

DELIVERABLE D.T3.1.3

- Recommendations for Rescuers in Emergency Phase for Cultural Heritage Safeguard

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1. INTRODUCTION

1.1. Objective and scope

There are several hazards which leave damaged items in different condition.

To estimate the damage and the associated **new fragility of the item**, deep knowledge of material composition and the decay process of the particular material is needed. However, it is not realistic to have this knowledge at hand when numerous helpers assist with rescuing cultural heritage items (CHI) in an emergency situation. Therefore some general rules shall be announced to minimize damage from wrong handling in an emergency situation:

1. Support
2. Hold deep
3. Don't open
4. Don't clean
5. Bring to safe place
6. Freeze, but not everything
7. Use established plans and get experts in

Concerning categories of damage it can be said that in general burnt material is sensitive to pressure because it is brittle, while wet material is slippery and sensitive to opening and local pressing; furthermore, soot smears everything, water-soaked dyes give off colour and glues lose their capacity to hold things together.

Concerning categories of archives it should be mentioned that there are archives, which are parts of an administrative body and archives, which hold autographs of artists, old material of families, etc. The latter, according to archivists' methodology, should rather be called „collections“. This is a matter of definitions. The collection-type archives may hold personal items of artists and important personalities and these might be any items of life such as clothes, pens, bags, paintings, etc..

1.2. Structure of the report

Deliverable **D.T3.1.3 Recommendations for Rescuers in Emergency Phase for Cultural Heritage Safeguard** is composed of the following sections: section 2 presents Salvage techniques, section 3 deals with particular questions of how to handle wet items; the information is a quotation of a handout of the Canadian Institut for Conservation and the source is given at the end of the chapter. The next chapter, "Handling heritage objects" is part of CCI's Preventive conservation guidelines for collections online resource and also a direct quote.

2. SALVAGE TECHNIQUES

Touching wet and burnt CHI

Touching burnt items may cause collapse of material; touching wet items may cause distortion and smearing of surface layers.

Books and sculptures become slippery due to surface sizing material, which reacts to water.



Contemporary art may give off toxic substances.

Labelling may come off due to water having weakened the glue that held them on the item.

Support

The most essential step is to support whatever is brittle or wet and soft. Support must be strong enough and not made of paper or cardboard, etc., which itself soaks with water and becomes vulnerable. Textiles, synthetic fleeces and wood are good support material.

Support textile and fleece must be handled in a stretched manner; in case the space is too narrow it may be bent a bit.

Furniture (including globes) must be supported by grabbing it at the bottom of the construction (not at the arm rests and the horizon ring), because joints may be loose due to water dissolving the glue. It is advisable to fix doors, etc. to furniture before moving it, however, water-sensitive surface of furniture must be taken into account (no wrapping of semi-dissolved surface).

Paper and wood become heavy and paper becomes vulnerable to pressure when wet.

Parchment is irreversibly damaged by water; fixing that kind of damage needs conservators' intervention.

Clean or not clean debris before removing items from the site?

Pick stones etc., which are heavy and could cause further damage to CHI. Do not move the debris over the surface of a CHI, this could cause severe damage.

Unique discs must be rinsed with distilled water and clean gloves in safe environment.

Wide-surface flat items: move in flat position or roll up?

Roll, if the surface does not contain material dissolving in water (dies/glues, etc.)

Roll rugs, large paper items from the longer side

Roll in supports

Opening is generally not recommended

Opening any boxes or storage wrappings in an emergency situation shall be avoided. Even entire drawers filled with objects should be moved rather than taking the items out.

Packing

Books shall be packed flat and interleaved with separation material such as drying foliar.

Items not to be frozen

Water damaged Daguerrotypes, albumen negatives, glass- and metal based collodian emulsions, lantern slides, glass stereo views and gelatine negatives must be air dried. Conventional black and white, colour negative and motion picture film must be kept in cold water until a conservator arrives.



No freezing should be applied for parchment.

Tap-drying

Tap-dry CHI only if you are sure that the benefit of tapping them dry overrules the disadvantage such as giving off colours or mechanical damage due to tapping.

Rinse off water from items (easel paintings and ceramic bowls).

3. Particular Handling of Wet Collections

NATURAL SCIENCE COLLECTIONS CONSERVATION SHARE COLLECT

Introduction

There are four techniques that can be used to dry collections.

1. Air drying
2. Desiccant air drying
3. Vacuum freeze drying
4. Vacuum thermal drying

In deciding which method to choose in a particular situation, the following factors should be taken into account:

What is the volume of materials? Air drying requires a great deal of space, a large supply of absorbent materials, and requires prodigious amounts of time and attention. This can be unrealistic if a large number of objects are involved. However, if the materials are frozen, small numbers can be removed from the freezer and dried over time.

Which method will yield best results? Some kinds of materials may be damaged if frozen, or so thoroughly soaked they are impossible to air dry successfully so another drying method should be chosen - see below

Is there need for access to the collections during drying? Some drying methods will necessitate restricting access for weeks or months.

