

Display

Introduction

Displaying cultural items is one of the most effective ways to teach, inform, and enrich people. It is, however, somewhat damaging to the items being displayed no matter how carefully it is done. This is because it exposes cultural items to conditions that accelerate their deterioration, such as harmful levels of light, temperature, relative humidity, and pollution. Ideally, items should be displayed in ways that minimize these hazards and protect them as much as possible. The information provided here will help you accomplish this. The information is based on standard museum preservation practice, and it is intended for the display of items in areas designated for this purpose alone, such as galleries. Issues related to items that are displayed in multi-use areas or other sorts of ways are not considered here. Some of the information is technical and may not apply to your situation. Focus on the information that is useful to you and skip that which you do not need at this time.

The National Information Standards Organization (NISO) developed guidelines for minimizing harmful environmental conditions when displaying library and archival materials. These guidelines are ANSI/NISO Standard Z 39.79-2001. The standard can be purchased from the NISO Press, Bethesda, MD. Although this standard was developed for library and archival materials, most of the information in it is applicable to all cultural items.

Light

What Are the Concerns Regarding Light?

Of all the hazards to which items on display are subjected, exposure to light is probably the most serious in the majority of situations. Fortunately, this is a problem that you can control, often with little effort and no money. For example, turning the lights off when no one is in the display area is easy to do, costs nothing, and actually saves money.

Light damages most of the materials from which cultural items are made.

The most obvious damage is the fading of dyes, pigments, and manuscript inks. Less noticeable but equally serious is the degradation of materials, especially textiles, paper, fibers, and feathers, which is greatly accelerated by light exposure.

Any exposure to light, even for a brief time, is damaging, and the damage cannot be reversed. For this reason, exposure to light should be limited, and most items should not be displayed permanently. Display should be for the shortest possible time and at the lowest reasonable light levels. Note that some lights, such as incandescent bulbs, generate heat and should be kept at a distance from displayed items and out of exhibit cases. Also, items should not be displayed where the sun shines directly on them, even if for only a short time and even if the windows through which the sun shines are covered with an ultraviolet-filtering plastic.

What Are Acceptable Light Levels?

Light levels are measured in two different types of units: *lux* and *footcandles* (one footcandle equals approximately 11 lux). For many years, generally accepted recommendations limited light levels for very sensitive materials to no more than 50 lux, and for moderately sensitive materials to 150 to 250 lux, although opinions on these levels varied. In recent years these recommendations have been debated, taking into consideration aesthetic concerns and varying rates of light fading for different materials. Also, it has been recognized that older viewers need higher light levels to discern details than do younger viewers. Ultraviolet (UV) light causes damage more quickly, and all light sources should be filtered to remove UV. This light is measured in units called *microwatts per lumen*. In general, if a light source emits more than 10 microwatts per lumen, it requires a filter.

Suggested Light Levels

The following guidelines serve as a general rule for items that are on display. There are, however, exceptions. Also, opinion varies regarding appropriate light levels for different materials. Consult a preservation professional if you have any questions.

- Materials that are *very sensitive* to light include textiles, paper, dyed quills, fibers, feathers, fur, and most dyes, pigments, and manuscript inks.

- Suggested maximum light level for these materials is 50 lux.
- These materials are found in such items as garments, baskets, drawings, documents, bags, and most everything that has color applied to it.
- Materials that are *moderately sensitive* to light include wood, parchment, leather, bone, ivory, horn, and oil paintings.
 - Suggested maximum light level for these materials is 150–250 lux.
 - These materials are found in such items as utensils, drums, decorations, bookbindings, and some weapons.
- Materials that are *generally nonsensitive* to light include unpainted ceramics, glass, metal, and stone.
 - Usually these materials do not have a suggested maximum light level unless they have a light-sensitive material added to them.
 - These materials are found in such items as utensils, bowls, vessels, and spear points.
- Suggested maximum ultraviolet (UV) light level for all materials is 10 microwatts per lumen.

Remember, all exposure to light is damaging for most materials. Staying within these light levels will slow the damage but will not prevent it.

For How Long Should Items Be Displayed?

