

## International Council on Archives

### FAQ 1. Shelving for Archival Storage – Key Issues

*Prepared by the ICA Committee on Archival Buildings in Temperate Climates*

#### 1. Introduction

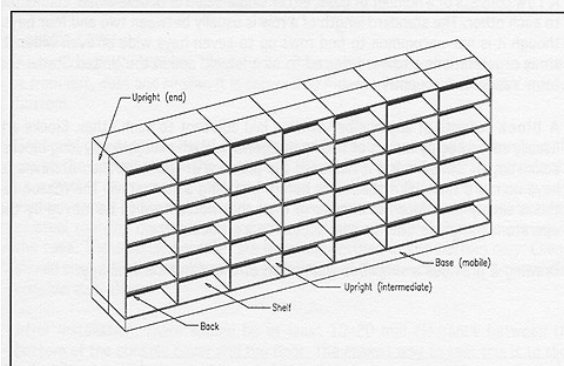
Shelving for archival storage comes in many shapes, sizes, and methods of operation. The notes that follow are intended to provide a brief overview of key issues to consider if you are making decisions about shelving.

#### 2. Shelving terminology

To understand shelving, and how it works, it is necessary to begin with some basic terminology.

- **Backs** are the enclosing panel on the rear of a bay of shelving. They provide the bay with its strength and rigidity.
- **Uprights** (or sides) are the enclosing panel on each side of a bay. They are supplied with a series of pre-punched holes along their full length which allow the user choice in the placement of individual shelves. Uprights are sometimes referred to as 'end' or 'intermediate'. End uprights are at each end of a row; intermediate uprights are the uprights in between.
- **Shelves** are individual horizontal members attached to uprights at either end, and upon which records can be placed. Usually shelves are held in place by four clips – one in each corner – attached to the uprights.
- **Bays** are the basic unit of shelving. They consist of a single back panel connecting two uprights on either side. Bays can be either single-sided or double-sided. A double-sided bay consists of two single-sided bays joined back-to-back and sharing a common back panel as the means of providing rigidity.
- **Rows** consist of a number of bays, either single-sided or double-sided, connected to each other. The standard length of a row is five to six bays, but it is not uncommon to find rows seven bays wide or even wider. In some countries a row is referred to as a 'stack' or a 'range'.

Drawing 1 illustrates a number of these components.



Drawing 1: Shelving components (double-sided mobile)

#### 3. How do you choose between mobile and static shelving?

Shelving can be installed in either static or mobile configurations.

**Static shelving** is ideal for small buildings. It is cheaper than mobile shelving, and there are no moving components, so nothing can break down or wear out.

**Mobile shelving** consists of units mounted onto bases fitted with wheels (sometimes called mobiles or carriages). The bases run on tracks (rails) secured to the floor. Static shelving units, usually fitted at one or both ends of a group of mobile units, are mounted on plinths (bases) secured directly to the floor.

Mobile shelving enables storage of far more material than static shelving – often more than double the quantity – over a given floor area than static shelving. Because the shelving moves, only one access aisle is needed. When a document is required, the particular row of shelving is located and an adjacent aisle is created by moving the shelving units apart.

Another advantage of mobile shelving is its potential to enhance security – mobile units can be locked to prevent unauthorised access.

Yet there are a number of issues that must be considered before installing mobile shelving.

It requires stronger floor loadings than static shelving, so a structural engineer will need to ensure that the floor loadings are sufficient to take the weight.

Because the shelving moves on tracks, an uneven floor can interfere with laying the tracks and the subsequent operation of the shelving.

Tracks can be placed below ground (sunken), or above ground (raised). Below ground tracks are usually built into the floor as part of the building's construction. Above ground tracks are particularly useful if the floor is uneven, or if the property is leased and the shelving has to be removed when the lease expires. If above ground tracks are used, false floors can be installed to cover them, making it easier for staff and trolleys to pass over the tracks, and reducing the risk of accidents.

