

HANDLING OF COLLECTIONS IN STORAGE



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CHAPTER 1

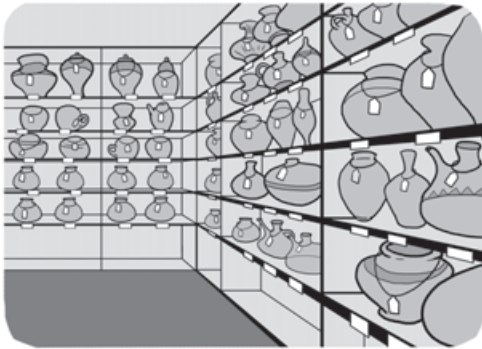
INTRODUCTION

1.1. Storage Area : the Heart of the Museum



A museum's storage area is a vital part of any museum and generally contains the larger part of the collection. It also plays an essential role in the development of a museum and its programmes as it is closely linked with other activities, such as research, consultation, exhibitions, conservation and loans.

The storage area guarantees the preservation of and accessibility to the collection, and as a result the proper care and management of collections in storage is an important challenge for museums if they are to maintain their roles as centres of knowledge, research and inspiration.



1.2. Preventive Conservation and Storage Management

The proper care of the collections while in storage and the correct management of the storage area are integral parts of preventive conservation for museum collections. Preventive conservation refers to measures and actions aimed at avoiding or minimizing future deterioration or loss, and good management of the storage area is the first defence against the deterioration of a collection. In a well-planned and well-run storage environment, most forms of deterioration will be either slowed or avoided. Costly and complicated conservation treatments are of little use if the objects treated are kept in an unsuitable storage space.



1.3. A Good Storage Area

A good storage area should :

- be under the responsibility of one person;
- enable quick tracking of objects (using a location code);
- provide easy access to objects with a minimum of handling;
- not store objects from the collections on the ground;
- have storage units that are adapted to the dimensions and types of objects stored;
- have stable fixtures able to support the weight of objects;
- provide protection against all agents of deterioration.



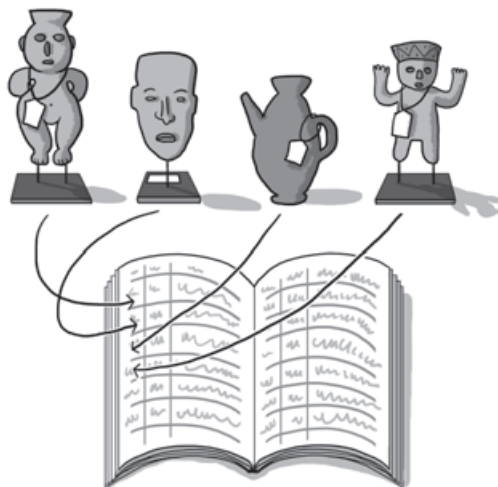
1.4. Inventory

A proper inventory is essential to the success of all museum programmes, and it is especially important for the care of objects from the collection while in storage. Taking an inventory of the collection means systematically checking the presence of each object belonging to the museum, generally by checking each with information contained in the museum accession book or catalogue. The objective of the inventory is to ensure that all the objects making up the collection are present and in the correct location.

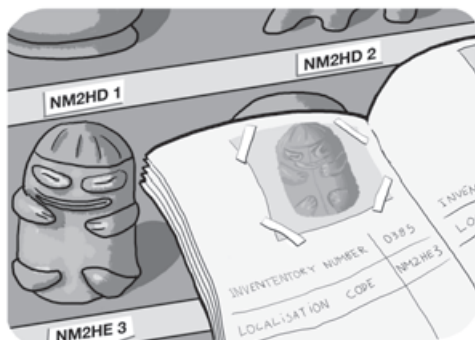
1.5. Minimum Documentation Standards

Minimum documentation standards mean that:

- there are comprehensive location codes for all areas in the museum and for all storage and display furniture;
- there is an up-to-date accession book that contains details of all accessions to the museum, for example over the last calendar year;
- all objects are individually numbered and can easily be located from the accession book or museum catalogue;
- objects that have not yet been registered can easily be located.



For further information on inventories, consult volume three of the *Cultural Heritage Protection Handbook* series on collection documentation.



1.6. Storage Area Location Codes

Each location where objects are stored, even if temporarily, must be given a location code. This means that :

- each location in the museum, whether a building, a storey of a building, a room, a piece of furniture, a shelf or a box, etc., must be given its own code;
- a combination of numbers and letters should be used in numerical and alphabetical order;
- the location code of each object should be entered in the museum catalogue;
- if an object is moved, it should be given a new code reflecting its new location;
- location codes should be regularly checked.

