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Practical guidelines for storage and packing of archaeological metal work

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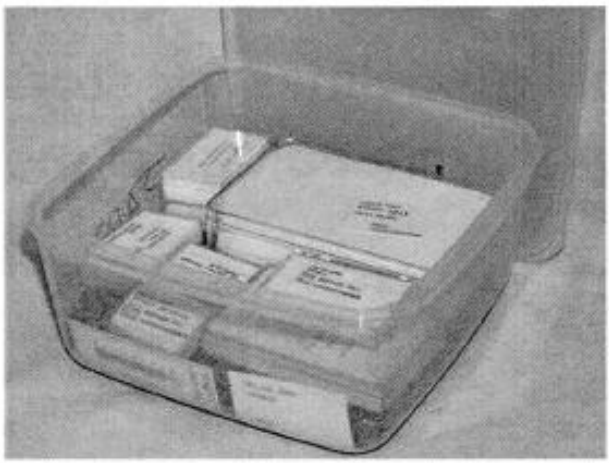
Storing archaeological metalwork

Once excavated, metals should be slowly dried under controlled conditions until they are ready to be stored in a microclimate where the atmosphere within the container can be kept dry. Once in a controlled environment, the metalwork should be monitored for any changes in condition. Silica gel must be replaced once it is saturated.

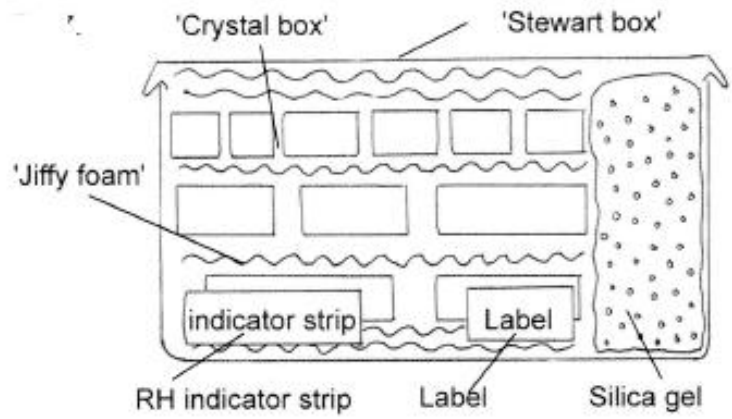
- Metal objects which incorporate enamel or organic remains are composite objects and should be seen and discussed with a conservator before packing.



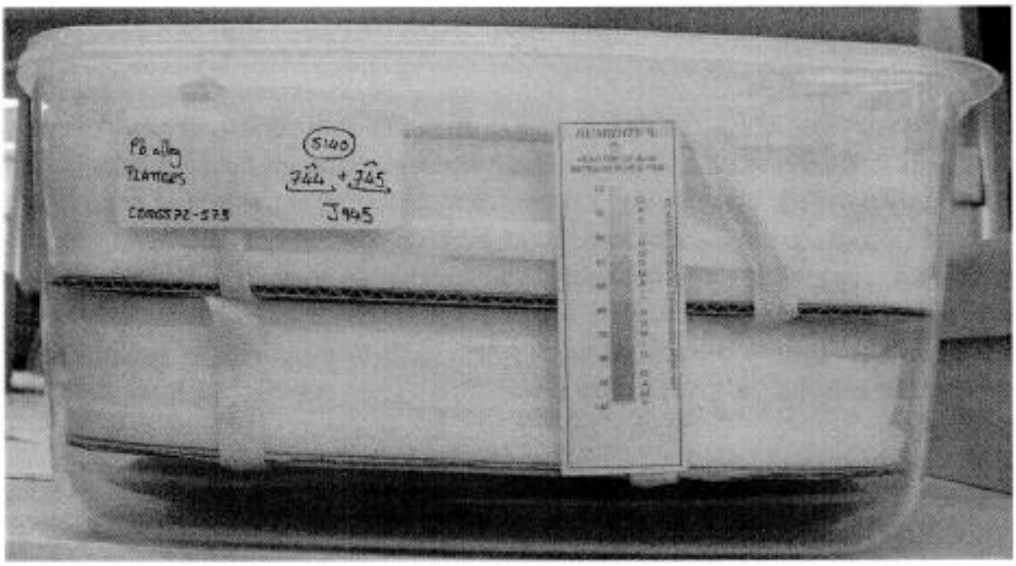
Archaeological metalwork stored with silica gel in an air-tight container. Jiffy foam will be used to pack the boxes inside securely. *Image courtesy of Wiltshire Council*