1. Air drying

Brief description of treatment:

Air drying is the most obvious and immediate way to dry almost any wet museum specimen or collection. Air drying requires little or no special equipment. It is a suitable choice to dry small numbers of damp or slightly wet materials (baskets, historic artifacts of wood, leather, books, metal, etc.) However, air drying is extremely space and labor-intensive as a space is outfitted with fans and dehumidifiers and wet objects are laid out on absorbent surfaces. This technique is therefore most suitable for relatively small quantities of damp or slightly wet artifacts or specimens.

What collections materials can be treated this way?

Most collections can be air dried.

Exceptions, which cannot be successfully air dried, are the following:

- Coated (glossy) paper, as found in some books and magazines



- Collections that are too large or too wet to dry before they will become moldy.
- Objects with stuffing, such as study skins, upholstered furniture, and some taxidermy mounts are not good candidates for air drying

General Procedures

- Set up a drying space of appropriate size with tables covered with absorbent materials - blotting paper, newsprint, toweling, etc.
- Aim to have temperature and relative humidity as close as possible to “normal” room conditions. (This will vary according to local conditions, but in the northeast 70-75 degrees F at 50-55% RH or below would be considered reasonable target conditions.) Introduce dehumidifiers and heaters as needed to achieve these conditions.
- Ensure good air circulation. Try to pull dry air into the room with fans, and push humid air out. Ensure that air currents are gentle so that they do not damage specimens or disrupt specimen labels.
- Spread wet items on tables with absorbent coverings. Gently blot off as much water as possible from the object’s surface.
- Change absorbent materials whenever they become significantly dampened.
- Pad out different layers of three-dimensional objects to increase air circulation.
- Re-shape shaped objects, and stuff them out with nylon net or polyester batting so that they will retain their shape as they dry.
- If possible, remove stuffing materials that will slow air drying. If not feasible, consider another drying method.
- Robust items such as documents and records (rather than specimens or artifacts) can be hung with clips to a laundry line or string to save space.

Pros and Cons of this Treatment

Pros

- Gentle
- Low “out-of-pocket” cost (existing space, simple equipment)
- Easy to monitor
- Collections stay at the institution
- No risk of over-drying

Cons

- Risk of mold
- Very labor intensive - a cost that should not be overlooked in insurance settlements
- Requires large spaces
- Extensive rebinding of very wet books should be expected, and expanded shelf-space will be needed.



- Some materials cannot be successfully air dried, as listed above.

2. Desiccant air drying

Brief description of treatment:

Desiccant air drying is done in a controlled drying enclosure which a specialist company can assemble onsite, or wet materials can be transported to a chamber at their premises. The chamber has a controlled temperature, controlled relative humidity, and very good air circulation. Large quantities can be dried, largely because the room set-up is very efficient and the air circulation effective enough to support a great density of wet material. Objects in the drying enclosure can be manipulated during the process to ensure even drying.

This method is essentially an advance on air drying, in that environmental conditions are closely controlled and a much lower RH can be maintained than would normally be possible without a special chamber. Note that desiccant air drying is not the same as desiccant dehumidification, a method often used to remove moisture from building structures.

What collections materials can be treated this way?

Any collection that can be air dried can be desiccant air dried. Conversely, collections that cannot be successfully air dried are not good candidates for desiccant air drying.

General Procedures

- A professional service will provide, at your facility or theirs, an enclosed space
- Controlled temperature (usually 74-80 degrees F)
- Controlled RH (usually under 20%)
- Active air circulation
- The service will ensure that objects in the chamber are moved or rotated to promote even drying

Pros and Cons of this Treatment

Pros

- Like air drying, this method is gentle
- Collections can stay at the institution, and access is possible
- Large quantities can be dried
- Drying is much faster than plain air drying
- Somewhat wetter materials can be successfully dried, as compared with air drying

Cons

- Mold is still possible if care is not taken; Collections that are too large, or too wet, to dry before they will become moldy.
- Objects are manipulated during drying, and some skill is needed in manipulating objects during drying for a successful result



- Some materials cannot be successfully air dried, as listed under air drying.

3. Vacuum Freeze Drying

Brief description of treatment:

Vacuum freeze drying is a particularly useful drying method for wet collections. Frozen, wet material is placed inside a vacuum freeze drying chamber at a specialist facility and placed under vacuum while temperature is closely controlled.

This drying method takes advantage of the fact that, at a certain temperature and pressure, ice sublimates directly into a gas without going through a liquid phase. This means a wet artifact or specimen that has been frozen will not become wet again during the vacuum freeze drying process, because the water that is bound in ice turns directly to vapor.

It is this transition from ice directly to vapor that protects the cellular structure of the material being vacuum freeze dried. The lack of a "liquid water" phase avoids additional swelling or distortion, beyond what happened before the materials were frozen, and also stops inks, dyes and other water-soluble media from further bleeding during the drying process.

What collections materials can be treated this way?

Any objects or specimens that can safely be frozen can be vacuum freeze dried including leather, textiles, and bird or mammal skins, but these will need careful attention and may need more cleaning after treatment. Vacuum freeze-drying is the only satisfactory method for saturated books and coated papers.

