. A library or archive may need to accommodate a range of different sizes, shapes and materials, but in general terms, there will need to be appropriate storage for:

- Books and bound documents
- Boxed archives
- Large flat items including maps and plans (this may include large books where these need to be stored flat)
- Rolled material
- Photographic material
- Magnetic media
- Gramophone discs
- Digital media formats
- Framed material (paintings, prints, drawings etc)
- Objects.

Consideration should be given to the option to store material by size/shape; if this is possible, the process and the management of storage space can be made easier, particularly with a well maintained location system. In this case different formats can be allocated to specific areas and the storage furniture chosen and arranged accordingly, using appropriate shelf depth, height and shelf intervals or special storage furniture such as plan chests.

**Storage furniture**

In general terms, the storage furniture options for library and archive collections 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 works, maps and plans
- Deep shelves for rolled material
- Wall-mounted racking for very long rolled items.

The use of storage equipment must conform to the specifications outlined in BS 4971: 2017 Conservation and care of archive and library collections.
The following table suggests appropriate storage furniture for a range of common library and archive formats.

<table>
<thead>
<tr>
<th>Format</th>
<th>Storage furniture</th>
<th>Depth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boxed archival documents (maximum foolscape(^1))</td>
<td>Shelving</td>
<td>450mm</td>
</tr>
<tr>
<td>Boxed archival documents (larger than foolscape(^2))</td>
<td>Deep shelving or plan chest</td>
<td>500 – 600mm (shelving) 965mm (plan chest)</td>
</tr>
<tr>
<td>Books (average size)</td>
<td>Shelving</td>
<td>350 – 400mm</td>
</tr>
<tr>
<td>Books (large or heavy(^3))</td>
<td>Deep shelving and frequent shelf intervals (shelving may be roller-fronted) Flat storage, no more than 3 items high</td>
<td>500 – 600mm 750mm for exceptionally large material</td>
</tr>
<tr>
<td>Large flat material</td>
<td>Deep shelving and frequent shelf intervals or plan chest</td>
<td>500 –1000mm (shelving) 965mm (plan chest)</td>
</tr>
<tr>
<td>Rolled material (up to 1500mm long)</td>
<td>Deep shelving and frequent shelf intervals</td>
<td>1500mm</td>
</tr>
<tr>
<td>Photographic material</td>
<td>Shelving or cabinets</td>
<td>450mm (average archival box depth)</td>
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<tr>
<td>Magnetic media</td>
<td>Shelving or cabinets</td>
<td>450mm (average archival box depth)</td>
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<tr>
<td>Gramophone discs</td>
<td>Shelving or cabinets</td>
<td>450mm</td>
</tr>
<tr>
<td>Digital media (hand-held)</td>
<td>Shelving or cabinets</td>
<td>450mm</td>
</tr>
<tr>
<td>Framed material (paintings, prints, drawings etc)</td>
<td>Purpose-designed vertical (and sliding) racking or static deep shelving with close shelf intervals or plan chests</td>
<td></td>
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</tbody>
</table>

\(^1\) 216 x 343mm
\(^2\) Generally, very large books that cannot safely be stored upright, should be stored flat and stacked no more than two high to aid easier production and reduce damage risk.

**Shelves**

The most effective way of protecting the collections and ensuring the most economic use of space is through good use of shelving. *[BS 4971: 2017 section 5.6.3]* specifies that shelves should be of a size and shape that fully supports the archival materials that they are intended to hold, while leaving sufficient space for the contents to be easily and safely withdrawn or replaced. The choice of shelves will depend on the resources available. Common shelving types are as follows:

- Proprietary office shelves in wood or metal
- Tailor-made shelves specially integrated into the building fabric
- Wooden shelves
- Metal shelves
- Heavy-duty industrial metal shelves.