Creating a dry microclimate for archaeological metals

1. Objects should always be packed in a 'Stewart' box. Acid free card boxes and 'Crystal' boxes are not sufficiently airtight.
2. Silica gel should be placed in a bag inside the 'Stewart' box. Perforated polyethylene or muslin bags can be used. The objects should not be in contact with the silica gel.
3. As a rough guide, the amount of silica gel required should be at least one fifth of the volume of the container. It is better to use too much than too little.
4. *Silica gel is a drying agent and irritant it should be handled with gloves. Health and safety information should be read and precautions taken to protect yourself and those around you.*
5. An RH indicator strip should be placed inside the box to monitor the humidity within. The indicator strip should be facing outwards so that the RH level can be read without opening up the box.
6. Label the box.
7. The boxes must be checked periodically to see when the silica gel needs changing.



Objects packed securely in a 'Stewart' box containing silica gel.



Lead objects stored in a dry microclimate; silica gel is placed in the bottom of the 'Stewart' box and dividers made of acid free card to protect the objects coming into direct contact with the dessicant. A Relative Humidity strip is clearly visible.

Creating a microclimate: monitoring and control

Relative Humidity (RH) Indicator strips

RH indicator strips are used to show the approximate moisture level within a sealed container. RH indicator strips should be placed inside a sealed container, facing outwards, so that they may be seen without opening the box.

The raised paper strip changes colour with changes in humidity – from blue (dry environment) to pink (damp environment). To find the RH level, read the number at the top of the blue section, between the blue and the pink.

Example of a Relative Humidity Indicator strip
Image courtesy of Wiltshire Council

Silica gel

Silica gel is a material which reacts with moisture in the atmosphere. It can absorb moisture or release moisture into the atmosphere depending on how it is being used. It is commonly used as a **desiccant**, to remove moisture from the air but once it has been '**conditioned**', it can also be used to maintain a specific humidity level within an enclosed space. Silica gel is available in two forms: as crystals or beads. Some types of silica gel incorporate colour to indicate the presence of moisture. Wiltshire Conservation Service use a silica gel bead which turns from orange to green when it is saturated. *Blue silica gel crystals are classified as toxic substances and should be disposed of appropriately.* Contact a conservator for advice.

As silica gel is a drying agent and an irritant it should be handled with gloves. Health and safety information should be read and precautions taken to protect yourself and those around you.

Do not use pre-packed silica gel which is used for commercial items such as bags and electrical goods. It is not possible to tell if the silica gel is working effectively and the quantities are too small to make any impact on the microclimate within the container.

Quantity of silica gel required

It is very important to use enough silica gel to effectively dry out the volume of air inside the sealed container. As a rough guide, the amount of silica gel required should be:

- At least one fifth of the volume of the air being dried. It is better to use too much than too little.

Monitoring and replacement

When dry silica gel is placed in a storage box it will absorb moisture from the enclosed surroundings. Over time, the silica gel will become **saturated** and will need to be replaced. Regular monitoring of the storage containers will alert you to any changes.

If colour indicating silica gel is being used it will change colour, showing that it needs to be regenerated. If white silica gel is used, the RH strip will show the RH has risen and that fresh silica gel is needed. The saturated silica gel can be dried out and used again.

Regeneration

Ovens used to regenerate silica gel should never be used for food. There are Health and Safety recommendations for silica gel – see below.

To regenerate moisture saturated silica gel, it should be placed in thin layers on heat resistant trays and heated in an electric oven for several hours at about 60°C. Increasing the temperature will turn the silica gel brown and render it useless. The silica gel should be removed from the oven and returned to a sealed container as quickly as possible. Do not wait until it has cooled but be careful not to melt the container you keep your silica gel in.

Wait until the silica gel has cooled completely before placing it in a microclimate box with museum objects.

Basic guidelines for packing

A great deal of damage can occur to archaeological objects from insufficient or inappropriate packing materials. Damage can be caused by either physical means – for example, rubbing against other objects, or by chemical means – where the object is 'attacked' by chemicals or substances present in the packing materials. Using sufficient quantities of appropriate packing materials can reduce damage to the objects. Each object must be considered individually to assess its packaging needs.

A well packed object will be easy to identify and/ or see without it being necessary to disturb or handle it. All parts of an object should be supported and protected to prevent physical damage. A number of packing methods and materials may be used to achieve this. The methods and materials selected will depend on factors such as:

- The size and weight of the object.
- The material it is made from.
- The environment in which it is kept.
- The condition of the object.