#### 4. Types of mobile shelving

Mobile shelving can be supplied in hand operated or electrically operated form.

- **Hand operated** – the operator moves a row of shelving by turning a handle, steering wheel or similar device located on the end of the row. The handle is connected, through a series of cogs and chains, to an axle located underneath the shelving. In turn, the axle is connected to wheels that run on the tracks.
- **Electrically operated** – the operator moves the shelving by pushing a button located at the entrance to the row. The button is connected to a motor that drives the shelving.

#### 5. What should you consider when choosing between hand operated and electric shelving?

Hand operated shelving is much cheaper than electrically operated shelving. As there are few mechanised components, there is little that can break down, or need replacing. Electrically operated shelving is very easy to operate, however, there is always the possibility that, over time, components could malfunction or become obsolete.

#### 6. Wooden and steel shelving

The choice of shelving materials is usually between wood or steel.

- **Wooden shelving** can be visually attractive, but if you decide to use it you should ensure that it has been treated to prevent attacks by insects, and that it is fire resistant.
- **Steel shelving** is usually made from bright mild steel and then treated, either with paint or a powder coating, to protect the surface from scratching and reduce the possibility of rusting.

#### 7. What should you look for when choosing second-hand shelving?

If you are planning to use second-hand shelving there are a number of precautions you should take. First, you should ensure that there is no rust present. Rust can contaminate the records. If particularly severe, it can also weaken the strength of the shelving.

If the shelving has minor rust or some other contaminants (eg grease), it should be cleaned and, if necessary, repainted. At the very least, place a layer of cardboard over the shelves as a buffer between them and the records.

You should also ensure that there are no rough edges or burrs on the shelving that could injure staff or damage the records.

#### 8. What accessories can be provided as part of your shelving?

Shelving comes with an array of accessories designed for specific record formats. For example:

- **Slide out reference shelves** can be attached directly underneath a shelf. They can be extended, by means of runners, allowing the operator to place items on them, at waist height, and not on the floor. When not in use they retract underneath the shelf above.
- **Wire racks** (known in Australia as 'toast racks' because of their similarity to toast holders) can allow items such as computer tapes and films to be stored upright.
- **Brackets** allow individual film canisters to be stored horizontally. The brackets are attached to the uprights and are sometimes known as 'pizza' shelving, because they resemble the way pizza boxes are stored.

In addition, there are cardholders, jackets and dividers that can store files or other objects within the shelving.

#### 9. How do you ensure your shelving remains stable?

Whatever height the shelving is, it must be stable. Measures must be taken to ensure it cannot topple over. This is particularly the case when units higher than seven or eight shelves are used. Advice should be sought from the manufacturer.

If you are in an area prone to earthquakes, additional measures may need to be taken to ensure shelving stability. Manufacturers have different ways of doing this. One way is to install a steel pipe above the shelving and attach the pipe to the walls of the storage area. The shelving units are then attached to the pipe by means of rollers.

### **10. How much shelving can be accommodated in a given floor area?**

One of the most difficult factors in planning a shelving layout is establishing how much shelving will actually fit into an available floor area. Put another way, how do you convert square floor metres into linear shelf metres? Some general calculations are as follows.

#### **Mobile shelving**

- 1 square metre of open storage area will accommodate 12–15 linear metres of storage if 8 high (2,475 mm) mobile shelving is installed.
- 1 square metre of open storage area will accommodate 10 linear metres of storage if 6 high (1,875 mm) mobile shelving is installed.

You should allow at least 1 metre (about 3 ft) for the aisleway where standard depth shelving – about 400 mm (1 ft 4 in) – is being used. If the shelving will house very large volumes or maps, then the aisleway should be larger, up to 1.5 metres (5 ft) or more.

#### **Static shelving**

- 1 square metre of open storage area will accommodate 7 linear metres of storage if 8 high (2,475 mm) static shelving is installed.