Proprietary office shelves are not designed for archive and library collections and will not meet the specifications outlined in *[BS 4971: 2017 section 5.6 Storage equipment]*. Tailor-made shelving is more commonly found in libraries and requires individual planning. Wooden, metal and heavy-duty industrial shelves are the most common types to be found in libraries and archives, need to be fully adjustable, and are usually available in the following formats:

- Static/free-standing
- Mobile\(^4\)
- Wall-mounted.

Generally, it is not advisable to store material (especially unprotected material) on wall-mounted shelves against an external wall, particularly where the wall is inadequately insulated and causes a cold ‘bridge’ resulting in condensation on the wall. This condensation will result in damp in the collections and the associated risks of mould and insects.

The maximum height of the shelves will be controlled by the shelving construction and the ceiling height. Adequate clearance should be allowed for fire detection and suppression systems, and shelf canopies. For health and safety reasons, the height of the highest shelf should be such that it can be reached with ease by a person of normal height, unless suitable arrangements are made for the safe retrieval of items from a greater height. In most cases, this will mean manual handling training for staff and the provision of 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. All shelving suppliers should provide clear signage to ensure that shelving is used and loaded appropriately. The minimum height of the lowest shelf should be 150mm from floor level. This will minimise damage from water in the event of a flood.

\(^3\) Also called compact shelving.
Wooden shelves
There is much professional discussion about using metal shelves as opposed to wooden shelves. Good quality wooden shelves that have been in place for a number of years should not be regarded as high risk. The primary concerns regarding wooden shelving are:

- Volatile Organic Compound (VOC) emissions from the wood itself and/or coatings
- Widespread use of Medium Density Fibreboard (MDF) containing residual formaldehyde (a VOC)
- Vulnerability to insect attack
- Combustibility.

The risk of damage caused by VOCs from new timber can be reduced either by sealing the surface using an acrylic varnish (allowing it to gas-off before the shelves are used) or by placing acid-free board or paper on each shelf. However, most of the shelving in archive and library locations is likely to have long since emitted any damaging chemicals and so this will refer to new installations. An appropriate Insect Pest Monitoring programme and effective fire detection will be vital to manage the other issues.

Metal shelves
The primary concerns regarding metal shelves are:

- Variable quality of manufacture
- Risk of rust in poor environmental conditions
- Risk of buckling during a fire.

Metal is seen as an archival industry standard (especially for mobile shelves) and is specified within BS 4971: 2017 section 5.6.4 Shelf material. It is usually manufactured from steel that has been coated with a paint that does not off-gas. Loading capacities should be confirmed with the supplier. The impact of internal pollutants on storage areas is a concern and so it is advised to ensure that products are tested where possible, and to ensure that preparations and coatings meet current standards (i.e. Acrylic varnishes). See BS EN 16893: 2018 section 5.4.3 Internal pollutants.

Static shelves
The advantages of static shelves are:

- Widely available and cheap
- 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 does not maximise the use of space
- There are many suppliers, so difficult to ensure standardisation.

Mobile shelves
Generally metal in construction, sometimes with plywood shelves. Produced as manually assisted (hand-driven) or electric powered. The advantages of mobile shelves are:

- Maximisation of storage capacity within a given area
- Reduction in the number of access aisles required
- Improved security as bays can be locked
- Shelf sizes that are standardised for library and archive collections.

The disadvantages of mobile shelving are:

- Not always appropriate for installation on storeys above ground level. It is vital to check that the location is suitable for mobile units and that all floor loadings are confirmed
- Requires regular maintenance to ensure that mechanical function and health and safety considerations are met
- 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.

Guidance on these issues is available in BS EN 168935.11 Floors and load distribution and Annex F, and BS 4971 5.6.1 Planning.

In addition, it is important to consider some additional factors, primarily for old or existing mobile units. When considering mobile shelves for an existing storage
space the rails or track will need to be sunk into the floor (which can be costly and complex), or a false floor will need to be added (in both cases this may reduce the overall height available for the shelves). Old units can be prone to ‘snaking’ and instability (this needs to be discussed with the supplier and included within the shelving specification). Additionally, older units can slip the rails (dangerous and costly to remedy). It is not recommended that old mobile units be dismantled and reassembled elsewhere.