Key Considerations

Listed below are the areas which need to be considered before deciding on the most suitable packing technique and materials for any particular collection item.

- **Size/ weight of object –** The box needs to be able to support the weight of the object when in transit or being carried. Foam and padding should also be able to provide adequate support rather than be squashed by the object.

- **Size of packaging**- Ensuring the box is not over large will reduce the amount of excess padding required and ensure that the object is not easily missed when accessing the box. Boxes which are too small will be damaging to the item.

- **Size of packaging 2-** Where is the packed item to be stored? Ensure that the size of the box will fit safely on the shelving or storage location. For example ensure large, heavy boxes can be stored on the lower shelves.

- **Condition of the item**- Are there any areas of the item which will need specific support during packing and which packing solution will provide this most efficiently. Should the packing be labelled to identify areas of the object which should not be used to lift it out of the box?

- **Materials**- does the collection item contain hazardous materials? Specialist packaging and additional labelling may be required.

Packing Materials

Suitable Materials

All packing materials used with archaeological objects should be of acid free quality, and chemically inert. Common types of packing materials are:

- **Acid free tissue and card**. Both can be cut and shaped easily using scissors or a knife. Acid free tissue can be made into 'pillows' and 'crackers' to cushion objects.

- **'Jiffy Foam'** – air blown polyethylene sheet available in more than one thickness. The sheets are slightly corrugated and can be cut with scissors.

- **'Plastazote'** – smooth, dense polyethylene foam, available in sheets of various thickness or blocks, and in several colours. Black and white 'Plastazote' are considered 'safe' to use. It can be difficult to cut cleanly, as the material tends to stretch slightly. Use a very sharp blade such as a scalpel.

- **'Ethafoam'** – a coarse, rigid polyethylene available in thick sheets. This can be cut with ease using a long blade, such as a bread knife or small hand saw.

All the above materials have been tested for their suitability with archaeological objects, and have been found to be inert.

Materials to avoid

Avoid the use of non-acid free materials, such as newspaper, tissue paper, cotton wool and 'Bubblewrap' as these often contain harmful chemical compounds. Archaeological objects may deteriorate is left in contact with these materials.

Also avoid the use of hairy or fluffy materials, such as cotton wool. The fibres can easily become transferred to the objects, and may be difficult to remove.

Boxing

Boxes are used to store objects for a number of reasons:

- The box protects the object from physical damage.
- The box protects the object from environmental agents, such as dust, pollution and light.
- The temperature and humidity inside the box is generally more stable than the external environment. Damaging environmental fluctuations are more gradual and less severe.

Boxes commonly considered suitable for use with archaeological objects are:

Acid free card boxes.

These are often used to store objects that are not very sensitive to environmental conditions.

'Stewart' boxes (translucent polyethylene boxes with lids that seal).

These are often used where special environmental conditions need to be maintained to preserve the object. For example, archaeological metalwork requires a very dry environment to prevent the metal from corroding further. 'Stewart' boxes are considered to be suitable, as they are known to be made of inert polyethylene. They have an effective seal, so the desired dry environment inside the box can be maintained for longer periods.

'Really Useful' boxes (translucent polyethylene boxes with lids that clip lock)

These should be used for objects that are not very sensitive to environmental conditions. They are made from polypropylene and are acid free. They are strong and stackable. They do not have an airtight seal.

'Crystal' boxes (clear, lidded boxes made of a specially formulated, inert polystyrene).

These are often used to pack individual fragile objects. These boxes are then placed inside another box, to:

- contain and manage the collection, for example in acid free card boxes, or
- create special environmental conditions for example inside a 'Stewart' box.

The smaller boxes are packed in such a way that they cannot move around within the larger box.

General packing methods

Packaging will need to be tailored to each item or group of items tackled. Select a combination of packing methods according to:

- The type of object.
- The material it is made of.
- The condition of that material.
- The environmental requirements of the object.
- The environmental conditions in the store.
- The weight of the object.
- The shape and size of the object.