These ratios are averages and are intended to give you a rough estimate. Pillars, air conditioning riser ducts, and other obstructions will reduce the space available for shelving.

### **11. How do you number the shelving?**

With a large shelving installation covering hundreds of metres, it is important to number all shelving for ease of location and retrieval. However, if finances are a problem, a simpler method is to number the end uprights only (ie the ones facing the main aisles). This way you don't need to individually number each bay or shelf. Anyone using the shelving can simply count off – the bays from left to right, and the shelves from top to bottom.

### **12. Why should you allow for ventilation in and around the shelving?**

Large installations of high shelving can restrict the airflow within a storage area. When designing a shelving installation it's important to allow for sufficient ventilation in and around the shelving, to help preserve the records you are storing.

In order to promote better ventilation it is suggested that the shelving installation should not be in direct contact with the walls; a distance of 200 mm is recommended.

Some organisations don't use backs on their shelving rows, preferring to have cross bracing instead. This will certainly allow for greater airflow, but you do need to ensure that the shelving is structurally stable.

Some manufacturers use components – uprights and shelves – that have pre-drilled holes to provide greater airflow.

### **13. Are there any occupational health and safety issues to be considered when designing a shelving layout?**

There are a number of occupational health and safety issues that should be considered when designing a shelving installation.

If you are intending to use very high shelving, greater than 2.5 metres (8 ft) you need to consider how staff will be able to access the shelving. What type of ladders, steps etc will be needed? What methods will be in place to allow staff to retrieve heavy, or bulky, items from the high shelves? In this context, it's a good idea to place low usage records on the higher shelves.

You should ensure there are no sharp edges or burrs anywhere on the shelving. Otherwise, staff can cut themselves, or records can be damaged.

If you are using above ground tracks, a false floor should be installed. It should be built after the tracks have been laid and before the shelving is installed. If the floor is installed later (eg following staff complaints or accidents) it will be considerably more expensive.

### **14. How do you design a shelving layout?**

With the knowledge of shelving and tracking systems outlined above, it is now appropriate to consider some of the key design issues affecting shelving layout.

#### **Type of shelving**

What type of mobile shelving should be purchased? In a large installation the choice is usually between hand operated or (more expensive) electrically operated units. In choosing between hand operated or electrically operated shelving you need to weigh up:

- cost
- what is to be stored
- size of the overall installation
- how often access will be required

If access will be frequent, it may be worth the extra cost to install electrically operated shelving in order to meet occupational health and safety requirements.

### **Floor loadings**

Are they sufficient to take the weight of the shelving and its contents?

### **Floor level**

Is the floor completely level? Are there variations and, if so, how substantial are they? The unevenness of the floor may require above ground tracks.

### **Obstructions**

Are there pillars, air conditioning controls, or other obstructions that might impede the placement of shelving? Pillars should be inspected to see whether there are footing pads around the bases that are larger and more restrictive than the pillars themselves.

Pillars should be used as the starting point when placing units on a design drawing. Remaining shelving can then be placed in position working outwards from the pillars.

Remember to take other obstructions into account – skirting boards, air conditioning intakes (in the walls or the floor), power outlets, light switches and sensors, fire hose reels, fire extinguishers etc.

### **Workers access**

Will there be sufficient access to the area for workers during the installation phase? This is particularly significant given that mobile bases can be over six metres in length (for a typical seven bay unit) and may be very difficult to manoeuvre into the area where they are to be located.

### **Shelving quantity**

How much shelving will actually be needed? This depends on how much material you have and what is likely to be created or received in the future. What are your predicted annual growth rates?

### **Moveable aisle ways**

If you are using mobile shelving you should allow for moveable aisle ways (as stated earlier). Depending on how many rows of shelving there actually are, it's a good practice to install a static unit after every 10 mobile rows, particularly if you are installing hand operated shelving. This reduces the labour involved in obtaining access to individual rows.