**Special storage furniture**

**Plan chests**

Plan chests are used to store large flat material, and must not include items smaller than this to ensure effective retrieval, economic use of space, and to reduce damage. Good quality plan chests can be a real asset and serve to protect flat material and ease retrieval and replacement. They can be made of metal or wood. The following issues need to be considered:

- Standard of carcass construction – robust, but lightweight (usually aluminium) and ideally fire resistant
- Manufacturers should be able to supply a range of drawer sizes. It is better to have more shallow drawers than a few deep, over-filled ones
- Rigid drawer construction required for support when open and filled
- Anti-tilt mechanism required
- Allow space for opening drawers and retrieving items
- Check floor loadings are adequate for chests when full
- Drawers require security locks if chests are located in public areas
- Chests may need to be raised on a plinth to ensure that collection items are stored above floor level and so protected from floods
- Chests should not be stacked.

**Hanging storage chests**

Upright, hanging storage chests are now less commonly used for the vertical storage of maps, plans and drawings, and are not recommended. There are a number of concerns:

- The lack of standards for construction and the materials used in construction.
- Risk of damage from the method of hanging, which may involve attaching a self-adhesive strip to the item (the strip has holes punched to receive the hanging supports). This method should only be used for low value items
- Chests are often over-filled due to overall space restrictions
- High risk of damage during retrieval.

**Cabinets**

In some organisations a more aesthetic arrangement is required, which enables collections to be seen but secure. The solution, common in historic libraries, has been to store books in glazed wooden cabinets. Whilst this solution achieves the objective, it does present some specific preservation problems. Dark, poorly ventilated cabinets can favour mould growth and encourage insects in poor environmental conditions. Condensation may form on the glass if the environment is unstable, and the glass may be easily shattered. If possible cabinets should be moved away from external walls and, if necessary, ventilation holes made in the back to increase air circulation. Glass can be replaced with a safety standard version or a security film applied to the glass surface to guard against shattering. Glass can also be replaced with decorative grills. Although less aesthetic, metal cabinets can also provide secure storage and protection from light, fire and water damage. For more detail consult BS 4971: 2017 section 5.6.9.

**Conclusion**

Appropriate storage is vital for the long-term preservation of collections. As part of collection care planning, organisations should review existing storage provision, evaluate current and future storage needs, and specify appropriate storage furniture. It is strongly recommended that BS 4971: 2017 Conservation and care of archive and library collections is consulted and forms the basis for setting specifications and planning the economic use of storage spaces.

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5 See BS 4971: 2017 section 5.6.9
Online Resources

BREEAM: sets the standard for best practice in sustainable building design, construction and operation and has become one of the most comprehensive and widely recognised measures of a building’s environmental performance.
breeam.com

Designing libraries: a freely accessible resource for library planning and design, a database of library buildings and a marketplace for services.
designinglibraries.org.uk

MAPLE: Major Archives Projects Learning Exchange
nationalarchives.gov.uk/archives-sector/networks-and-collaboration/major-architectures-learning-exchange/

National Archives, Identifying and specifying requirements for offsite storage of physical records, The National Archives, 2011
nationalarchives.gov.uk/information-management/manage-information/planning/requirements-offsite-store/

National Institute of Building Sciences, Archives and Storage Record building
wbdg.org/building-types/archives-record-storage

Additional reading

BS EN 16893: 2018 Specifications for location, construction and modification of buildings or rooms intended for the storage or use of heritage collections

BS 4971: 2017 Conservation and care of archive and library collections


ICA Bibliography of Books, Journal Articles, Conference Papers and Other Printed Sources Relating to Archival Buildings and Equipment 2017


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