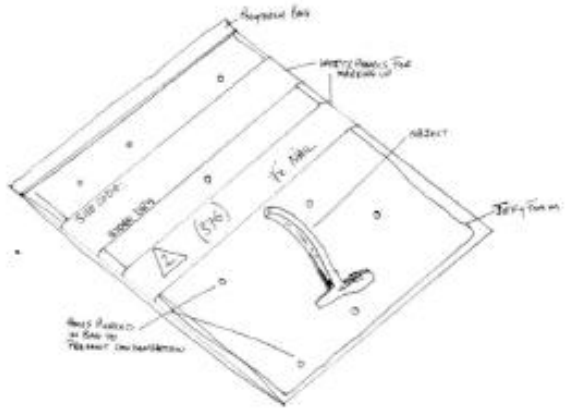
General Guidelines:

- Assess every object for its packing requirements.
- Avoid assuming that the examples below are suitable for every object within the same category.
- Nest objects in packing materials, so that you can easily get at the objects without putting it at risk.
- Make sure that all parts of the objects are well supported.
- Pack fragile objects separately. Pack smaller objects individually in 'Crystal' boxes. Place these 'Crystal' boxes inside another box, either a 'Stewart' box or acid free card box. Pack the smaller boxes so that they cannot move around within the larger box.
- Use a combination of packing methods to achieve the most effective packing system for the individual object.
- Do not roll objects in packing materials. Damage can occur when unrolling and the object can easily be dropped.
- Pack fragile items separately so that they cannot knock or abrade each other.
- Do not crowd or over-pack a container.
- Ensure sufficient packing material is present in boxes to prevent movement of items inside boxes.

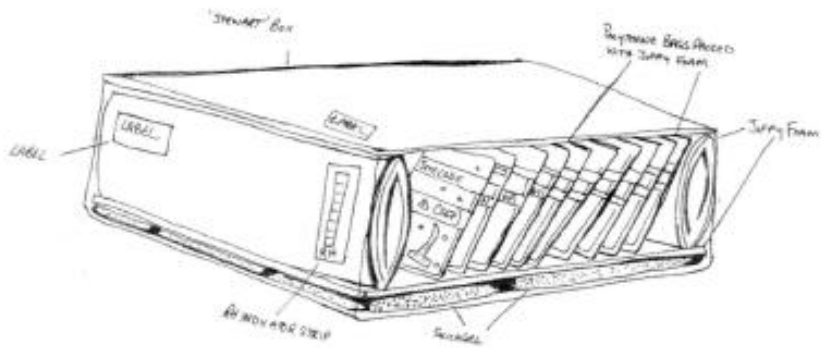
Grip seal bag technique

Packing:

- The grip seal bag technique is best suited to small, but more robust items.
- Objects are usually packed individually, one per grip seal bag.
- The grip seal bag is padded with a layer of jiffy foam cut to the size of the bag's interior.
- Only one layer of jiffy foam is used so that the object is visible through the bag.



- Multiple objects packed in grip seal bags can then be packed together in larger boxes. An additional layer of padding should be included around the interior of the box and then grip seal bags added in a logical manner. Do not over crowd the box!



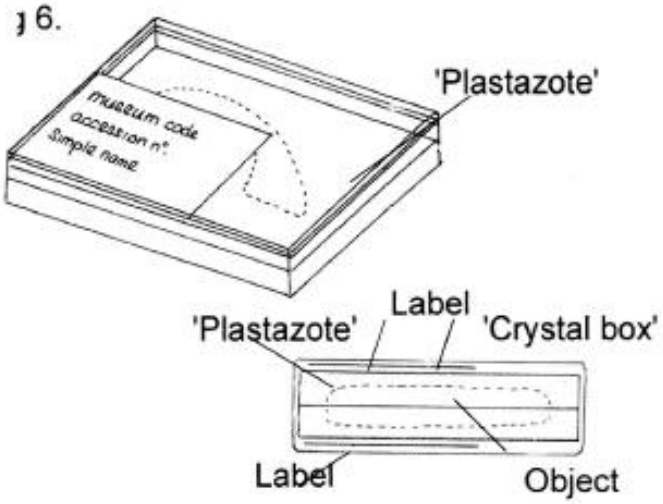
Labelling

- The front white panels on the grip seal bag can be used for labelling in an archival pen, such as an 'Artline 250'. Always write labels on the outside of the bag before putting the objects inside!

Crystal box technique

Packing:

- The crystal box technique is best suited to small items.
- Objects are usually packed individually, one per crystal box.
- The object is resting on, and supported by 'Plastazote' sheets, cut to shape with a sharp knife such as a scalpel.
- If possible, the object should be visible through the 'Crystal' box, without having to open up the box.



Labelling

- Use of a 'Tyvek' label facing outward inside the lid of the box annotated in archival pen, such as an 'Artline 250', ensures the box can be re-used. However, there is a risk the label can be separated from the box losing the information.
- Writing on the exterior of the box with an archival marker; avoids loss of the information. However, this can wear off over time and removal of the archival marker with acetone to allow reuse of box, however this can cause clouding and discolouration of the box over time.