1.7. Unique Designation of the Museum Storage Area

A museum storage area should only be used to store items from the museum's collection. Activities such as registration, conditioning and packing, quarantine, and study should be done in specific rooms connected to the storage area. In general :

- a storage area should only be used for storage of objects;
- packing materials, old display panels and furniture, publications and other materials should not be stored in the storage area;
- activities such as studying, packing and photographing should take place outside the storage area.





1.8. Involvement of all Museum Staff

A successful and well-organized storage area involves the cooperation of all staff members through teamwork, planning and communication.

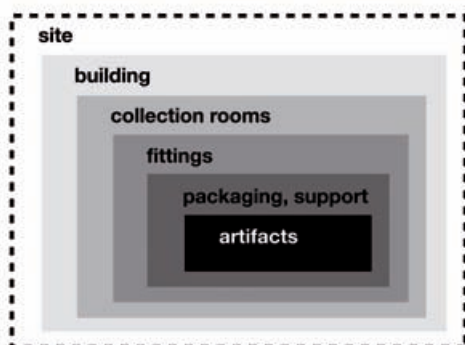
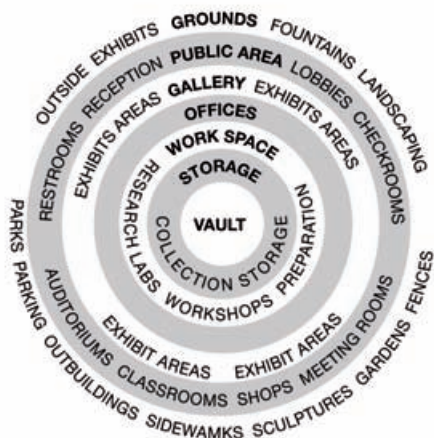
Written storage procedures should be known by all staff members, including the rules and regulations for entering the storage area and retrieving an object, for cleaning and maintenance, for checking visitors and for the regular inspection of the collection. A single person should be officially responsible for the storage areas.

1.9. Rules and Regulations for Security and Access

Rules and regulations for the storage area should include:

- establishing rules on security and access to the storage space;
- ensuring that all staff members are familiar with the rules and respect them;
- exercising tight control over the numbering and management of keys;
- controlling access to the storage space: only storage technicians and supervisors ordinarily have right of access to the storage area, and all other persons, including researchers, conservators, cleaners and maintenance staff, should be considered visitors and registered in a logbook;
- allowing visitors to enter the storage area only by special permission and under the supervision of storage area staff, in order to prevent possible damage, theft or relocation of objects;
- registering visitors in a logbook with their names, date, and purpose of the visit;
- prohibiting smoking, eating or drinking in the storage spaces.





CHAPTER 2

COLLECTION STORAGE FACILITIES

2.1. Factors affecting the Choice of Storage Location

The following factors should be taken into account when deciding the location of a storage area:

- threats of natural disasters, including floods, storms, earthquakes, volcanic eruptions or avalanches, in the surrounding area;
- the immediate surroundings of the building and its location and possible risks of pollution, vibration, etc.;
- the type of building, including the building materials used (wood, concrete. etc.) and the number of floors;
- accessibility and infrastructure, including ease of access from outside the building and within it, including to the loading bays, exhibition areas and conservation area;
- location of the storage area within the building, for example in a central area protected from climatic fluctuation and not under the roof or in the basement.



2.2. Storage Room Specifications

The storage area should be easy to clean and should be kept as dust-free and clean as possible. This can be achieved by:

- sealing all concrete parts of the storage area with epoxy or water-based polyurethane;
- smoothing walls and painting them with latex paint.

The carrying capacity (Kg/m^2) of the storage area should also be noted.

2.3. Reducing Threats to Storage Areas

2.3.1. Fire

Walls and ceilings should be built of fireproof material such as stone or gypsum.



Smoke detectors should be installed and regularly tested.

Fire-fighting equipment should not contain powder as this can stick to the surface of objects. Pressurised water or carbon dioxide (CO₂) portable fire extinguishers are recommended.

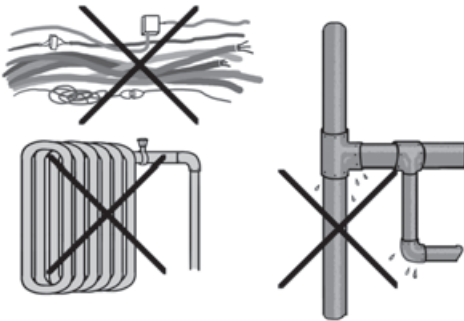
Fire-fighting equipment should be within easy reach.

Flammable objects (e.g. cellulose nitrate film) should be stored separately from other objects and preferably in a different building.