Even if items are displayed at acceptable light levels, fading, embrittlement, and deterioration will eventually occur if items are displayed for too long. How do you know when this will happen? This is difficult, if not impossible, to determine in advance, so you will need to consider all the relevant factors and make a judgment. Every museum must decide for itself what the maximum display times and total light exposure limits should be for its items based on several factors.

How Do You Decide on Limits?

Factors to consider include the amount of time that lights are turned on in the display area, the light levels in the display area, the light sensitivity of the materials in the item being displayed (calculations should be based on the most sensitive material in an item, not the least), the physical condition of the item, an item's

history of prior display, the desired lifespan of the item, the significance of aesthetic concerns (the importance of seeing details, which requires higher light levels), and the audience (an older audience requires higher light levels to see items well). Begin your consideration by looking at the items you have on display at present. See if you can identify any fading that may already have occurred by turning them over to determine if they are darker or brighter where not exposed to light. Note that the amount of light shining on one item in a display area will not necessarily be the same for other items in the display area. The amount of light on each item should be measured, and the position of the items on display adjusted accordingly.

What Are Lux Hours?

Some museums track total light exposure in terms of lux hours, which take into account both the intensity of exposure and the number of hours of exposure. The number of lux hours is obtained by multiplying the light levels (in lux) of the light shining on an item by the number of hours the item is exposed to this level of light.

The more intense or bright the light, the shorter the display times should be. Limited exposure to a high-intensity light will produce the same amount of damage as long exposure to a low-intensity light. For example, if the exposure time is kept the same but the intensity of illumination—the light level—is halved, the resulting damage will be halved ($100 \text{ lux} \times 50 \text{ hours} = 5000 \text{ lux hours}$, whereas $50 \text{ lux} \times 50 \text{ hours} = 2500 \text{ lux hours}$). This relationship, referred to as the *law of reciprocity*, is helpful in deciding on light levels and the length of display time. Some museums have settled on an annual light exposures ranging from 150,000 lux hours for very sensitive materials to 450,000 lux hours.

How Do You Measure Light Levels?

The easiest and most accurate way to measure light levels is with a light meter. Note that not all meters measure UV, and you will want to obtain one that does if possible. Light meters are expensive, ranging from several hundred to several thousand dollars, and not many museums have them. The ones that do will sometimes loan them by mail. Also, some regional conservation centers have light meters available for loan by mail. If you cannot obtain a light meter, you can

measure non-UV light using a 35mm single-lens reflex camera with a built-in light meter. For instructions on how to do this contact a preservation professional.

Two inexpensive tools are available that will enable you to *estimate* the possible damage that could occur in your display area. One is a Blue Wool standards card available from conservation suppliers. These cards can be cut into vertical strips to increase the number of them for use. Cover half of the card lengthwise with a light-blocking material, and then place it in a display case or in the display area. Periodically remove the light-blocking material and compare the two halves of the card to see the amount of fading that has resulted from the light. This will give you a general indication of how serious your light exposure problem is. The Canadian Conservation Institute has produced a light-damage slide rule that helps derive additional estimated information from the Blue Wool card to help with informed decision making regarding display of items.

How Can You Minimize Light Damage to an Item?

Decide on an acceptable exposure time and light level for an item, and do not exceed them. If you have reached the limits for a particular item, one solution practiced in many museums is to take that one item off display and replace it with another. This practice of *rotation* is a commonly employed strategy for limiting the damage to an item while maintaining the integrity of the display. It requires, however, that other similar items suitable for the display are available and that staff have the time to carry out the rotation (selection and preparation of the replacement item, modification of display label text, removal and cleaning of the rotated item, record keeping to track this change). Rotation works best when exposure histories in lux hours are kept for each item so you know when to rotate one item on display with another. These histories are referred to as lux logs by some museums.

Another method of minimizing light damage is to illuminate an item on display only when a visitor comes to see it. Lights can be controlled by motion sensors to go on when the visitor's presence triggers the sensors. Alternatively, the visitor can push a button to activate a light when he or she wants to see the item. The simplest and least expensive way to minimize light damage is to cover display cases with a light-blocking cloth that the visitor lifts when he or she wants to view items in the case.

Finally, camera flashes are no longer considered a light problem unless you

expect specific items on display to be photographed frequently, in which case you may want to prohibit flash photography. Extended use of photographic or video lighting can cause damage, so you may want to restrict this, explaining to visitors that this restriction is due to the light sensitivity of the items.