The materials that are generally not appropriate for be vacuum freeze drying include:

- Acrylic and oil paintings on canvas and panel paintings
- Materials with friable media (pastel, charcoal, some paints).
- Research collections, if it is a concern that DNA may be affected by freezing
- Artifacts with very complex structures incorporating many materials, such as musical instruments
- Japanese lacquer ware
- Wet ivory and bone
- Some plastics may not be appropriate to freeze as they may become embrittled

Within photographic collections, if time allows, check for the following materials, which risk permanent damage if frozen: collodion wet plate negatives, cased photographs (daguerreotypes, ambrotypes, pannotypes, tintypes, ferrotypes], glass color transparencies (Autochromes), and lantern slides

Although research is lacking, there is some feeling that magnetic media and audio grooved media (cylinders, discs) may be damaged by freezing

Herbarium specimens prepared with high moisture acrylic adhesives may become tacky upon freezing and sheets may stick together

Bones and wood should generally not be freeze-dried because splitting and cracking may occur. Air drying is the preferred method for these materials.

There is concern about freeze-drying photographic prints, although these can be safely frozen. Air drying is the preferred method for these materials.

General Procedures

Wet collections that have been frozen are placed in a commercial freeze drying vacuum chamber. Vapor pressure is reduced inside the chamber to below the triple point of water (4.57 torr/0.6092833



kilopascals). A small amount of heat (around 40.5°C or 105°F) is introduced intermittently into the chamber, causing the ice within the still frozen objects to sublime out as a gas.

Pros and Cons of this Treatment

Pros

- This method is suitable for most materials and is especially suitable for large numbers of wet books and records.
- Because there is no additional wetting, there is no additional shrinking or distortion, and no additional bleeding of unstable colors.
- Coated papers do not stick to each other
- Surface dirt tends to fall away

Cons

- Higher up-front costs than other methods - labor intensive
- Collections are not accessible during treatment
- Some distortion still occurs. Physical restraints can be used to limit distortion during drying of books, but these methods are not standard, and do require considerable additional time.
- Extensive rebinding of very wet books should be expected, and expanded shelf-space will be needed
- Collections must be transported off-site

4. Vacuum Thermal Drying

Brief description of treatment:

Like vacuum freeze drying, vacuum thermal drying is carried out in a vacuum chamber within a specialist facility. However, vacuum thermal drying is carried out at an elevated temperature (above the triple point of water). For this reason, ice does not sublime into gas, as in vacuum freeze drying, and the object is exposed to the destructive actions of water as it dries. As a result, physical distortion is likely to occur, and unstable media (dyes, inks, paints) will continue to bleed until the substrate is dry.

What collections materials can be treated this way?

Vacuum thermal drying is not a suitable drying method for museum collections or for permanent retention records. It is a reasonable method to use for materials such as business records, where information must be saved but the material itself is replaceable

General Procedures

Wet or frozen materials are placed in the chamber, and a vacuum is drawn. Heat is introduced raising the temperature to a moderately high level (often around 60°C or 140°F or higher), and humidity within the chamber is gradually lowered as materials dry.

Pros and Cons of this Treatment

Pros

- Relatively quick
- Relatively inexpensive, because faster
- Large amounts can be processed



- Can help remove smoke odor

Cons

- Additional wetting and heating allows renewed swelling, bleeding of colors and severe distortion
- Coated papers stick
- Water-soluble paints, inks and dyes may bleed
- Over-drying may occur
- Organic materials are aged by heat
- There can be enormous distortion in books. Extensive rebinding of books should be expected, and expanded shelf-space will be needed.
- Additional Resources for Stabilizing Wet Collections

Visit the Response & Salvage page of the Museum SOS website

The Conservation OnLine Disaster preparedness and response page provides a useful collection of resources”

<https://www.amnh.org/our-research/natural-science-collections-conservation/general-conservation/emergency-preparedness/collections-salvage-and-recovery/salvaging-wet-collections>

(14th April 2019)

4. Handling heritage objects

“Handling heritage objects” is part of CCI’s

- Preventive conservation guidelines for collections online resource. This section presents key preventive conservation considerations for safe handling practices with regards to heritage collections.
- Table of contents
- Handling: key considerations
- Handling: risks to heritage objects
- Physical forces
- Contaminants
- Handling: risks to handler
- Strategies for safe handling of objects
- Prior to handling
- Understand the object
- Clear the way
- Prepare the handlers
- Protection for the object
- Protection for the handler



- Limit contamination
- Gloves: pros and cons
- Limit the handling of dirty objects
- Support, lift and move objects
- Secure or immobilize elements and moving parts
- Where to place hands
- Use rigid flat supports and trays
- Provide supports
- Be aware of attachments, handles, old repairs
- Multiple handlers
- Lifting specific types of objects
- Moving objects a short distance
- Selecting wheeled equipment for moving objects
- Ensure security
- Report damage
- Bibliography
- List of abbreviations
- Handling: key considerations

Handling heritage objects and collections with care is an important aspect of their long-term preservation. Two main considerations to keep in mind when handling objects are the risks involved for the objects and the risks that the objects may pose to the handler. Handling protocols of sacred or culturally sensitive objects should also be observed. Consult Caring for sacred and culturally sensitive objects for information on the importance of consultation in order to identify and develop handling protocols.

Handling: risks to heritage objects

Heritage objects are at their most vulnerable when being handled.

When groups of objects are examined, the most prevalent damage observed is usually the result of impact—dents, scratches, cracks and breaks (Figure 1). Damages like these commonly occur during an object's original (historical) use and provide evidence of use that might be of value to researchers. However, once an object comes into a collection, it must be protected from further damage.