2.3.2. Water, Electricity and Gas Pipes

Ideally, the storage area should not include:

- Loose electrical wiring;
- Water pipes;
- Drain pipes;
- Heating ducts;
- Gas pipes.

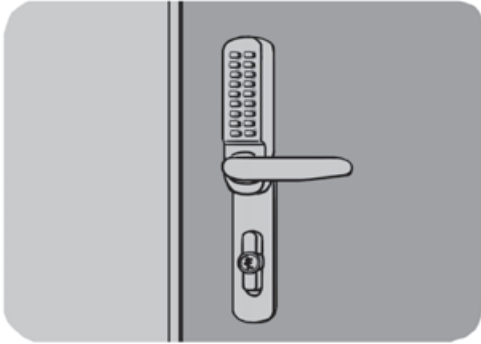


All electrical equipment and wiring should be insulated and kept in good condition, in order to eliminate any danger of fire as a result of short circuiting.

Water and drain pipes should not run through storage rooms since they pose a risk of water damage should they burst or leak.

Heating ducts should not run through storage rooms since they can cause damage through fluctuating temperatures.

Control panels should be placed outside storage areas to afford easy access for maintenance personnel.



2.3.3. Security

Doors should be made of solid wood or be metal plated and should have high-quality locks.



2.3.4. Biological Agents (insects, rodents, micro-organisms)

Storage areas should be dry and well ventilated, in order to reduce the risk of insect infestation and mould. In particular:

- all openings to the building from the outside should be sealed;
- all doors and windows should be kept closed;
- ventilation openings should be fitted with fine mesh screens to keep insects out.

To prevent pests:

- collection and storage rooms should be inspected regularly for signs of infestation;
- insect traps should be installed;
- inspections should be carried out for frass and droppings;
- any pests discovered should be recorded in a logbook, together with measures taken for their control;
- non-toxic methods should be used to control pests in the interests of the personnel, the collection and the environment.

Quarantine:

- all objects coming into the collection should be inspected and quarantined;
- objects suffering from biological infestation should be isolated and then treated and cleaned.

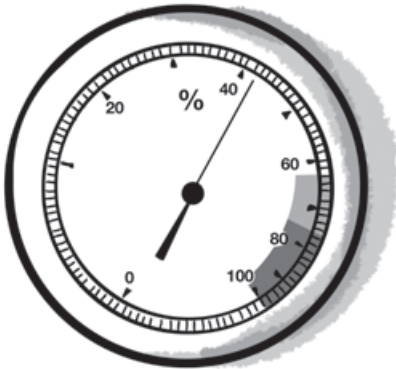
CHAPTER 3

STORAGE AREA CONDITIONS



3.1. *Climate*

- A stable environment should be maintained.
- Climatic conditions should not be changed if objects look stable (i.e., no visible change or deterioration) and have been in the same location for more than five years.



3.1.1. Humidity

- Damp should be avoided, meaning a relative humidity of $> 75\%$.
- Objects should not be placed next to cold walls.
- Objects should be kept above floor level.



3.1.2. Temperature

Objects having special temperature needs (some modern papers, most photographic materials, most electronic media, etc.) should be kept under temperature-controlled conditions or they will become unusable over a period of between 30 and 100 years. Each reduction of 5°C will double their lifetime.

3.2. *Lighting: Intrusion of Natural Light*

Light causes permanent damage to objects made of organic materials. Therefore:

- the storage space should be divided into sections, each having separate lighting;
- lighting should be sufficient for observation, proper handling, etc.;
- lights should be turned off when leaving the storage room.

There should be no sources of natural light in the storage areas. Windows should be covered with blinds, screens or shutters, especially those receiving direct sunlight.





3.3. Contaminants

Air-pollution and dust are permanent threats. Good ventilation and the use of chemically stable materials will minimize the build-up of harmful concentrations of gas. In addition:

- dust covers and boxes should be used to protect objects against dust. Should air-conditioning ducts be present, outlets should be covered with fine material which should be regularly cleaned;
- fans should be used;
- insect repellents containing naphthalene (mothballs) should not be used in the storage areas, and neither should household insecticides or fungicides since these contain chemicals that can damage objects from the collection, especially in a closed environment.



CHAPTER 4

STORAGE FURNITURE

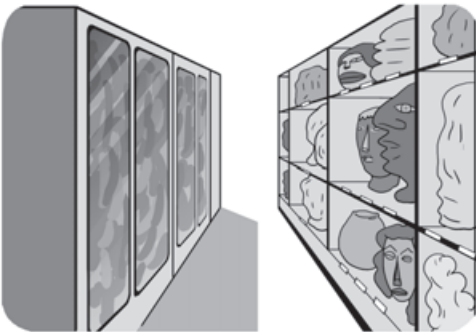
4.1. Role of Storage Furniture

Appropriate storage furniture should:

- Provide physical support and protection for objects;
- Offer protection from causes of deterioration;
- Increase/facilitate the accessibility of objects;
- Make efficient use of space.