Temperature and Relative Humidity

Maintaining acceptable levels of temperature and relative humidity is also important. This will help slow the rate of deterioration for the items on display just as it does for those in storage. The guidelines provided in *Basic Preservation Considerations* should be followed in determining acceptable levels.

What Are Macro- and Micro-environments?

Acceptable levels of temperature and relative humidity are controlled within a macro-environment, a micro-environment, or a combination of both. The definitions of these terms seem to vary within standard museum preservation practice. In general, the term *macro-environment* refers to the conditions within a large space, such as the entire display area, whereas *micro-environment* refers to the isolated conditions within a smaller enclosed space, such as a display case.

What Are Active and Passive Systems?

The conditions in the macro- or micro-environment can be achieved by what preservation professionals refer to as an active or a passive system. These definitions also vary in the preservation field. As the terms are used here, active systems usually employ equipment such as furnaces, boilers, air conditioners, dehumidifiers, and humidifiers. Passive systems, on the other hand, usually rely on the natural buffering capacity of materials such as paper, cloth, wood, and silica gel.

How Are Conditions Maintained?

In practice, a combination of macro- and micro-environments and active and passive systems is often utilized to maintain acceptable conditions. The temperature and relative humidity of the entire display area—the macro-

environment—are maintained by the building-wide heating and air conditioning equipment—an active system. For highly sensitive materials, such as metals that corrode in high humidity or wood that shrinks in low humidity, a humidity-buffering material such as silica gel—a passive system—is used in a display case—a micro-environment—to adjust conditions and maintain them at the special levels needed by especially sensitive materials.

If you expect to loan items to a museum in another geographic area where the conditions are very different from those to which your items are acclimated, you may need to use a microenvironment with a passive system. The same is true when borrowing items that you need to protect while they are in your care. Do not hesitate to consult a preservation professional for guidance in this.

Monitoring

The temperature and relative humidity in the display area should be monitored just as in the storage area. The instruments described in ***Basic Preservation Considerations*** can be used. Some of these are available in small sizes that work well in display cases.

Air Quality

Pollutants contribute to the deterioration of items on display just as they do to those in storage, resulting in corrosion and structural breakdown. Pollutants can originate from the environment or from the materials from which display cases are constructed. Environmental air pollutants were discussed in ***Basic Preservation Considerations***, and the information provided there applies here. Pollution deriving from display cases is discussed below.

How Do You Control Pollution in the Display Area?

Pollution can be controlled in the entire display area (the macro-environment) by the use of a building-wide air filtration system to remove gases and particulates. Some systems of this sort use activated charcoal and potassium permanganate chemical filtration. These systems require regular maintenance and replacement of chemicals. If you do not have a system like this (and even if you do), be sure to

keep your heating and cooling systems as clean as possible and operating efficiently. Be sure to have all air intakes and duct work checked annually. These measures will help control particulates.

If you do not have a filtration system for your display area, conditions inside display cases (the microenvironment) can be controlled to help protect sensitive items from gaseous pollutants. Cases can be sealed with gasketing to minimize the amount of air exchange between the outside and the inside of the cases (see below), and scavengers can be used in them. Scavengers attract and hold specific environmental substances, such as sulfur, through chemical and physical means. In fact, museums that have a building-wide system will often still use scavengers in display cases to provide added protection for highly sensitive items, such as metals. Silver and all polished metals are particularly sensitive to atmospheric pollutants, and an anti-tarnish cloth or other sulfur scavenger is often included in cases with items that contain these materials. Both activated charcoal and alumina impregnated with potassium permanganate are frequently included in cases to protect against pollutants. Several conservation suppliers sell these scavengers. The suppliers can provide information about the amount of a particular scavenger needed for cases of a given size, the various forms in which the different scavengers are available, and how to install or use them.

A relatively new product on the market incorporates activated carbon and zeolites to capture and retain pollutants. This product, marketed under the trade name MicroChamber, comes both as paper and board and can be included in cases to help control pollution. Because this product is relatively new, little is known about its effectiveness as a display case scavenger.