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Figure 1. Watercolour on an acidic card. Weak materials are easily damaged when carelessly handled.

With training and planning, it is possible to anticipate problems and develop methods for the safe handling and movement of objects, thus reducing the risk of additional damage.

Physical forces

Breaks, cracks, chips, losses, deformation and surface abrasion are all evidence of dropping, knocking or even improper placement of hands when lifting fragile objects. The extent of damage depends on the type of materials and their condition. Typically, more brittle materials suffer more damage than flexible ones, but the weight of objects and the height from which they are dropped all have an influence in that regard (further details about physical forces as an agent of deterioration can be found under Agent of deterioration: physical forces).



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Figure 2a. This beaded, black velvet cape from the late 19th or early 20th century appeared to be in good condition overall, but a closer examination of its fur trim and collar revealed that the fur was so weak that it was at risk of tearing when handled.



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Figure 2b. Detail of the black fur trim during treatment. During treatment, the fur was partly unstitched from the rest of the cape and, when flipped over on its back side, revealed numerous tears.

Objects may appear to be strong to the untrained eye, but they may conceal weaknesses or unanticipated deterioration:

Materials might have become fragile due to their aging and subsequent deterioration, e.g. some historical black-dyed leathers and furs can be extremely degraded to the point of tearing under their own weight (Figures 2a and 2b).

Visually intact surfaces can hide very fragile interiors, such as a piece of wood that has been tunnelled by insects but has an intact skin, or outer layer. A surface that fools the eye has potential to fool the hands. Even when carefully handling an object, pressure, albeit minimal, is applied at the point of contact, which can cause damage if the object is very fragile in this area.

Joints, ties, adhered components, etc. may be damaged, worn or loose. Often, weaknesses at joints and points of assembly are not conspicuous until closely inspected (Figures 3 and 4).



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Figure 3. A coffee pot that needs to be moved stands on a counter.



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Figure 4. Handles, which are used frequently, can be weakly attached. For this reason, they are often the weakest element of an object. In this case, the coffee pot handle came off when the handler attempted to use it to lift the object. Examine an object before moving it.

Lifting objects without adequate support can cause damage. For example, a ceramic vessel with incipient cracks may break apart if not properly supported when handled. Weakened materials in an object may no longer be able to support their own weight or the weight of attachments and protruding components. For example, an ornate silk object may be too weak to support the weight of attached decorative elements when lifted without a support; the elements will pull at the point of attachment and cause the fabric to tear (Figure 5). The object needs complete support to prevent damage when being moved.



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Figure 5. A dance costume from the early 1900s shows silk fibres that have torn from the weight of attached decorative elements.

Wheeled transporting devices, such as dollies or carts, are commonly used, but they can jostle unsupported objects, which may cause damage to very fragile objects, e.g. weakly bonded paint layers (Figure 6) or adhesive joints may separate. Cracks already present on an object may extend, or there may be movement of loosely attached components that stress the point of attachment, such as weak hinges on doors. Padding, securing ties and other possible solutions to these problems are discussed under Support, lift and move objects.



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Figure 6. Detail of a Chinese lion dance costume. The weakly bonded paint separated, causing flaking and losses, probably due to abrupt movements during handling.

Contaminants

Natural salts and oils from hands can mark clean surfaces, even though this may not be immediately noticeable.

Objects particularly sensitive to damage from this type of contamination when handled with bare hands include:

- metal surfaces: polished silver, copper and brass (Figures 7, 9 and 10)
- gilded surfaces (Figure 8)
- photographs, which can easily be marred because most photographic surfaces are extremely absorbent and hygroscopic
- Glossy surfaces, such as glass or highly polished stone, may hold fingerprints. Even though the salts and oils may not react unfavourably with these surfaces, additional and otherwise unnecessary cleaning or polishing will be needed to improve the appearance.



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Figure 7. A clear fingerprint on brass due to touching with bare hands.



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Figure 8. Gilded surfaces should be handled with gloves. This image shows a gold-painted frame rather than gilt; nevertheless, if the surface is unfamiliar, the handler should always wear gloves.



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Figure 9. Even though the silver-plated goblet is tarnished, it should be handled with gloved hands.



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Figure 10. Wear gloves (nitrile seen here) when handling metal objects.

Applied pressure to unclean surfaces (dusty, soiled) can cause dirt to be forced more deeply into a substrate. If the pressure is applied by hands, the perspiration and oils fix the dirt in place, especially on porous or rough surfaces.

Handling: risks to handler

The other side of handling is the potential effect of the objects on the handler. Certain kinds of objects may present hazards that are inherent to their constituent materials and how these degrade, e.g. radioactive luminous dials (Warren 2010), corroded lead (Figure 11), some plastics (Tsang 2010), some ethnobotanical specimens (Kubiatowicz and Benson 2003). Others may contain hazards acquired during their history or use, e.g. objects contaminated with mould (Figure 12) and those that contain pesticide residues (Sirois, Poulin and Stone 2010). All of these have the potential to affect the health of the handler.

Consult CCI Technical Bulletin 26 *Mould Prevention and Collection Recovery: Guidelines for Heritage Collections* for more information on health effects relating to mould exposure.



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Figure 11. This marionette has corroded lead components (the fingers). The object was labelled, bagged and isolated from other materials to contain the hazardous contaminant prior to treatment.



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Figure 12. Mould on a book.

Strategies for safe handling of objects

The following are strategies for day-to-day handling and short moves of objects within a building.



Prior to handling

Handling can easily be a source of physical damage, so avoid handling whenever possible. When handling is needed, forethought and planning are required no matter the object or the distance of the move.

Understand the object

An important first step is to thoroughly examine the object before any handling to determine the strong and weak areas. Some objects are so fragile (e.g. objects with flaking or powdery paint) that they should be handled as little as possible or they may need special handling precautions to be moved safely. For complex objects, condition reports should be consulted, if available, and updated as necessary. The object should be examined closely with the following considerations in mind:

- Is the surface intact or are some areas poorly attached?
- Are there parts that risk falling off if the object is moved from its present position?
- Is the surface dirty or mouldy?
- Will personal protective equipment be needed?
- Are there any movable parts or components that are weakly attached?
- How heavy is the object?
- How many people will be needed to lift and move the object safely?
- Will the object be safer if a support or a padded tray is provided for the move?

Clear the way

To move an object, the path from its present location to its new location should be known in advance and, if necessary, checked before the move begins. An abstract familiarity with the route cannot be used to predict recent obstructions.

Consider the following steps when planning a route:

- Prepare the new location. It should be clean, large enough for the object and have padding in place if needed (Figure 13).
- Clear the pathway and open doors or arrange help to aid passage.
- Check heights and widths of doors for clearance.
- Ensure that there is adequate space to turn corners.
- Remove obstacles or hazards on the floor or items hanging from the ceiling.



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Figure 13. Padded blocks were put on the floor next to a wall before placing this painting on them, in between two protective cardboard panels, for temporary storage.

Prepare the handlers

Protection for the object

The handlers should remove any items that might scrape or catch on objects such as rings, bracelets, watches, pendants or belt buckles.

Protection for the handler

Handlers need to be aware of whether the objects to be handled pose a risk. If dealing with hazardous materials or if in doubt, handlers must wear appropriate protective equipment, such as HEPA (high efficiency particulate air) filter masks, gloves, coveralls, aprons, lab coats and protective shoes (Figure 14).



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Figure 14. Some mounted natural history specimens might have been prepared with, or later treated with, toxic materials. If the specimen's history is unknown, handle it as if it were contaminated with a hazardous material. Wear protective gloves, a mask and a lab coat or coverall.

Common examples of hazardous materials include mouldy materials; powdery materials which may release fine, loose particulates into the air when moved; pesticide residues (e.g. from older taxidermy specimens or objects previously treated with insecticides); lead containing particles; and chemical residues on pharmaceutical and medical objects. Consult Conserv O Gram 2/19, [*Guidelines for the Handling of Pesticide Contaminated Collections*](#) (PDF version, 231 KB) for more details on these health and safety issues.

Limit contamination

Gloves: pros and cons

As mentioned above, gloves are required to protect handlers where there is a health and safety risk of contamination.

There are certain types of materials and surfaces that should always be handled with gloves to protect the object. These include metals, gilded surfaces, photographic documents (prints, negatives, slides and motion picture films), highly polished surfaces and powdery (deteriorated leather, etc.) or dirty surfaces (consult [Contaminants](#) for more information on these materials).

The practice of handling all objects with gloves shows an attitude of care and regard for the heritage value of the objects. There are, however, certain circumstances where gloves can reduce the sensitivity of touch and are therefore not recommended. The potential for damage from insensitive and insecure handholds on a particular object must be weighed against the potential for contamination from salts and oils from hands.

If unsure of the risk, thin and close-fitting gloves provide the best solution, allowing dexterity with limited reduction of sensitivity to touch while also protecting surfaces. Figure 15 shows a selection of glove types, and Table 1 provides a comparison between different types of gloves and their advantages and disadvantages.



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Figure 15. A variety of glove types. From left to right: inexpensive cotton, cotton with grip nodules, better quality cotton, nylon, polyethylene, latex and nitrile.

Table 1: types of gloves available for handling objects and their advantages and disadvantages



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Figure 16. Sure Grip cotton gloves with white PVC dots (or nodules).



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Figure 17. Detail of PVC dots.



© Government of Canada, Canadian Conservation Institute. CCI 125773-0027
Figure 18. Sterling silver showing a transfer of the dot pattern.

Figures 16 to 18: An experiment was carried out at CCI to check if gloves made with PVC nodules pose a risk for objects. Sterling silver (92.5% silver and 7.5% copper) was tested because this alloy reacts rapidly with many harmful agents and the result is visible to the naked eye. The sterling silver sheet was placed in direct contact with a Sure Grip cotton glove (Figure 16). After exposure to direct sunlight for nine weeks, the glove's grip nodule pattern (shown in Figure 17) had transferred to the sterling silver (Figure 18). This indicates that the grip nodules transferred a material that could corrode the alloy. The conclusion is that it is best to avoid using this type of glove for handling objects.

Limit the handling of dirty objects

Objects covered with dust or soot should be handled as little as possible. When dirty surfaces are handled, the dirt is often pushed further into the surface and compacted by hand pressure (Figure 19). Porous surfaces are especially difficult to clean because the dirt enters small interstices.



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Figure 19. Handling dirty surfaces with bare hands can press dirt and skin oils into the surface and create areas that are more difficult to clean.

Objects made of materials which are supple and cover a large surface area, such as furs, feathers and textiles, should be moved as little as possible until the dirt is removed. Unnecessary movement may cause fine particles to be driven further into the structure.

Removal of surface dust and dirt should be considered prior to moving since:

- clean objects are usually easier to handle and there are generally fewer health and safety risks
- the surface condition can be seen
- dirt will not be pushed into the surface
- dust and dirt will not be transferred to another area
- a clean object, to most people, will have more significance and they will instinctively handle it more carefully than if it was dirty (although this should not have any relevance on the quality of care provided to the object)
- If prior cleaning is not possible, placing the object in a box or covering it with tissue or plastic sheeting will minimize direct surface contact and will contain loose dust as the object is moved.

- Support, lift and move objects
- Secure or immobilize unstable elements and moving parts

Multiple components of an object should move as one, unless they can be separated and each piece moved individually (e.g. furniture drawers or lids). Any loose parts and any free-moving but attached sections (e.g. hinged) need to be immobilized. This should be done by securing the part to the object itself or to the object's support. Examples of components that should be secured are doors that cannot be latched, broken material that is loosely attached and torn or loose coverings.

Cloth tapes or belts are useful to bind objects as they have soft surfaces and are flexible (Figure 20). Band clamps might also be used for larger objects, but only sufficient pressure should be applied to secure the object, and any pressure point should be padded beneath the bands (e.g. foam blocks or blankets at the corners).



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Figure 20. A fragile basket is secured with twill tape and Coroplast supports prior to being moved.

The interior of objects should be checked and any loose interior parts stabilized (removed, tied down or padded). A good example is the removal of suspended weights and pendulums prior to moving long-case clocks.

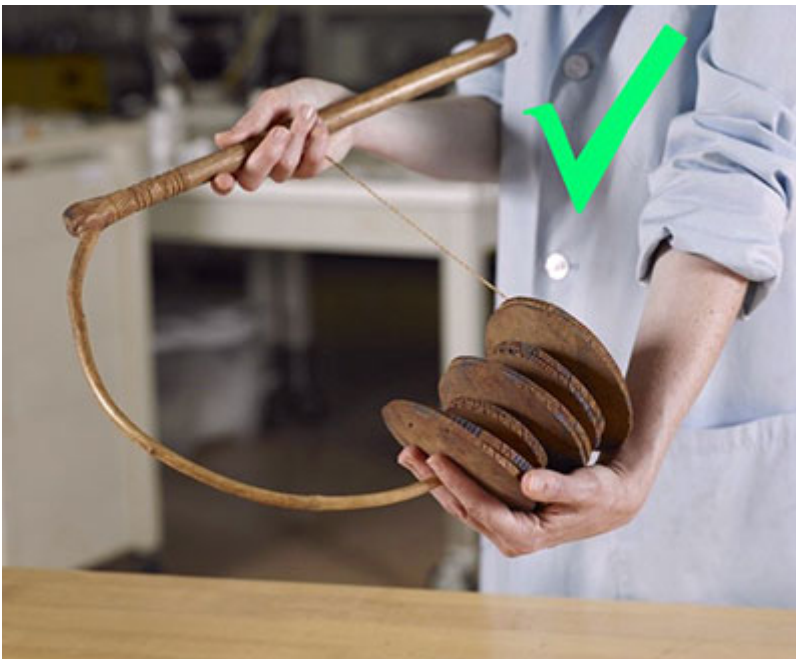
Where to place hands

Use both hands to carry one object at a time. One hand can be placed higher on the object to provide balance, while the other hand can be placed at the base to support its weight (Figures 21 to 24). If the object is to be transferred to another person, it should be placed on a solid surface and then transferred, rather than being transferred from hand to hand.



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Figure 21. In this example of an object being carried with one hand, the object's weight is not supported and stress is placed on a weak part of it, i.e. the cord.



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Figure 22. To properly carry an object, support its heaviest part with one hand and use the other hand to hold another part of it for balance. For best touch sensitivity on materials that do not react to salts or oils from hands, handle with bare hands that have been recently washed and dried.



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Figure 23. This unframed painting is carried by two people, each supporting the weight with one hand at the bottom edge and placing the other hand at the back and side of the painting to keep it balanced.





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Figure 24. Gloved hands (nitrile gloves shown here) are used to carry an iron and glass lantern at its base.

Use rigid flat supports and trays

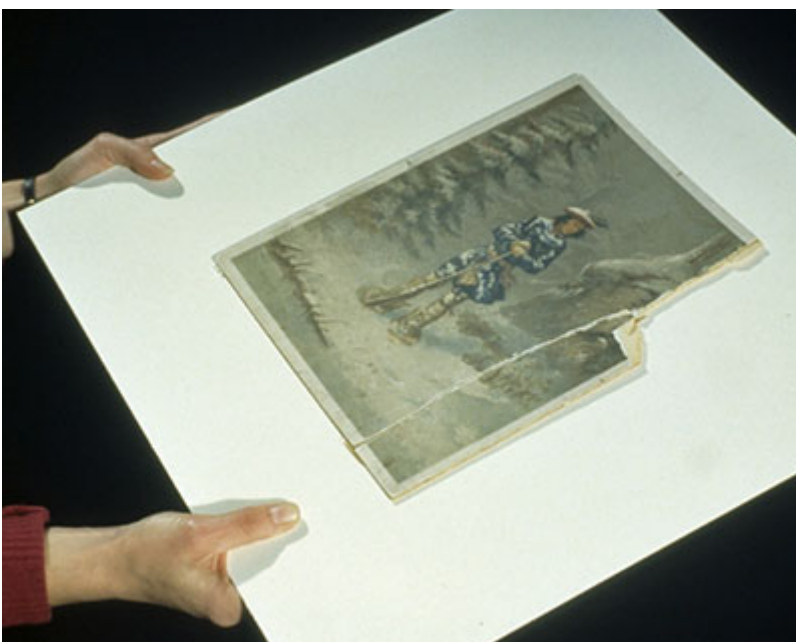
Hands can only span and support a small area, which may be adequate for supporting small objects or larger strong and rigid ones. Strong, flexible objects may also be able to tolerate the support that hands (and occasionally arms) provide for a short period of time, such as a garment being lifted from a worktable (Figure 25) and moved close by.

In general, though, flexible items such as paper, textiles, skins and hides require full support (Figure 26).



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Figure 25. A structurally stable garment is lifted from a work surface to be moved close by.



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Figure 26. Moving a paper object on a rigid support.

Fragile materials, whether rigid or flexible, also require an even support that hands cannot provide. A rigid support should be inserted under the object; the support can then be handled rather than the object.

The strength of the support needed will be dictated by the weight of the object. A sheet of paper or a light textile item can be supported on a piece of 4-ply matboard. An object of light to medium weight might need a fluted plastic sheet or a rigid foam base, while plywood might be useful for heavier items. Flat supports can be slipped under objects. Trays or bins are useful if the objects can be lifted and carried in them (Figure 27).



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Figure 27. A silver-plated coffee pot and a detached handle are carried in a plastic bin padded with tissue.

Provide supports

Permanent supports for storage and handling provide the best solution; they will serve as long-term protection and will reduce the hazards of handling and the preparation time required for moving objects (Figures 28 to 31). The object will be fully supported, and the handler may never need to touch the object.



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Figure 28. Flat flexible objects can be rolled on a padded tube for transport or storage. For more details, see CCI Note 13/3 *Rolled Storage for Textiles*.



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Figure 29a. An antler sculpture of three geese is secure on its display mount but requires additional protection during handling because the middle antler tine is mobile and, if not retained, could slip out of place (if the object is tilted, etc.).



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Figure 29b. Detail of a storage mount. This mount also allows for the safe movement of the small antler sculpture as it holds components in place in the foam mount.



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Figure 30. Objects can be immobilized with cloth tape on a fluted plastic board. The tape is pushed into knife-cut slots in the board with a thin-wedged instrument.



Courtesy of the Museum of Anthropology at UBC, Vancouver, Canada. Basket A2.593; Heidi Swierenga, photographer

Figure 31. A basket is carried on a foam support. Tabs attached to the support hold the basket in place while it is being moved.

Be aware of attachments, handles, old repairs

Attachments as well as protruding parts of an object that were intended as handholds to move or lift it might have been weakened by extensive use or a poor repair prior to the object being collected. They may no longer be able to support the weight of the object if used to grasp or lift it. If a break occurs while lifting, the rest of the object may be damaged if it drops to the ground. Convenient handholds, used frequently in the past to lift the object, should always be suspected of being fragile. For example, chairs should be lifted at the seat rail and not at the back or arms (Figures 32 and 33). Lifting by any projection attached to the top of an object will result in all the weight being concentrated at this point, thus risking fracture (Figure 34). The weight of objects should be supported from the base (Figure 24).



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Figure 32. Avoid lifting chairs from the top of the back.



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Figure 33. To safely carry a chair, grasp each side of the seat and lift.



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Figure 34. Do not carry an object by a handle or another element attached to its top. In this case, it is not advisable to carry the lantern by the top ring, as this puts all of the lantern's weight on the ring, which could be only weakly attached to the rest of the object. Also, wear gloves when handling metal objects.

Multiple handlers

Objects should always be lifted, never dragged, which requires having enough personnel on hand for the lifting. One person should act as the lift leader to talk through the lift and move, ensuring that safe handholds are known by everyone, and that all handlers are ready to carry out instructions at the same time. Movements need to be coordinated, and the object needs to be monitored as it is being moved. This is especially important if the object cannot be moved on a cart or trolley (e.g. if stairs must be used).

Lifting specific types of objects

When handling wet objects (e.g. objects affected by leaks or floods), allowances must be made for absorbed liquids that increase the weight of the object. The material may not be able to support the additional weight, and the water might weaken the material or structure. Support the object as much as possible, preferably using a solid support.

Lift heavy or large objects, such as a piece of furniture or a sculpture, near the base using strong and solid areas as handholds (Figure 35). Bend the knees and hold the object close to the body. A heavy object should only be lifted for a brief period, so ensure that a cart or dolly is standing nearby. Very

heavy objects should be moved with appropriate equipment (forklift, pump truck or small crane) and by experienced handlers.



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Figure 35. This treadle sewing machine table was lifted appropriately at the cast iron base with gloved hands.

When lifting bagged objects, the layout, weakness and shape of the contents should be determined and a solid handhold established (Figure 36). Bare hands or close-fitting plastic gloves should be used when lifting bagged objects, as the surfaces of the bags may be slippery.



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Figure 36. Support the base of bagged items and use nitrile gloves or bare hands to ensure a good grip.

Any flat surface that has loosely attached components, such as poorly bound pigments or flaking paint, should be carried and stored horizontally to prevent loss.

Moving objects a short distance

Good building design can simplify the safe movement of objects enormously. Highly desirable features include level floors, separate freight elevators, ramps, loading docks with dock levellers, wide doors and adequate space for movement within storage areas.

For short trips, a tray is useful for moving one or several smaller objects with low centres of gravity. The interior of the tray should be padded with a foam sheet that provides cushioning as well as a surface that prevents sliding. Small objects with high centres of gravity are better carried by hand or in padded boxes.

A cardboard box or a plastic container with padding around each object may be useful as temporary housing during a move. If several objects are moved in one container, it is important that each be separated with padding to prevent damage through contact (Figure 37). Objects should not be placed one on top of the other.



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Figure 37. These fossils are individually surrounded with polyethylene foam rings (i.e. padding) to prevent them from bumping into one another when moved.

Flat objects, such as paintings or framed items, can be placed vertically in a box and separated from one another by a stiff sheet spacer (cardboard, corrugated plastic, etc.) slightly larger than the objects it separates.

Selecting wheeled equipment for moving objects

It is easier and safer to use a cart or a flatbed trolley, unless an object has to be carried when negotiating stairs or if it cannot tolerate even the small amount of movement caused by wheeled equipment. Many styles of carts are available for specialized applications, including the A-frame cart with a high, slanted support for objects that need to be transported vertically (Figure 38). Carts are more manoeuvrable if all the wheels swivel caster-fashion. This is important in areas where movement is restricted. Movement of objects on a cart due to the cart rolling over imperfections in a floor should be avoided. The use of padding materials will restrict the movement of objects and dampen vibration.



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Figure 38. Framed and unframed paintings are moved on an A-frame cart. A cardboard sheet separates each piece.



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Figure 39. A cart with pneumatic tires is used to move several objects. To dampen any damaging contact, the shelves were each lined with a foam sheet (white) and the shelf rims were padded with (black) plastic foam pipe insulation.

If objects have been well wrapped and padded, they can be placed on unpadded carts, provided that they are secured in place to prevent movement. In most cases, padding the cart is more convenient. A robust, low-cushion padding material, such as carpet, will withstand heavy loads. Additional padding, such as soft foam (up to several centimetres thick, depending on the weight of the object) may be used to absorb vibration. All objects must be separated from each other by padding materials or rigid sheets.

The type and size of wheels will influence the smoothness of movement; larger wheels (127 mm [5 in.] in diameter) will go over cracks and defects in the floor more smoothly than smaller wheels. Pneumatic tires will reduce vibration (Figure 39) (Esser 2011).

Ensure security

Moving objects, even within a building, creates a certain security risk. To ensure maximum security:



- Move objects from one secure area to another and supervise at all times to prevent theft, vandalism or damage.
- Update the object file by indicating the new location.
- Consult Agent of deterioration: thieves and vandals for more strategies on strengthening security measures for heritage collections.

Report damage

Reports should be made of any damage, preferably with photographs, and the appropriate staff member should be informed (e.g. collections manager, registrar, conservator, curator). Box or bag all pieces that come loose, identify the package and keep it with the object (e.g. box or bag the object together with the bag or box containing the detached pieces). If pieces are sharp or fragile, wrap each piece in tissue before packaging it. If breaks are in danger of being snagged and lifted, a cloth tape can be bound around the break, or a warning label tied or placed near the object.

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<https://www.canada.ca/en/conservation-institute/services/preventive-conservation/guidelines-collections/handling-heritage-objects.html> (14th April 2019)

5. A curriculum for a training workshop on handling damaged objects has been prepared based on this short handout:

- A) Participants shall get this handout before the workshop and make themselves familiar with various special terms used in the text as a home work session using the internet.
- B) Various items found in the disposal area are collected and burnt/put under water/burnt and put under water and left to become wet for 2 days. They might be in boxes or otherwise packed and unpacked. They are then put on shelves and the task is to bring them to a lorry and store them there to be shipped for freezing. Items that cannot be frozen or can be dried in another appropriate way without freezing shall be treated accordingly.
- C) The task falls into several subtasks:
 - 1. Identifying the items material-wise
 - 2. Identifying the weak points of the damaged items based on the knowledge accumulated under 1
 - 3. Making decision as to which items shall be frozen and which shall not
 - 4. Making decision as to handling items which cannot be frozen
 - 5. Making decision as to the manner of packing the items that will be frozen
 - 6. Making decision as to where to get the proper packing material and bringing together packing material
 - 7. Making decision as to where the material not to be frozen is to be put
 - 8. Implementation action
 - 9. Final evaluation and discussion.

Result

The participants will be able to review a situation with damaged cultural heritage items requiring a complex set of decisions and remove them from the site in the best possible way.



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