### **Shelving height**

How high the shelving will be determined by floor to ceiling clearance levels. Whilst the temptation may be to install shelving that makes the maximum use of these levels, other factors also come into play. The higher the shelving, the more difficult it is to gain access to the top shelves. There may be occupational health and safety matters to consider. In any event, staff may resist using the higher shelves.

You need to allow sufficient clearance between the ceiling and the top of the shelving. This is to ensure that the shelving does not interfere with lighting, air conditioning vents or sprinkler heads.

When calculating the height of shelving units you must include both the height of the uprights and the height of the mobile bases. With its wheel assembly, a base is normally about 170 mm (7 in) in height. So, if uprights of 2,475 mm (8 ft 3 in) are being used, the shelving will in fact be 2,645 mm (8 ft 10 in) high.

Above ground tracks will add another 50 mm (2 in) to the overall height.

There should also be sufficient clearance between the bottom shelves and the floor to protect the records on those shelves from damage in the event of flooding. The bottom shelves should be at least 150 mm above the floor.

### **Type of tracks**

The choice between above or below ground tracks will often be resolved by whether the building is owned or leased. The owner of a leased building will probably insist that above ground tracks be installed so that they can be removed at the end of the tenancy. Even if your organisation is the owner of the building, it may still be necessary to use above ground tracks if the floor levels are severely askew.

If below ground tracks are to be used, it may be preferable to have the tracks fitted as part of the building construction process.

### **Fire safety**

The installation of large expanses of shelving can jeopardise an area's fire safety unless appropriate precautions have been taken.

The location of emergency and exit light fittings should be noted. After the shelving has been installed they may require relocation if they are no longer visible.

Fire egress distances may be impinged and should be confirmed with authorities before the shelving is installed, as should the location of fire extinguishers and hose reels.

If overhead sprinklers are installed in the storage area, a specified clearance may be needed between the top of the shelving and the sprinkler heads. In Australia, for example, there must be a clearance of 500 mm (19.6 in) between the top of the shelving and the sprinkler heads.

#### **Lighting**

Large expanses of shelving can reduce the effectiveness of an area's lighting, and this needs to be considered when locating units on a master plan. Lighting can also give off heat, so it's important that the shelving is not too close to the lights that damage to the records might result.

#### **General points**

In locating the shelving on a master drawing, a number of other factors must be considered (eg wheelchair access to the storage area if appropriate, widths of major access aisles and fire exit corridors).

You should also leave sufficient space for opening of doors into storage areas and for the movement of staff pushing large trolleys.

### **15. Summary – what are the essentials?**

1. Shelving should possess sufficient load bearing strength for records to be housed in it.
2. The mass and distribution of the load should be considered when designing the shelving installation, regardless of whether the shelving is static or mobile.
3. Shelving materials should not give off harmful emissions.
4. The shelving system should allow sufficient air circulation for records being stored.
5. Individual shelves should be versatile and adjustable to allow for varying sizes and types of items in the collection.
6. There should be no sharp edges or burrs on the shelves.
7. The shelf clips should not obstruct the withdrawal of documents or records stored.
8. Records should be stored inside of the outer edge of the shelves and uprights.

### **16. Further reading**

- Bright, Franklyn F, *Planning for a Movable Compact Shelving System*, Chicago Library Administration and Management Association, Occasional Papers, Number 1, 1991.
- British Standards Institute, British Standard 5454–2000, *Recommendations for the Storage and Exhibition of Archival Documents*, London, 2000, pp. 12–13.
- Ling, Ted, *Guidelines for Mobile Shelving for Archives, Libraries and Museums*, Australian Archives, Standards Australia and Standards New Zealand, Sydney, 1997
- Nitecki, Danuta A and Curtis L Kendrick, *Library Off-site Shelving: Guide for High-density Facilities*, Colorado, 2001.

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for the ICA Committee on Buildings in Temperate Climates  
February 2004*