4.2. Open and Closed Storage Systems

The environmental quality of storage areas and the size or value of objects to be stored will determine whether objects can be stored in open or closed storage systems.



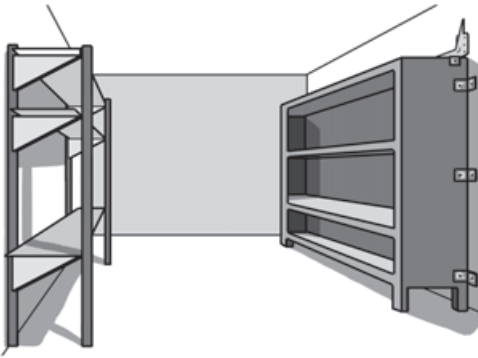
Use open storage systems for:

- Objects in sound condition.

Use closed storage systems for:

- Small objects;
- Precious objects;
- Structurally sensitive objects (e.g., complex constructions of feathers, or complex constructions of dense fibres, etc.);
- Dust-sensitive objects (e.g., objects with loose pigments or uneven surfaces);
- Light-sensitive objects (rubber, paper, textiles, some pigments, etc.);
- Dangerous objects (arrows, weapons, etc.).

4.3. General Characteristics of Storage Furniture

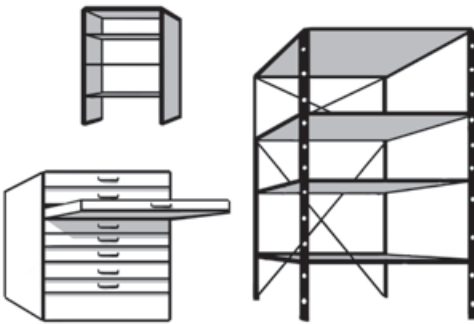


- Strong furniture units should be used that will not bend under the weight of objects.
- Furniture units should be bolted together and (when necessary) to the floor or ceiling to ensure stability.
- When available adjustable shelves should be used.
- Sharp edges or protrusions should be avoided, especially with metal cabinets.
- Surfaces should be smooth.

4.4. Furniture Materials

Objects in storage can be affected by other materials in their immediate environment. As a result:

- storage furniture should be selected taking the type of collection and available budget into account;
- powder-coated (synthetic polymer fused onto steel) or painted (primer finish) metal shelves that are free of sharp edges or protrusions should be selected, these being inert, chemically stable and readily available.



Enamelled steel is the most chemically stable material for storage units/furniture.

Wood is suitable if well seasoned. It should be noted that most woods are subject to pests.

4.5. Dimensions of Storage Furniture

Storage furniture should be able to accommodate a wide range of objects of different sizes. Standard shelving can be found on the market and be cost-effective. If standard shelving is chosen, then there is a risk of wasting space if this shelving is wider than the average sizes of the objects in storage.

However, if the shelving is too narrow, then there is a risk of mechanical damage, dropping or abrasion during handling.



Overall dimensions should depend on:

- the size, shape and weight of the objects;
- the availability of space within the storage area;
- the height of the ceiling, since it is preferable that the collection be accessible without the use of a ladder.



4.6. Aisles

The width of the aisles may vary between 70 and 120 cm depending on the size of the objects on the shelves.

Aisles should be carefully planned to allow sufficient clearance for the movement of objects and the use of removal equipment.

4.7. Further Equipment

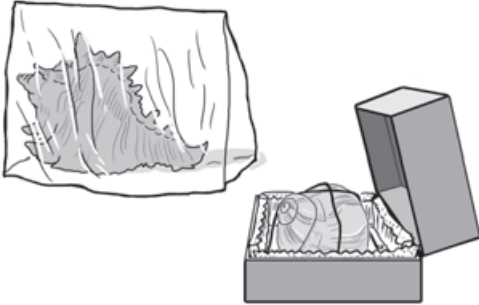
Further points to bear in mind include:

- Trays and boxes: these should have smooth surfaces without sharp edges or corners;
- Carts: these should be smooth-running, preferably with hard rubber tyres;
- Ladders: these should be stable and be able to bear the combined weight of the storage worker and objects;
- Tables: these should be of good quality and should be able to carry several objects at once. They should be situated on an even floor and should be easily movable.



CHAPTER 5

MATERIALS FOR THE STORAGE AREA



5.1. General Considerations

Some materials, such as lead, soft metal alloys and some shell materials, are sensitive to vapours emitted by building materials like wood, wooden fibreboard and oil-based paint. These materials should be stored in polyethylene (PE) or polypropylene (PP) boxes or plastic bags.

5.2. Materials for Short-Term Use

Non-archival materials may be cost-effective and appropriate during short-term and minimal exposure to potentially harmful materials (e.g. during transport).



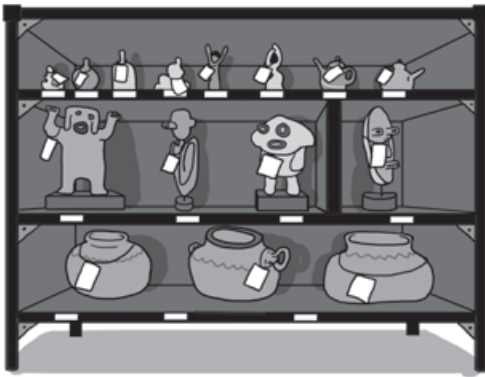
5.3. List of Materials

See the annex at the end of this publication

CHAPTER 6

PLACING OF OBJECTS IN STORAGE

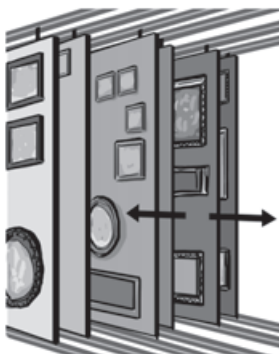
6.1. Classification and Shelving of Objects



The placing of objects within a particular unit should be well planned.

Objects can be placed according to their:

- Dimensions, form, and weight: large or awkwardly shaped objects should be placed on lower shelves; small objects should be placed in drawers; lighter objects should be placed on top shelves; bulky objects should be placed within easy access of the storage area entrance;
- Materials or type of object: objects of a similar material or type should be placed together;
- Thematic (chronological, cultural or geographical origin, etc.).



6.2. Types of Placement

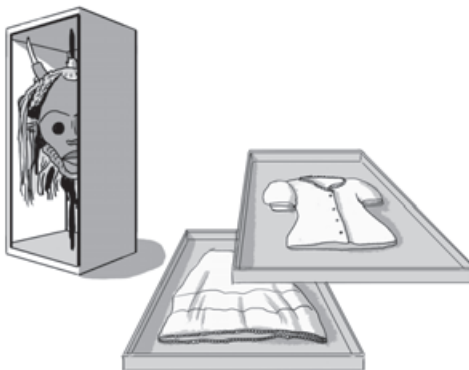
Objects can be stored in different ways. For example :

- Lying flat on a shelf or in a drawer;
- Vertically, hanging on a wall, or a grid, etc.;
- Rolled up (especially textiles and carpets);
- Supported using an individual support;
- Packed in bags, containers, boxes, crates etc.



6.3. General Rules

- Objects should never be placed directly on the floor.
- Large objects like furniture should be placed on a dolly or in a frame for protection and ease of handling and transport.
- Very heavy items or large pieces of furniture should be kept on storage platforms, pallets or carts on wheels to avoid extra lifting.
- Shelves should not be overcrowded with objects that are crammed together. As a general rule, only one or two objects at most should be moved before the intended object is reached.
- Sufficient spacing should be left between objects to allow for handling, access and proper air circulation.

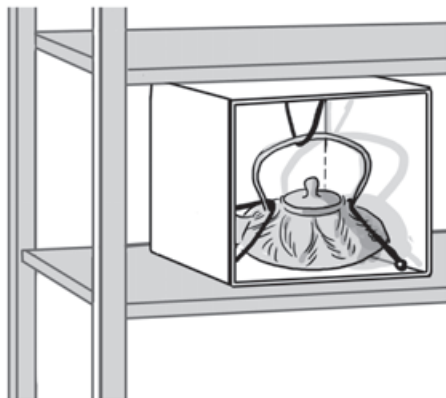


6.4. Mounting of Objects

6.4.1. Objects needing Individual Support

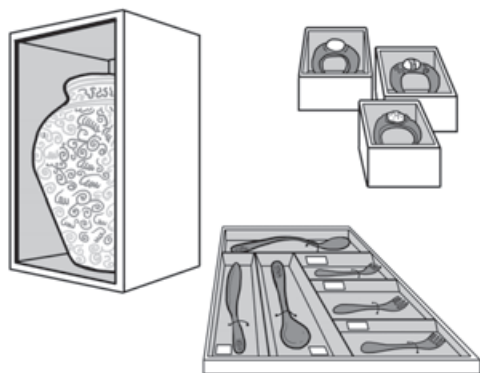
The following types of objects typically need individual support:

- objects having fragile surfaces or structures (e.g., brittle fibres, silk and grass);
- objects with moving or protruding parts;
- objects that may collapse over time under their own weight;
- objects that are not stable without support;
- objects that are frequently studied;
- objects with many loose parts.



6.4.2. Types of Support

Supports should be kept as small and simple as possible, with boards or shallow trays often being sufficient. The dimensions of storage shelving should be borne in mind when designing supports.



6.4.3. Mounts and Frames

Issues to bear in mind when using mounts and frames include:

- complex mounts or frames should be used for large, complicated or heavy objects;
- storage mounts should be made of durable and compatible materials;
- storage mounts should be designed to balance around a centre of gravity and should not cause stress to the object;
- storage mounts should be standardized.



CHAPTER 7

HANDLING AND MOVING THE COLLECTION WITHIN THE MUSEUM

7.1. What does Handling an Object mean?

Handling refers to touching an object, changing the position of an object, or moving an object even over a short distance.



7.2. Risks of Handling

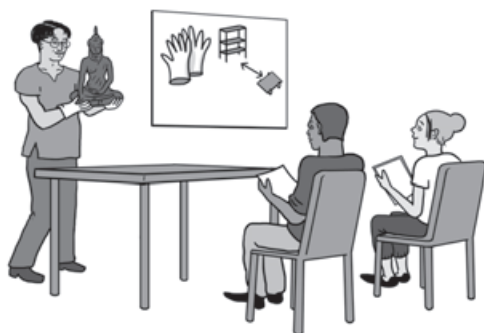
Most damage to objects happens as a result of improper handling, often when working under pressure of deadlines.

Objects are most vulnerable and most likely to be damaged when they are being handled or moved.



7.3. General Guidelines

- Handle objects as little as possible.
- Wear gloves to touch objects.
- Carry only one object at a time.
- Support the object with both hands and never pick it up by its handle alone.
- Avoid overloading trolleys or stacking objects on top of each other on trays or containers.
- Never force an object, or part of an object, into position.



7.4. Necessity of Staff Training

Good staff training can minimize risks related to careless handling and improper use.



7.5. Support Considerations

- Containers and materials must be clean and covered with a soft, non-slip surface.
- Separate objects from each other using cushioning material.



7.6. Handling Procedures

7.6.1. Clothing

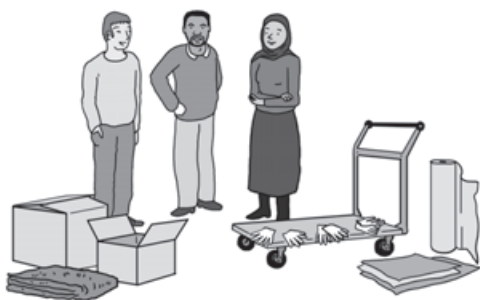
When handling objects:

- Wear comfortable clothes and non-slip shoes;
- Do not wear rings, bracelets or other jewellery.



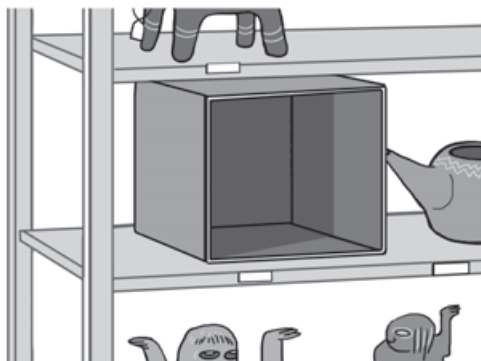
7.6.2. Gloves

Wear plain cotton or nitrile gloves. If these are not available, hands should be washed thoroughly to prevent contamination of objects.



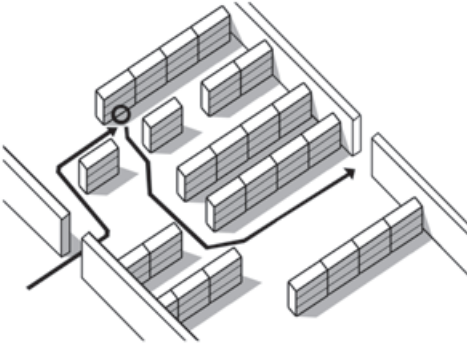
7.6.3. Equipment

The correct equipment should be assembled before any object is moved.



7.6.4. New Location

The new location of an object should be prepared in advance.



7.6.5. Route

- Plan routes before starting the transport of objects.
- Check the width of doors and corridors.
- Check the height of steps.
- Remove any obstacles.



7.6.6. Group

A handling sequence should be agreed beforehand if there is a group of people involved in the transport.



7.6.7. Inspecting Objects

- Inspect objects for structural soundness and stability before handling them.
- Take the construction, weight, size and shape of large objects into account before moving them.



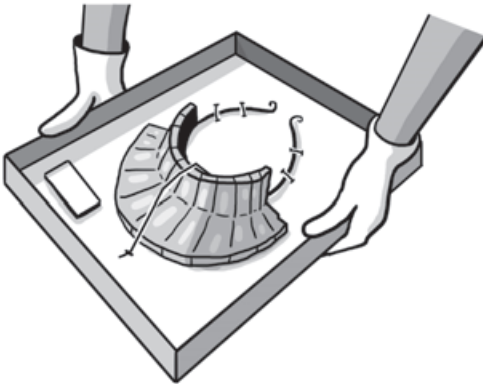
7.6.8. Picking up Objects

- Before picking up an object decide whether it can be safely touched, and if so which parts.
- Pay attention to handles and other protrusions that can break off.
- Touch easily-marked surfaces with caution.



7.6.9. Carrying Objects

- Pick up objects using as little pressure from the fingers as possible.
- Use both hands to give proper support.
- Place one hand beneath the object, or beneath the heaviest part of the object, and support the object with the other hand.

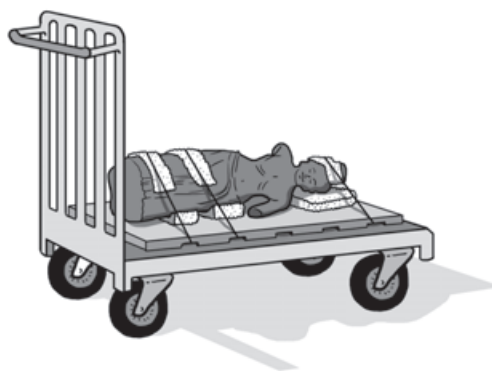


7.7. *Moving the Collection*

7.7.1. General Considerations

When transporting objects, it is important to provide:

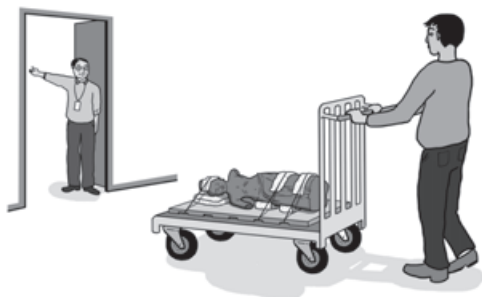
- full support for each object;
- protection from vibration and impact.



7.7.2. Trolleys

Use trolleys fitted with:

- pneumatic tyres or large rubber tyres that will absorb shocks and keep the cart in a stable position;
- padded trays that will support objects on the trolley and prevent them from moving or falling off.



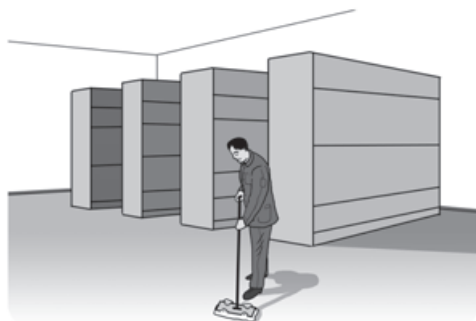
7.7.3. Transportation

- Move trolleys at a steady, even speed.
- Avoid sudden movements and abrupt stops.

CHAPTER 8

MAINTENANCE

8.1. Housekeeping



- A good housekeeping system should be established that will help keep storage areas clean and tidy.
- Procedures and checklists for regular maintenance should be established that will ensure that work is organized in accordance with the norms and standards of the institution.
- An annual general clean is not acceptable in the absence of a regular cleaning routine.
- Frequent cleaning minimizes the possibility of pest infestation.
- Cleaning agents containing bleach or ammonia should not be used on or near objects.

8.1.1. Typical Cleaning Regime

Storage rooms should be cleaned on a regular basis.

A typical cleaning regime could look as follows:

Daily: remove dust using vacuum cleaners fitted with special dust-trapping filters. Collect the waste in dustbins with lids. Dispose of litter.

Weekly: wipe floors using a damp (not wet) cloth. Vacuum clean mats outside the storage area.

Monthly: vacuum clean underneath chests and cupboards.

Yearly: vacuum clean.



8.1.2. Dusting of Objects

Cleaning and dusting of objects needs specialised training and should only be undertaken by or under supervision of a trained conservator.

In general:

- dusting of objects should be carried out outside the storage rooms;
- loose dust and dirt should be removed using a soft, dry brush and then vacuumed up using a vacuum cleaner fitted with a total filtration system (HEPA filter);
- a vacuum cleaner with a brush should never be used directly on an object;
- wet solvent cleaning (water or other liquids) should not be used to remove dust;
- separate brushes should be used for different materials. While the dusting of feathers requires a very soft brush, metals can be cleaned with a much firmer brush. Regularly clean brushes to avoid a build-up of dust;
- the gentlest solutions should be used first;
- consult a specialist when in doubt.



Bear the following safety precautions in mind:

- dust can contain contaminants, such as poisonous residues from previous pest treatments. Objects should be inspected for such residues before dusting;
- face masks and nitrile or rubber or similar gloves should be worn to give minimum protection against contaminated dust.



8.2. Inspection and Monitoring

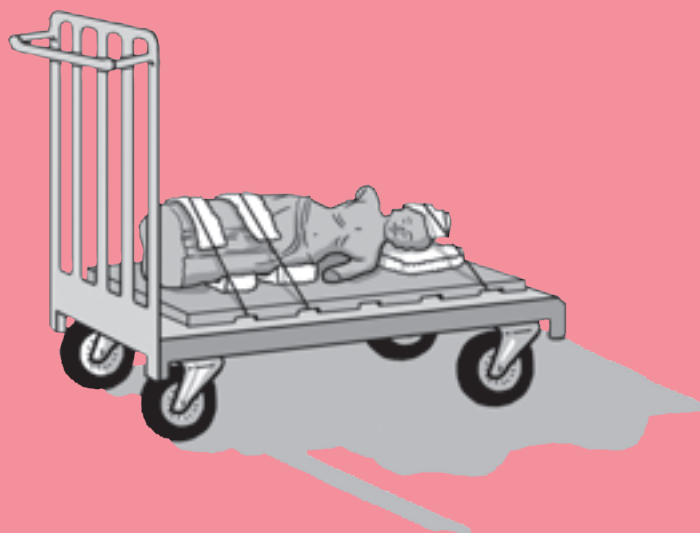
Regular inspection of the collection in the storage area should be carried out.

Regular routine checks should be made for signs of pest infestation. Pipes and ducts running through the storage area should also be inspected.

Materials commonly used for storing and transporting objects

Item	Description	Product brand or generic name	Purposes
Bags	Resealable polyethylene bags	Ziplocks®, Baggies®, Minigrip®	- Storage of small items - NB bags should not be sealed to allow air circulation
Sheet (for direct contact with object)	Acid-free tissue paper		- Inserted between objects to interleave or cover materials - Used as filling or 3D nests
Film (for direct contact with object)	PET clear polyester film (Polyethylene terephthalate)	Mylar®, Melinex®	- Wrapping material when object's surface is sticky - NB Can be statically charged
Cloth (for direct contact with object)	Washed muslin, cotton and linen		Wrapping material
Fabric (for direct contact with object)	Non-woven high-density polyethylene fibrous blend fabric	Tyvek®	- Used as dust covers and labels. - NB Some variants contain Teflon®.
Filling	Cotton or polyester batting	Fibrefill®	Making cushions or soft supports, covered with cotton material
Fabric	Woven tubular (round) knit fabric made of cotton (or polyester) that can be stretched	Stockinet	Stuffed with batting or cloth, can be used to make storage and exhibition supports.
Thread/Band	Cotton or polyester thread or band		To attach different parts of an object

Support	Acid-free board (sometimes corrugated)	Mattboard	• Supports or small trays
Support	Acid free foam-core, extruded polystyrene or polyurethane with paper top layer	Kapaline®, Artfoam®	• For temporary use only as in-between layers are not chemically stable
Support	Honeycomb mounting boards (beeboards)	Acid-free rigid paperboard -	• Mounting heavy objects
Support	Corrugated polypropylene boards	Coroplast®, Vikuprop®	• Mounting heavy objects and serving as a base.
Support (flexible)	Cross-linked polyethylene foam	Plastazote®, Cubical®	• Filling and as a top layer in direct contact with the object. • Cushions collections in storage or shipping. Lining mounts drawers or shelves. Pinning small objects
Support (rigid)	White polyethylene closed-cell foam	Polyfoam®, Ethafoam®, Museum Art Foam®	• Provides cushioning, and support in storage mounts. Also used for packing and shipping. Sheets can be used for lining drawers or shelves NB Thickness and density must match the object's weight. Surface can be rough and must be covered with softer material.
Glue and tapes	• Low melt glue • Water-activated paper or linen tape • Cotton or polyester twill tape	Velcro®	• Adhesives for attaching materials. NB Should not be in direct contact with the object.



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