Monitoring

Scientific tests are available that determine the presence of various pollutants. Most of these require familiarity with testing procedures. Probably the most practical way of monitoring for pollution is to make frequent routine visual checks. If you see color shifts or any other changes, particularly excessive tarnishing or the formation of corrosion, such as a white, green, or rust-colored powder on metal objects, call a preservation professional for advice.

Display Cases

As mentioned earlier, pollutants often originate from the materials from which display cases are made. Woods, wood sealants, paints, adhesives, gasketing materials, and display fabrics are all potential sources of harmful gaseous pollutants. These can build up in sealed cases, intensifying the damage they cause.

Should Cases Be Ventilated or Sealed?

Some cases have openings for ventilation, allowing for free exchange of air inside the case with that in the display area. This helps avoid a buildup of pollutants and stagnant air inside the case. These cases work well if dust and gaseous pollutants are at a minimum in the display area and if the temperature and relative humidity are at acceptable levels. Sealed cases, on the other hand, are preferable when items on display require conditions considerably different from those in the display area. It is especially important, however, that these cases be made out of materials that do not emit harmful gases that will build up inside them.

Glazing, Gasketing, and Adhesives

Glazing materials that are generally considered safe to use include safety glass, acrylic (such as Plexiglas or Lucite), and polycarbonate (such as Lexan). The materials used for gaskets vary widely. A safe material to use is polyethylene backer rod or cord, which is available from larger hardware stores and home improvement stores. Be sure the backer rod is made of polyethylene, as it is available in other materials that are not as stable. Safe adhesives include 3M double-sided tape #415 available in different widths from conservation suppliers, and ethylene vinyl acetate (clear) glue sticks for use in a glue gun, available from hardware and craft stores.

Wood Cases

Wood has traditionally been popular for display cases because it is attractive, easy to use for construction, and economical. Harmful acids and other substances, however, are emitted by wood, wood composites, and some sealants and adhesives. Although emissions are highest initially, in most instances volatiles are present for

the life of these materials. To avoid potential damage, avoid the use of wood for display cases. If this is not possible, sometimes you can avoid the use of wood on the case interior, making that part of the case out of acrylic (such as Plexiglas or Lucite), and having it supported by wood. If this is not possible, other measures can be taken to minimize potential problems from the wood.

Certain woods and wood composites off-gas more than others. If you must use wood, select one of the less damaging ones, such as aspen or poplar. Oak, one of the most popular woods for cases, is also one of the most hazardous and should be avoided if possible. Sheet products are commonly used for case construction. These are a combination of woods and adhesives, and both of these components need to be identified to determine if the resulting product is safe for display use. For example, particleboard and interior plywood have been known to incorporate a problematic urea-formaldehyde adhesive. Phenol-formaldehyde adhesive is much more stable. Plywood and other sheet woods that are stamped by the American Plywood Association (APA) to be Exterior Grade Oriented Strand Board (OSB) and Medium Density Fiberboard (MDF) sheet products should be free of harmful adhesives. At present, acceptable sheet products to use include Medex, Medite II, Danoka Featherboard, Wheatboard, Iso-Bord, and Bellcomb. If you are planning on ordering a large amount of sheet board, it is possible to specify both the wood and the adhesive used in manufacture. Aspen is the wood of choice for MDF and OSB. The adhesive should be either phenol-formaldehyde or isocyanate. Follow the manufacturer's safety instructions for personal protection when cutting or machining these products to avoid health risks.

Product formulations change frequently. Obtain current information on available products from a preservation professional before selecting a wood product so the least damaging materials are chosen. When possible, all woods and wood composites should be tested to determine their safety for use.

Sealants for Wood

New cases made from wood should be coated. If you already have display cases made of wood, the wood may need to be coated. Contact a preservation professional for advice. Note, though, that no sealant will completely block the emission of harmful volatiles. Also, some sealants are better than others at blocking damaging substances. Care must be taken to choose a sealant that forms

the most effective barrier possible and does not itself emit harmful substances. The most readily available sealant recommended at this time is a waterborne polyurethane. Many kinds of polyurethane are available. Be sure to select one that is waterborne rather than solvent-borne. Contact a preservation professional for the brand names of waterborne polyurethanes that are currently being recommended. Paints can also be used to coat wood if the natural appearance of the wood does not need to be retained. Two-part epoxy paints are best, but these are difficult to use. