

Chapter 6: Handling, Packing, and Shipping

A. Introduction	6:1
B. Handling Objects	6:2
Why are careful handling practices important?	6:2
Who needs to learn safe handling practices?	6:2
What basic practices can I use to safely handle and move objects in the museum?	6:2
How should I proceed with moving an object?	6:3
What are the basic rules for handling museum objects?	6:4
What is the best way to protect an object I must pick up?	6:6
When should I wear gloves?	6:6
What should I do if I damage an object?	6:6
What personal health and safety issues should I consider when handling museum objects?	6:7
C. Moving Objects Within the Museum	6:9
What should I do before moving objects within the museum?	6:9
What do I need to know before moving objects?	6:9
D. Packing and Shipping Preparations	6:11
When would I need to pack and ship objects?	6:11
Why is it important to properly pack objects for shipping?	6:11
How can I learn how to pack museum objects?	6:11
What kind of workspace do I need for packing?	6:11
How much time should I allow for packing objects?	6:12
What do I need to consider before shipping?	6:12
How do I determine if the object can be safely shipped?	6:12
How do I ship hazardous materials?	6:13
How should I document the condition of the objects?	6:13
E. Packing and Shipping Materials	6:13
Why is it important to use the right packing and shipping materials?	6:13
What sources of packing materials are available?	6:13
What are good covering and wrapping materials?	6:14
What are good cushioning materials?	6:15
What materials make good interior boxes?	6:15
What kind of tape should I use on the box and the wrapping material?	6:16
How should I select an exterior container?	6:16
What kinds of containers do I use for objects that have different weights and sizes?	6:17
Can I build an exterior container?	6:17
Can I use a reusable shipping container?	6:17
How do I protect objects from environmental changes during shipping?	6:17
How should I store packing materials?	6:17
F. Packing for Shipping	6:18
How do I decide which way to position an object in a container?	6:18
How do I cover and wrap an object?	6:18
How should I cushion the object inside the container?	6:19
What other techniques can I use to cushion objects and provide shock absorption?	6:20
What should I do before closing the container?	6:22
Should I wrap and label the shipping container?	6:22
What should I put on the label on the exterior of the container?	6:22
What kind of identification markings should I put on the box?	6:23

G. Shipping Objects	6:23
What things should I consider if I use a professional packer/shipper?	6:23
What transportation alternatives are available for shipping museum objects?.....	6:24
When should I use the U.S. Postal Service?	6:24
When should I use commercial package delivery services?	6:24
When should I use an art shuttle van or special product truck?	6:25
When should I use airfreight?	6:25
Should I use a courier?.....	6:25
H. Receiving and Unpacking the Container	6:26
How should I unpack a container?	6:26
Should I check for insect infestation?.....	6:27
What do I do if an object is damaged, lost, or destroyed during shipping?	6:27
I. Selected Bibliography	6:28

List of Figures

Figure 6.1. Proper Handling Techniques.....	6:1
Figure 6.2. Carts and Trays Minimize Handling.....	6:2
Figure 6.3. Equipment and Supplies	6:3
Figure 6.4. Hold Objects at the Strongest Point.....	6:5
Figure 6.5. Wear Gloves and Use Both Hands.....	6:6
Figure 6.6. How to Lift Properly and Avoid Injury.....	6:7
Figure 6.7. The Proper Way to Lift a Chair	6:8
Figure 6.8. The Proper Way to Lift a Small, Framed Photograph.....	6:8
Figure 6.9. The Proper Way to Lift and Carry a Small Textile Object	6:8
Figure 6.10. Use Trays and Padding to Prevent Damage.....	6:10
Figure 6.11. Pad and Separate Parts.....	6:19
Figure 6.12. Wrapping, Padding, and Packing for Shipping an Object.....	6:20
Figure 6.13. Objects Double-boxed for Shipping.	6:21
Figure 6.14. Example of Written Handling Rules for NPS Park Collections.....	6:30

CHAPTER 6: HANDLING, PACKING, AND SHIPPING

A. Introduction

This chapter outlines handling, packing, and shipping guidelines for safely moving museum objects. By following these guidelines, you can prevent damage to the objects in your museum collection. The chapter includes:

- basic practices to ensure object safety
- guidelines for handling objects
- guidelines for moving objects inside the museum
- materials and techniques to properly pack for shipping
- basic directions for shipping objects
- guidelines for unpacking an object
- bibliography of references on handling, packing, and shipping museum objects

Specific guidance for handling different types of objects can be found in the appendices of this volume for each object type.



Figure 6.1. Proper Handling Techniques.
Proper handling techniques are essential to museum housekeeping practices.

B. Handling Objects

When you touch, lift, or hold an object you are handling it. When you work in a museum you will have to handle objects for a variety of tasks. To do this safely and effectively it is important to learn and practice good handling techniques.

1. *Why are careful handling practices important?*

Preventive conservation starts with careful handling. Proper handling is largely a matter of common sense and is necessary for the care and protection of objects. However, good handling techniques are not always obvious. Museum procedures require specialized handling knowledge that must be learned. For example, metals can corrode after being handled without gloves. Paintings may crack as a result of bumping and jarring during movement. Mishandling can cause obvious examples of damage, such as shattered glass in a frame, broken ceramics, torn documents, or dents and scratches in metal objects.

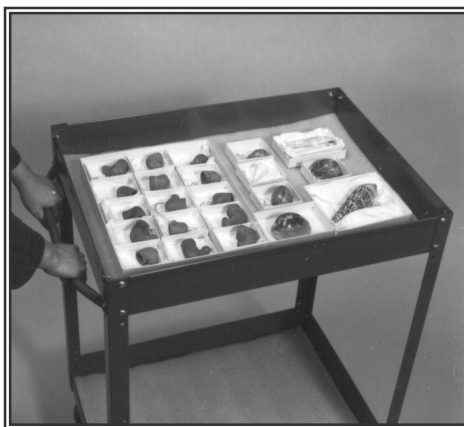


Figure 6.2. Carts and Trays Minimize Handling.

The use of equipment and supplies such as carts and trays minimizes the need to handle objects.

2. *Who needs to learn safe handling practices?*

Anyone who handles museum objects needs to be aware of the guidelines in this chapter. If your day-to-day responsibilities require you to handle objects, you need to be sensitive to their delicate nature. Regular activities like cataloging, photographing, housekeeping, and packing for shipment all require you to handle and work with objects.

3. *What basic practices can I use to safely handle and move objects in the museum?*

Write guidelines.

Establish written guidelines to help foster a professional attitude and respect for objects. Provide **all** staff with a set of written guidelines. Post the guidelines in museum storage areas. Be sure that all staff who handle objects read the guidelines. Researchers who handle objects should read the guidelines when they first use the collections. Staff should read the guidelines when hired and review them periodically. See Figure 6.14 for an example of handling guidelines you can use.

Train your staff.

Don't handle museum objects without training. Training should be an on-going activity, particularly when new types of objects are being handled. Make "hands-on" experience a part of all training for individuals working with collections. Re-training reminds people of the importance of proper handling techniques. You should give a special training session whenever new staff members assist in handling objects.

Use proper supplies and equipment.

Only use equipment that is of good quality and in good condition. Equipment for moving objects includes flatbeds, carts, dollies, pallet lifters, polyethylene tote pans, and object support trays. The supplies you use with the equipment to move objects include polyethylene foam pads for lining carts and trays, quilted furniture pads, acid-free tissue, and clean cotton or plastic gloves. You may need to acquire personal protective equipment such as lab coats and smocks, safety glasses, dust masks, and personally fitted respirators. Supplies and equipment are listed in more detail below.

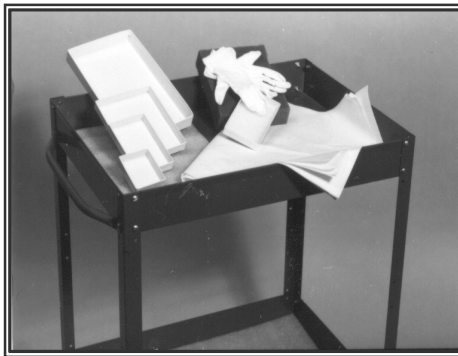


Figure 6.3. Equipment and Supplies.

Equipment and supplies for handling and moving museum objects include trays, padding, tissue, gloves, and carts.

4. How should I proceed with moving an object?

Consider safety first.

Before moving an object, inspect equipment to ensure that the object and the handler will be safe during the move. Do you have the proper personal protective equipment? Identify the space where you will move the object. Make sure there is room to house the object in its new location. If you have inadequate equipment, supplies, or space, postpone moving the object.

Plan your move.

Never consider moving an object routine work, even for daily housekeeping tasks. You must plan each step in the process before handling or moving a museum object. Where will you stand before picking up the object? Is there an open space to receive it? Planning helps keep handling to a minimum. When you plan, it helps you remember that each museum object is special. Keep in mind the following factors when you plan to move an object:

- ***Do you need to move the object?*** Is moving the object absolutely necessary? **If not, don't move it.**

- ***What are the object's structural characteristics and condition?*** Is it strong enough to withstand the move?
- ***Is there evidence of previous repairs?*** Review catalog records, condition reports, and photographs and examine the object to identify previous damage that may make the object especially fragile. Is there documentation that gives recommendations on moving hazards or safe moving techniques?
- ***What is the safest way to lift the item?*** How will you need to lift and carry the object to protect it from damage?
- ***How many people are required?*** Do you need help to move the object?
- ***Where is the object's new location?*** Is it large enough to properly house the object? Is the environment appropriate?
- ***What route will you use?*** Is it clear of obstructions?
- ***Will the personal health and safety of the handler be at risk?*** Do you have the proper moving equipment (for example, lumbar support belts or pallet jacks) to avoid physical strain? Do you need to wear a lab coat or dust mask?

5. *What are the basic rules for handling museum objects?*

When you handle objects use common sense and follow these basic rules to prevent damage to objects:

- Treat every museum object as if it were irreplaceable and the most valuable piece in the collection.
- Handle objects only when necessary.
- Move only one object at a time. Note: Small items can be moved together in a tote pan **if** they are separated and supported by padding.
- Never hurry.
- Take no risks.
- Never smoke, eat, or drink while handling objects.
- Avoid wearing anything that might damage objects by scratching or snagging the surface (for example, rings and other jewelry, watches, belt buckles, nametags, service badges).
- Use pencils, **not** pens, when working near objects.
- Keep hands clean, even when wearing gloves.
- Wear appropriate gloves.
 - Wear white cotton gloves when handling most objects.

- Wear plastic gloves (latex or nitrile gloves) when handling these types of objects:
 - slick objects like ceramics or glass
 - objects with oily or tacky surfaces that can attract cotton fibers
 - fragile or damaged paper or other organic materials that may catch on cotton fibers
 - some natural history specimens
- Know the condition of an object before moving it.
 - **Don't** lift by protruding handles or rims, which are often structurally weak.
 - Fragile objects should be given additional support, such as a tray or mount, before being lifted.
- Never layer or stack objects when moving them.
- Allow yourself plenty of space in which to work.
- Store objects so they can be easily moved without disturbing other objects.
- Tie on acid-free, cotton string tags or number trays, boxes, and bags so numbers can be easily seen without handling the object.
- Save all information associated with an object (for example, tags or labels).
- Remember to lift items properly.



Figure 6.4. Hold Objects at the Strongest Point. *A teapot should be handled by the base rather than by the handle or spout.*

The less museum objects are handled, the longer they will survive.

6. *What is the best way to protect an object I must pick up?*

When you pick up an object:

- Identify the strongest part of the object and hold it at this point.
- Take your time, handle only one object at a time, and use both hands.
- When an object has more than one part, for example, a teapot and lid, handle each part separately.
- Don't lift objects by protruding parts such as handles or rims.
- Stabilize any loose parts that cannot be removed.
- Move slowly and concentrate on what you're doing.
- Use a support board or tray whenever possible.

7. *When should I wear gloves?*

Gloves protect objects from contaminants such as dirt, salts, acids, and oils on your hands. Even clean hands can transfer these damaging substances. Wear clean, white cotton gloves except when handling ceramics, smooth glass, oily or tacky surfaces, fragile or damaged paper, or some natural history specimens. (Refer to Chapter 11 for a discussion of protective gloves to use when handling natural history specimens.) When handling these objects, wear tight-fitting latex or nitrile gloves for better gripping. Even when wearing cotton gloves, wash your hands frequently. Be careful not to rub your face and hair and then handle objects. Body oils may be transferred to the object and cause damage.

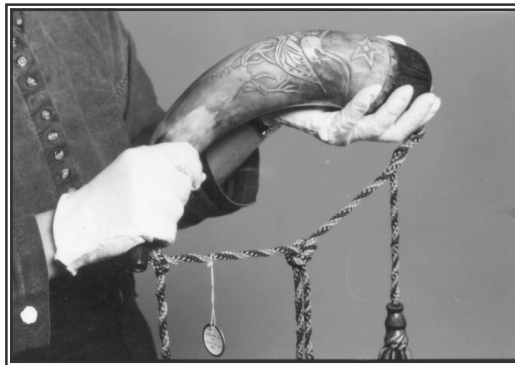


Figure 6.5. Wear Gloves and Use Both Hands.

Use two hands and wear gloves when handling museum objects.

Wear clean, white cotton gloves for handling many museum objects. Wear tight fitting latex or nitrile gloves when handling slick objects like ceramics or glass, objects with oily or tacky surfaces, fragile and damaged paper and other organic materials that can catch on cotton fibers, and some natural history specimens.

8. *What should I do if I damage an object?*

If you damage an object, report the damage. Damage should be recorded in the condition and condition description fields of the ANCS+ catalog record. Follow the instructions in the *ANCS+ User Manual* on reporting condition.

S M H db k P tII Ch t 3 f i f ti h t d

See *Museum Handbook*, Part II, Chapter 3, for information on how to do condition reporting.

Take photographs of the damage if possible. Save all pieces and carefully pack them so that no further damage occurs before a conservator can make repairs. Small pieces may be wrapped and bagged in self-sealing polyethylene bags labeled with the appropriate object identification information.

9. *What personal health and safety issues should I consider when handling museum objects?*

It is very important to follow health and safety precautions when handling museum objects.

- Practice safe lifting techniques. Remember to lift with your legs and not your back. Use proper personal support equipment, such as a lumbar support belt. Don't lift more than you can safely carry. See Figure 6.6 for a list of techniques that will help protect you from injury.
- Be careful how you handle potentially dangerous objects (for example, firearms, ammunition, and medicines). See *Conserve O Gram* 2/5, "Fossil Vertebrates as Radon Source: Health Update"; 2/8, "Hantavirus Disease Health and Safety Update"; and 2/10, "Hazardous Materials in Your Collection."
- Don't touch or inhale fumes or particles from objects treated with pesticides such as arsenic. See *Conserve O Gram* 2/2, "Ethylene Oxide Health and Safety Update"; 2/3, "Arsenic Health and Safety Update"; and 2/4, "Dichlorvos (Vapona) Update."

1. ***Be sure you have firm footing and keep your legs apart.***
2. ***Bend at the knees.***
3. ***Use your leg and stomach muscles, not back muscles, when lifting from a stooped position.***
4. ***Get close to the object and keep it near your body.***
5. ***Avoid twisting; pivot using your feet.***
6. ***Keep your back straight.***

Figure 6.6. How to Lift Properly and Avoid Injury.



Figure 6.7. The Proper Way to Lift a Chair.



Figure 6.8. The Proper Way to Lift a Small, Framed Photograph.



Figure 6.9. The Proper Way to Lift and Carry a Small Textile Object.

C. Moving Objects Within the Museum

Preventive conservation continues with the careful movement of objects. When you move objects you increase the risk of damage and loss because you are both handling them and changing their location.

1. *What should I do before moving objects within the museum?*

Before you move objects within the museum for dusting or cleaning, or any other purpose, be familiar with the rules you should follow that help reduce the risk of damage. Planning is essential before handling or moving any museum objects. Think through your plan so that you lift and move objects properly. With advanced planning, you can keep movement of objects to a minimum.

Moving puts an object at its greatest risk.

2. *What do I need to know before moving objects?*

Evaluate the object's condition and structure before moving it. Review object catalog records for condition reports, photographs, or other instructions that may provide information on the object's stability.

Know the object's condition and structure.

- Check the catalog card for any record of past damages.
- Check for loose parts or fragile surfaces. Careful examination will usually reveal if an object is not stable.
- Do I have to move the object? Constantly handling and moving objects can cause them harm.

Use safe handling practices.

Know the rules for handling museum objects. See Section B of this chapter. When lifting objects:

- Use both hands.
- Lift most objects from the base and/or close to the center of gravity.
- Don't try to push or drag objects across surfaces.
- Don't handle objects by handles or rims.
- Place objects inside containers (trays or boxes) for carrying (see Figure 6.9).
- Make sure objects are padded using museum materials (for example, polyethylene foam or acid-free tissue).
- Secure objects in separate compartments in a box or tray to prevent them from being damaged.
- Don't allow objects to stick out beyond the sides of the containers.



Figure 6.10. Use Trays and Padding to Prevent Damage.

These pipe bowls were placed in individual specimen trays within a larger tray to prevent damage during movement.

Use trained, experienced staff.

When selecting people to move objects:

- Evaluate the experience of the people handling and moving the objects.
- Assign specific tasks to each person.
- Review the move plan verbally with participants before moving the objects so that all understand their duties and assignments.

Use proper equipment.

Make sure you have the proper moving equipment so that the move is safe for both objects and people.

- Use the correct type of equipment. Useful equipment includes trays or baskets to support objects and flatbeds, carts, dollies, and pallet lifters to move objects.
- Inspect the equipment to make sure that it is safe for both the objects and the person handling the objects before you begin.
- Pad carts and other surfaces with polyethylene foam or another stable material to protect the objects.
- Postpone moving the objects if you don't have proper equipment, supplies, space, and trained helpers.
- Use rubber doorstops to prop doors open before you pass through.
- Use personal protective equipment when appropriate.

Clear the new location and the route there.

Before moving the object:

- Make sure the location is ready to safely house the object.
- Know which route to take, which equipment to use, and how much time you'll need to complete the move.
- Provide written instructions if needed.
- Be aware of all surfaces that the object may contact (for example, doors, floors, and walls).
- Study the spaces through which the object may pass (for example, doorways, stairwells, display areas).
- Avoid tight areas.
- Don't move objects during peak visitation periods or open hours, if possible.
- If transporting the object outdoors, move it when the weather conditions are good, with no rain, snow, or extreme heat. If this isn't possible, then take appropriate precautions such as waterproof coverings and packing to provide environmental buffering.
- Be aware of weather conditions at the final destination to determine the type of protective container needed.

D. Packing and Shipping Preparations

1. *When would I need to pack and ship objects?* Sometimes you must pack and ship objects to send them to a new location. For example, you may need to pack and ship objects for outgoing loans or conservation work.
2. *Why is it important to properly pack objects for shipping?* The hazards of shipping an object are numerous. Improper packing can cause an object to be permanently damaged or destroyed. A properly packed container is critical to ensure your objects arrive safely.
3. *How can I learn how to pack museum objects?* Begin by following the rules for the proper handling of objects. See Sections B and C of this chapter. The best way to learn how to pack is to work with an experienced packer. Learn to pack different types of materials, such as textiles and glass. **Each object requires a unique packing solution.** Museum professional associations often offer classes on packing and shipping.
4. *What kind of workspace do I need for packing?* You need enough room to work comfortably with the objects you are packing. For small objects you will need a table or desk; for larger objects you may need to have a portion of a room. For these larger objects, figure that you will need a space at least three times the size of the object you plan to pack. If you do a lot of packing, you should have a permanent packing area. When setting up a packing area:

- Select an area that can be cleared so you have sufficient room to safely pack the objects.
- Choose an area close to where the objects are stored to prevent unnecessary handling. Avoid continuously moving objects up and down stairways, around tight corners, or through narrow doorways.
- Pad the table with a few sheets of 1/8" polyethylene foam. Cover the polyethylene foam with 4-mil polyethylene sheeting. Securely fasten the sheeting beneath the work surface.
- When packing textile objects, pad surfaces with unbleached muslin over polyester batting.
- Remove all other tools and materials from the table while packing.

5. *How much time should I allow for packing objects?*

Packing can take several hours or even days, depending on the object. Allow yourself plenty of time to pack correctly. Don't hurry. Make sure each object is secure before moving onto the next.

6. *What do I need to consider before shipping?*

When you are preparing to ship an object, plan carefully. A lot of damage can occur during shipping. Movers may jar or drop objects. Airplane vibrations, exposure to bad weather, and rapid fluctuations in relative humidity can damage objects. Proper packing and shipping will limit these and other travel hazards including:

- shock and vibration
- sudden changes in temperature and humidity
- mishandling
- theft, vandalism, and loss

Before moving a museum object outside of the building, consider:

- the object's fragility
- the shipping method
- the climate through which the objects will travel
- the climate at the object's destination

7. *How do I determine if the object can be safely shipped?*

Carefully examine the object to see if its condition allows for safe travel. Be sure to check the condition and structure of items that can be very fragile. These include glassware, photos on glass, wooden musical instruments, paintings on wood, pastel paintings, charcoal drawings, and cracked porcelain. See the appendices in this volume for the particular problems you may find with different materials.

8. *How do I ship hazardous materials?*

To ship hazardous materials, such as nitrate film or firearms, you must follow special shipping requirements. The Bureau of Alcohol, Tobacco, and Firearms (ATF) has specific guidelines for shipping certain types of firearms. Contact the ATF's National Firearms Act Branch at (202) 927-8330 to determine the shipping requirements for your collection. Work with the company that will do the shipping to find out specific requirements for other types of hazardous materials. *Conserve O Gram* 14/8, "Caring for Cellulose Nitrate Film," gives information on shipping nitrate film.

9. *How should I document the condition of the objects?*

It is important to document the condition of an object before moving it. If an object is damaged, the documentation will help you determine the extent of the damage.

See *Museum Handbook*, Part II, Chapter 5: Outgoing Loans, for information about recording condition for loans. You may want to use the Object Condition Report (Form 10-637) to document an object's condition. For insurance and other purposes, when documenting condition:

- Use a portable light source and magnifying lens to help identify markings.
- Note and document areas that have been previously repaired.
- Carefully examine objects for pest infestation.

E. Packing and Shipping Materials

1. *Why is it important to use the right packing and shipping materials?*

Packing materials can adversely affect the object. Some materials are abrasive and can damage objects. Friable objects (for example, ancient glass, charcoal, pastel and conte crayon drawings, corroded metals) are susceptible to mechanical damage from even minor abrasion. Acidic tissue should not come in contact with objects that are acid sensitive. Some plastic bubbles and foams may leave imprints on polished metals, varnished woods, oriental lacquer and other smooth-surfaced objects. Materials that come in direct contact with the object must not stain, be abrasive or acidic, or off-gas damaging chemicals. To prevent these types of damage you should select appropriate materials for each packing situation. Never re-use packing materials on different types of objects as residues and dirt can be transferred.

This section describes materials commonly used in packing objects for transit. The bibliography lists a variety of references that can aid you in selecting proper materials and techniques. You can also contact your regional/Support Office (SO) curator or a conservator if you have questions about a specific material.

2. *What sources of packing materials are available?*

New packing products are continually appearing on the market. Contact museum packers to learn about new materials. If you choose a new material, be sure it has been tested and generally approved by the museum field. See *NPS Tools of the Trade* for some suggestions. You can obtain other supplies from the following sources:

- General Services Administration Federal Supply Schedule (look under "Cushioning Materials" or "Packaging and Packing Supplies")
- *Storage of Natural History Collections: Ideas and Practical Solutions*, put out by the Society for Preservation of Natural History Collections (listed in the bibliography)
- local telephone directories (look under "Boxes," "Packaging Containers," and "Packaging Materials")
- businesses specializing in packaging for high-tech electronic equipment

Ask your regional/SO curator if you are unsure about any materials you want to use.

3. *What are good covering and wrapping materials?*

Good covering and wrapping materials include:

- ***Acid-free glassine paper*** is stiff, translucent, and glossy in texture. You should use glassine only for short-term storage (less than 30 days). Glassine is recommended for covering paintings, bottles with labels, or objects with a friable or oily/tacky surface. Use only new glassine paper since it deteriorates and becomes acidic over time.
- ***Tyvek*** is an alternative to glassine. This material is available in soft textile-like or slick, smooth finishes. Tyvek is a type of high-density polyethylene and is stable for long-term use.
- ***Tightly woven nylon fabric*** can be used to cover cushioning foams to protect the object. Make sure nylon doesn't come into contact with the surface of delicate materials as it can be abrasive.
- ***Cotton knit*** (available in rolls) is another good covering material. It is a good, soft cover for polyethylene foam supports.
- ***Unbleached washed muslin*** can be used for wrapping sculpture and textiles. Wash muslin in hot water several times before using it to remove sizing and make it softer.
- ***Soft, unbuffered acid-free tissue paper*** is used for covering basketry, metal, and textiles. It is also good for making pads to fill empty spaces and covering appendages on objects.
- ***Mylar®*** is a clear, stable polyester film that serves as a good primary protector for paper. Mylar has an electrostatic charge. **Never use it on pastels or charcoal drawings.**
- ***Blanket pads or quilts*** are used for covering large sculpture and furniture.
- ***Acid-free folders*** are used to contain unframed prints, documents, and photographs.

Examples of when and where to use these materials can be found in the references listed in the bibliography.

4. *What are good cushioning materials?*

Cushioning materials are designed to absorb shock and buffer the humidity. These materials are usually foam products that you can use in a variety of cushioning techniques. Use each type of foam correctly to achieve adequate shock and vibration protection. Because each foam product offers different cushioning qualities, you may want to use a combination of foams. The Canadian Conservation Institute (CCI) has designed tools (The Circular Slide Rule for Cushion Design and PadCAD computer program) to help museums estimate how much cushioning material to use. These aids help you evaluate the shock that occurs when a package is dropped from a certain height. This calculation helps you determine how much and what kind of cushioning materials you should use. You can obtain these aids directly from CCI, 1030 Innes Road, Ottawa, ON KIA OM5, Canada (613) 998-3721 <<http://www.pch.gc.ca/cci-icc/>>.

A few good cushioning materials are listed here:

- **Bubble-pack™** is a plastic sheet with trapped air bubbles. Bubbles can leave impressions on an object's surface so use this product with the bubble side facing away from the object's surface. Don't use it with sharp objects that can break the bubbles. Use several layers to maximize the padding effect. Always wrap the object first with tissue or muslin to protect the surface and to buffer relative humidity.
- **Polyethylene foam sheets (Ethafom, Volara)** are light, easily handled, shock absorbing, chemically inert, and a barrier to moisture. Join sections with a heat gun, glue gun, or double-faced tape. These sheets are available in various densities, thicknesses, and textures. Use only white sheets; blue and pink sheets contain additives that may cause deterioration.
- **Polyurethane foam** is one of the best cushioning agents and it cuts easily. Its soft springy nature absorbs shock very effectively. It is very unstable, however, so use it only for **short-term** transport packing. Always put a barrier, such as acid-free tissue or Tyvek, between this foam and the object.

One packing material commonly used is **plastic "peanuts,"** which are expanded polystyrene. These are usually not appropriate for museum objects. They are messy, retain moisture, and they cling to surfaces. They are also difficult to remove if they get caught in appendages. If you must use these peanuts, do so only with small, light objects (<5 lbs.) or as a pad of peanuts collected in polyethylene bags. **Plastic "potato chips"** are a better form for providing padding.

5. *What materials make good interior boxes?*

Double boxing gives extra protection to objects (see Section F.5). The interior boxes can be made from a variety of materials. Many objects can be packed inside double-strength fiberboard boxes. You can also use polyethylene or polystyrene boxes. These plastic boxes will also protect objects from water damage.

Sometimes you may need to make a specially shaped box to pack odd-sized objects. There are several materials you can use to produce specialized interior boxes:

- **Foam-Cor®** is a polystyrene foam sandwiched between two layers of clay-worked kraft linerboard.
 - **Archival corrugated board** is an acid-free, lignin-free cardboard.
 - **Vapor barrier films** are a variety of laminate metal and plastic sheet materials that allow very little penetration of oxygen or water vapor. They make good box liners and can help maintain the interior microclimate.
 - **Cellophane and masking tape** can both be used to attach packing materials. Don't use these for closing the outside of the container, as they are not strong enough to resist damage during shipping.
 - **Pressure-sensitive plastic tape** can be used to seal the outside of the container.
 - **Water activated paper tape** can be used for sealing containers and attaching kraft paper. The 3"-width tape is best.
 - **Nylon reinforced strapping tape** should only be used for closing containers. The adhesive on this tape is very sticky and strong, so be very careful to keep it away from objects or wrapping materials that may contact objects.
6. *What kind of tape should I use on the box and the wrapping material?*

Don't allow any tape to contact the surface of objects.

7. *How should I select an exterior container?*

A quality exterior container contributes to an object's safe travel. Select containers prior to packing. Consider the following criteria:

- the physical characteristics of the item you are shipping (for example, size, weight, fragility)
- how much space the object needs inside the container for the object to fit comfortably and securely
- the method of transportation and who will handle the container
- environmental and weather changes that may require humidity and temperature buffering
- the number of times the object will be packed and unpacked

Exterior containers are fabricated from metal, wood, cardboard, fiberglass, and high-density plastics. The best exterior containers are:

- puncture proof
- light proof

- watertight
- protective against shock or vibration
- good environmental buffers

8. *What kinds of containers do I use for objects that have different weights and sizes?* You should pack objects according to their weight, height, and density. Pack light objects in double strength cardboard boxes. Heavier objects (for example, paintings, sculpture, and furniture) or valuable and fragile items need the extra support of wood, fiberglass, or high-density plastic. You may have to build a special container customized for the object or hire a professional carpenter to build one.
9. *Can I build an exterior container?* Build a container only if you have good carpentry skills and packing experience. You can use nails and glue to build the container, but use screws on the lid once the object is in the box. Never use nails on the lid because they can accidentally pierce the object. Vibrations from hammering or prying open the lid may also cause damage to the object.
- Line the interior of the container with polyethylene sheeting, Tyvek, or vapor barrier film to protect the objects from water and to help buffer the interior microclimate. Add gaskets, skids, handles, and battens as needed for protection. Use castors on large containers to facilitate movement.
- For more information on the specifics of making a box for shipping museum objects, see the references at the end of this chapter.
10. *Can I use a reusable shipping container?* If you frequently pack and ship objects you might want to purchase reusable polyethylene containers. The Museum Management Program can provide more information on reusable containers and where you can get them.
11. *How do I protect objects from environmental changes during shipping?* Containers will be exposed to temperature and relative humidity changes during the shipping process. These environmental changes can affect the object inside. Hygroscopic materials (materials that readily absorb moisture) used as packing materials can act as a buffer against relative humidity changes within the container. Wood, paper, natural fiber fabrics, and silica gel are good examples of hygroscopic materials that make good packing materials.
12. *How should I store packing materials?* Keep packing materials in a clean, dust free, controlled environment. Avoid accumulating excess packing materials if you don't have adequate storage space for them because they increase both the risk of fire and the chance of infestation. If possible, store them in an environment with stable humidity between 40-60% RH. Wood crates and packing materials absorb moisture and pollutants. If the crates absorb more moisture than is recommended, allow them to adapt to the same environment as the object for two weeks prior to shipping. Open the lid to speed the process. Before bringing packing materials into the collections area, check all materials for pest infestation.

F. Packing for Shipping

Once you have selected your packing materials and decided on the kind of interior and exterior container you will use, you need to pack your object. This section discusses how to pack and cushion an object so it will not be damaged from shock and vibration. It also describes the documentation that you should include inside the container.

1. *How do I decide which way to position an object in a container?*

Evaluate the object's shape and size before packing. Plan for the worst possible travel scenario. Consider the object's weight and center of gravity. When you position the object:

- Place the heaviest part of the object low and close to the center of the container.
- Place glass-covered framed works of art vertically with padding between each item.
- Separate parts of objects (for example, a teapot and lid) and wrap separately.
- Immobilize and dismember objects with moving parts (for example, a spinning wheel) and wrap parts separately.
- Provide additional support for heavy parts of an object.
- Pack only objects of similar weight in the same container.



Figure 6.11. Pad and Separate Parts.

Pad moveable parts and separate parts of an object to avoid damage during handling.

2. *How do I cover and wrap an object?*

Use an initial covering to protect objects from abrasive packing materials and to serve as an additional buffer. Use soft, unbuffered, acid-free tissue for most objects. If possible, don't use tape to hold the covering material closed. Instead, tuck the tissue in on itself or into an appendage. This removes the chance that tape will get stuck to the object. Don't wedge

tissue so tightly that it exerts stress on the object. **Never crumple tissue in wads.** Insert smooth pillows of tissue between parts of an object.

Wrap paintings in glassine paper or Tyvek. Don't use plastic as it can trap moisture if the temperature drops radically during shipping and condensation occurs. This moisture can support mold growth and many other types of deterioration.

After you cover the object, round off all projecting parts and handles with tissue. For example, imagine you are wrapping a teapot. Place soft, unbuffered, acid-free tissue around the spout, inside the teapot, and in the open space under the handle. The end result is a rounded-off ball of tissue where projecting parts are protected by the whole. Wrap the entire teapot in one sheet of tissue or bubble-wrap to hold padding in place. Label the exterior wrapping with object identification information (for example, object name and catalog number).

3. *How should I cushion the object inside the container?*

There are several ways to properly cushion objects inside the packing container:

- Use packing materials (for example, bubble-wrap, polyurethane, or polyethylene foam blocks) that help absorb shock and vibration and create a thermal barrier.
- Always provide at least two inches of cushioning between objects in the same container.
- Provide at least two inches of cushioning between objects and the walls of the container.
- Allow three to four inches between very fragile items like ceramics and glass and between heavy objects.
- When determining the number of objects you may pack in one container, use common sense. Consider weight, fragility, and sensitivity to environmental conditions. For example, do not pack heavy metal industrial parts with china. Likewise, environmentally sensitive ethnographic objects require more buffering material than historic metals.



Figure 6.12. Wrapping, Padding, and Packing for Shipping an Object.

4. *What other techniques can I use to cushion objects and provide shock absorption?*

There are a variety of techniques that you can use to cushion objects. These techniques include:

- double boxing
- cavity packing
- padding negative spaces
- cushioning braces

You should base your selection on the fragility, size, and construction of the object as well as the modes of transportation during shipping.

Double Boxing

Double boxing is the process of packing an object in two sequential boxes. It's an excellent way to cushion objects. Follow these steps:

- Wrap the objects and cushion them inside one box.
- Pack the first box inside a second box at least two inches larger on all sides.
- Completely fill the spaces between the boxes with newspaper or foam, or use corner blocks or plastic rings between the boxes.



Figure 6.13. Objects Double-boxed for Shipping.
The straps make it simple to remove the interior box.

Cavity Packing

Cavity packing is the process of placing small to medium-sized objects in hollows cut into layers of polyethylene foam. This technique is clean and easy to use in repacking. To cavity pack:

- Trace the shape of the objects.
- Mark the shape on the foam with a pencil.
- Cut out the contour with a bread knife or electric carving knife.
- Protect the object against abrasive polyethylene material by covering the cavity with soft, unbuffered acid-free tissue, Tyvek, or another smooth inert material.

Padding Negative Space

Use this technique for less fragile objects. Surround the object with tissue paper and then wrap it with successive layers of bubble wrap. Place the object inside the container and use pads of tissue, bags of packing peanuts, or soft foam to fill in the excess area. Allow several inches between each object and between the objects and the inner container. Larger, heavier objects will need more separation than small, lightweight objects. When using this technique for open objects (for example, pots or baskets) fill them with tissue to prevent collapse caused by the pressure of surrounding objects.

Cushioning Braces

A cushioning brace holds the object in place and may be necessary to immobilize the object when padding negative spaces. To make a cushioning brace, measure the distance between the object and the container. Build polyethylene blocks to fill in the space. Cover the polyethylene with a less abrasive material such as soft acid-free tissue to protect the object. Place packing material on top of the object to prevent it from moving during shipping, but don't overfill the box. Overfilling places too much compression on the object.

5. *What should I do before closing the container?*

Before you close the container, place packing material above the object to prevent movement if the box is overturned. Avoid too much compression so that padding material does not damage the fragile objects. Cushioning material should support and enclose but not compress the object. After you finish packing, lightly jar the container to determine if objects can shift. If they can, you must repack the container.

You should create an inventory of all contents inside the lid of each packing container. If the procedures for unpacking are complicated, include written unpacking instructions or a sequence of photographs showing the proper packing or unpacking procedure. Unpacking in an incorrect order can cause damage. Place a label with the address neatly typed or printed inside the box in case the exterior address is lost or destroyed.

6. *Should I wrap and label the shipping container?*

After a box is packed you may want to wrap it in paper to give it a finished, clean appearance. If you must wrap a box, do it carefully and neatly. A poorly constructed and shoddily wrapped container invites people to mishandle it. A neatly wrapped and properly labeled container encourages handlers to be careful. Kraft paper is an excellent exterior wrap for containers. Tape all open edges and folds of the paper.

7. *What should I put on the label on the exterior of the container?*

Prepare the exterior label as follows:

- Always print the name and address of the recipient in permanent ink.
- Write the recipient's name and address directly on the outside of the box as well as on any wrapper. This way, if the wrapper is torn, the package will not have to be opened to get the name and address of the recipient.
- Place the typed or neatly printed address in the center of the box. Place a duplicate label with this information inside the box. If the address is a P.O. Box, include the telephone number on the label.
- Always include the name of the recipient on the address label. Phone before you ship so that the recipient will be expecting the shipment.

8. *What kind of identification markings should I put on the box?*

- Write neatly on the top, "OPEN THIS SIDE."
- Put arrows on the sides to let the handlers know which end is up.
- Add necessary labels to warn handlers and give them information they may need to know to properly handle the box. For example:
 - Label the package "FRAGILE" if the contents are delicate.
 - Add the proper hazard label for nitrate film and other hazardous materials.
 - Print specific instructions such as, KEEP DRY, DO NOT TILT, HANDLE WITH CARE.
- Mark the total number of boxes on the address labels (Box 1 of 2, Box 2 of 2).
- Make sure all labels are secured with strong tape or adhesive.
- **Don't** attract thieves by writing "Works of art" or "Museum objects."

G. Shipping Objects

1. *What things should I consider if I use a professional packer/shipper?*

You may decide to contract for packing/shipping service. However, be aware that professional packers/shippers seldom have knowledge of and sensitivity to the delicacy of museum objects. Use shippers who've handled museum collections before or who specialize in museum collections. The reputation of a particular art packer or carrier is an important factor to consider. Get referrals from your regional/SO curator and other parks or local museums. Check references of any firm you plan to hire. After you select a company, discuss and confirm the following points of information about the shipment:

- size and weight limitations
- insurance coverage
- costs and payment terms
- pick up and delivery times

The park should also be specific with the carrier about meeting NPS standards. Finally, be prepared to supervise and give specific instructions for packing/shipping the objects.

Park curatorial staff should inform the regional/SO curator of positive and negative experiences with particular art packers and carriers. This information will help to maintain a current list of available packers and carriers for referral to other parks.

2. *What transportation alternatives are available for shipping museum objects?*

There are several options for transporting museum objects. These include:

- U.S. Postal Service
- package delivery services (for example, United Parcel Service (UPS) or Federal Express)
- motor freight
- airfreight
- courier

Your selection depends on:

- size
- weight
- distance
- object fragility
- extra services required

Specific features and limitations of each alternative are described below.

3. *When should I use the U.S. Postal Service?*

Use the U.S. Postal Service (USPS) for objects that are not fragile or of special significance (for example, high monetary, associational, or research value). Always mail "priority" class to reduce transit time. Send by registered mail, return receipt—the most secure service offered by the USPS. With registered mail the USPS monitors the movement of your package from the point of acceptance at the post office to delivery. You will receive a receipt when you mail your package and a delivery record is kept at the post office at the other end. When you request a return receipt, you will receive a receipt showing who signed for the item and the date that it was delivered. Completed packages must weigh less than 70 pounds and measure less than 108 inches in combined length and circumference.

4. *When should I use commercial package delivery services?*

Use commercial package delivery services such as United Parcel Service (UPS), Federal Express, or Airborne Express for shipping sturdy objects. These companies have limits on the value of objects they will ship and insure. Talk to the company you choose to find out:

- value limits (companies often will not ship objects worth more than \$50,000) For more information on appraisals, see *Museum Handbook*, Part II, Chapter 4: Inventory and Other Special Instructions.
- insurance requirements (most companies have a basic insurance coverage, but require you to purchase higher limits)
- size and weight limits

- pick up and delivery alternatives (for example next day, second day, weekend)

Be sure to require the service to sign and return an Acknowledgment of Delivery form. When shipping to a large institution, specify that a specific person or department must sign for the delivery. This is to ensure that the package is not left at a loading dock or reception desk.

5. *When should I use an art shuttle van or special product truck?*

Art shuttle vans and special product trucks offer another form of transportation for museum objects. Some national van lines and specialized art handling companies offer these services. However, they are subject to side routing, delay, and transfer between vehicles. When choosing this shipping method, discuss in detail the route and process that the transport will use. Ship only in air-ride suspension trucks that can absorb road shock. Transport objects sensitive to temperature and relative humidity changes in a climate controlled van. Cost is based on size of shipment, weight, distance, and extra services such as pick-up, non-stop delivery, climate control, and daily progress reports. You can find other information about specialized shippers in the AAM Products and Services Directory under "Shipping and Moving Companies."

6. *When should I use airfreight?*

Airfreight is a fast transportation method, but it can be expensive. Airfreight also subjects objects to considerable handling. However, with airfreight, the object is out of your control for the least amount of time.

A typical airfreight-shipping scenario looks like this:

- 1) Truck or van transports the object to the airport.
- 2) Objects sit on the loading dock.
- 3) A forklift carries objects to the plane.
- 4) The objects fly on one or more planes.
- 5) A forklift unloads the objects. They may sit for a time on the loading dock:
- 6) A van takes the objects to the final destination (airfreight companies generally contract for pickup and delivery services).

Plan routing carefully to minimize stopovers and plane changes. This prevents unnecessary loading and unloading or an unattended crate at the loading dock. Be mindful of pressure differences between ground and flight level that may affect pressure-sensitive objects. Size limitations are related to airplane configuration. Weight and dimension of the shipment normally determine air shipment charges. Seek out an airfreight forwarder to help you coordinate air and ground transport.

7. *Should I use a courier?*

All of the above techniques have some level of risk. You can reduce this risk by using a courier. Using a courier decreases the possibility of loss. Because of the fragility, sensitivity, and high value of most museum objects, consider having a courier accompany the object during transit. A courier is also recommended if the trip is complex with many carrier changes. Someone with knowledge of conservation, museum documentation, and object handling techniques may serve as a courier. This person might be either a hired agent or a NPS employee.

As a courier on an airplane, you must:

- Make all arrangements in advance with the airline. Explain what you will be carrying, loading, and unloading.
- Check on airline size limitations before planning for a hand-carried shipment.
- Purchase an extra seat for the object if necessary.
- Secure the object (container) with a seat belt unless it will fit under your seat or overhead compartment.
- Never let the object out of your sight.
- Do not carry hand luggage that gets in the way of the object.
- Do not reveal the contents of the package to other passengers.
- Try to board before and disembark after other passengers.
- Supervise the loading and unloading of objects in the cargo hold and accompany the object from the plane to the cargo shed.
- Deliver the museum object as soon as possible.

If traveling by car:

- Be sure someone is always with the object in the vehicle.
- Stop only when necessary.

H. Receiving and Unpacking the Container

1. *How should I unpack a container?*

You should use as much care unpacking a box as you use in packing it. Follow these basic instructions:

- When you receive a shipment, don't open the box for 24 to 48 hours to allow the contents to acclimate to the new environment.
- If the box exterior is damaged, note the problem on any receipt of acceptance that you sign. This identifies the fact that damage occurred before the box arrived at the park.
- Cut tape carefully to avoid excess pressure on and damage to the object.
- Check for unpacking instructions that may be included with the box.
- Check the contents of the box against the packing list to ensure that everything is present.

- Flatten all packing materials completely to be sure that no object pieces or small items are still inside.
- If the object has to be repacked to return it, place the packing materials inside the box or crate and save the container.
- Take careful notes on the unpacking sequence and label all packing boxes and supports so they can be reused properly.
- Never permanently store museum objects in packing containers. Such containers are for short-term transportation needs.

2. *Should I check for insect infestation?*

As soon as you unpack the box you should check for pests:

- Thoroughly check the object for signs of infestation such as shed larval skins or live insects.
- If infestation is noticed, immediately isolate the object and develop a strategy for dealing with the infestation. If the item does not belong to you, contact the owner and solicit their input when developing your strategy. See Chapter 5: Biological Infestations, in this handbook, or contact your regional/SO curator for additional information.

3. *What do I do if an object is damaged, lost, or destroyed during shipping?*

All shipments should be insured with wall-to-wall insurance coverage. See *MH-II*, Chapter 4, for information about insuring shipments. If an object is damaged when it is returned, document the damage. Damage should be recorded in the condition and condition description fields of the ANCS+ catalog record. Follow the instructions in the *ANCS+ User Manual* on reporting condition. See *MH-II*, Chapter 3: Cataloging, for information on how to do condition reporting.

Take photographs of the damage if possible. Save all pieces and carefully pack them so that no further damage occurs before a conservator can make repairs. Small pieces may be wrapped and bagged in self-sealing polyethylene bags labeled with the appropriate object identification information.

If the damage occurred during shipping, report the damage to the shipping company and submit an insurance claim. You will have to provide evidence that the object was not damaged before shipment.

If an object is lost or destroyed during shipping, report the loss and deaccession the object. Follow the procedures outlined in the *MH-II*, Chapter 4: Inventory and other Special Instructions, Section III, "Reporting Loss of Museum Objects," and Chapter 6: Deaccessioning, Section H, "Loss, Theft, Involuntary Destruction, Abandonment or Destruction."

I. Selected Bibliography

- Alberta Museums Association. *Basic Principles of Artifact Care and Handling*. Edmonton, Alberta, Canada: Alberta Museums Association, 1991.
- American Association of Museum. *The Official Museum Directory, Volume 2, Products and Services*. New Providence, N.J.: National Register Publishing, 1998.
- Dudley, Dorothy. "Chapter 7: Packing and Shipping." In *Museum Registration Methods*: Washington, D.C.: American Association of Museums, 1979.
- Fall, Frieda Kay. "General Rules for Handling Art Museum Objects," *Museum News*. 43, no. 1 (1964): 33-39.
- _____. *Art Objects: Their Care and Preservation, a Handbook for Museums and Collectors*. La Jolla, Calif.: Laurence McGilvery, 1973.
- Gallery Association of New York State. *Way to Go: Crating Artwork for Travel*, Hamilton, N.Y.: Gallery Association of New York State, 1985.
- Gilmore, Jean Allman, and Rebecca A. Buck, eds. *The New Museum Registration Methods*. Washington, D.C.: American Association of Museums, 1998.
- Hansen, Greta, and Dennis V. Piechota. "The Care of Cultural Property in Transit: A Case Design for Traveling Exhibitions." *Technology and Conservation* (Winter 1982).
- Keck, Caroline K. *Safeguarding Your Collection in Travel*, Nashville, Tenn.: American Association for State and Local History, 1970.
- Lister, Joyce. "Safeguarding Museum Collections: A Review of Handling," *Museum Quarterly* (Summer 1984): 23-26.
- Mecklenberg, Marion F. *Art in Transit: Studies in the Transport of Paintings*. Washington, D.C.: The National Gallery, 1991.
- Odegaard, Nancy. *A Guide to Handling Anthropological Museum Collections*. Tucson, Ariz.: Western Association for Art Conservation, 1992.
- Powell, Brent. *Technical Drawing Handbook of Packing and Crating Methods*. Packing and Crating Information Network. Washington, D.C.: American Association of Museums, PACIN Task Force, 1993.
- _____, comp. *Soft Packing: Methods and Methodology for the Packing and Transport of Art and Artifacts*. Washington, D.C.: American Association of Museum, PACIN Task Force, 1994.
- Richard, Mervin J. "Elements for Effective Packing," *Museologist*, 45, no. 166 (Winter 1983-4).
- Richard, Mervin J., Marion F. Mecklenberg, and Ross M. Merrill, eds. *Art in Transit: Handbook for Packing and Transporting Paintings*. Washington, D.C.: National Gallery of Art, 1991.
- Rose, Carolyn, and Amparo R. de Torres, eds. *Storage of Natural History Collections: Ideas and Practical Solutions*. Pittsburgh, Pa.: Society for the Preservation of Natural History Collections, 1992.
- Rose, Cordelia. *Courierspeak: A Phrase Book for Couriers of Museum Objects*. Blue Ridge Summit, Pa.: Smithsonian Institution Press, 1993.

Rowlison, Eric B. "Rules for Handling Works of Art," *Museum News* 53, no. 7 (1975): 10-13.

Sandwith, Hermione, and Sheila Stainton, *The National Trust Manual of Housekeeping*. London: Allen Lane, 1984.

Shelley, Marjorie. *The Care and Handling of Art Objects*, rev. ed., New York: The Metropolitan Museum of Art, 1986.

Sixsmith, Mike. *Touring Exhibitions: The Touring Exhibition Group's Manual of Good Practice*. London: Butterworth-Heinemann, 1995.

Stowlow, Nathan. "Conservation and Exhibitions-Packing, Transport, Storage and Environmental Considerations," *Museum and Monuments XVII*, UNESCO, Boston: Butterworths, 1987.

Taylor, Loretta, ed. *Basic Principles of Artifact Care and Handling*. Alberta, Canada: Alberta Museums Association, 1991.

Rules for Handling Objects in Park Collections

1. AVOID wearing anything that might damage objects by scratching or snagging the surface, such as rings and other jewelry, watches, belt buckles, nametags, and service badges.
2. NEVER smoke, eat, or drink around the objects.
3. Handle objects only when necessary.
4. LOOK carefully at an object before lifting. Ask yourself:
 - Is the surface fragile?
 - Are there any clues to make me think it is damaged?
 - Where am I going to put the object, and is there a clear space set aside for it?
5. Use BOTH HANDS to lift an object.
6. If an object is in a container, lift only the container.
7. WEAR GLOVES when lifting objects
8. Wash your hands before putting on cotton gloves. Oils and acids can soak through gloves.
9. If you break something, tell the Curator.

Figure 6.14. Example of Written Handling Rules for NPS Park Collections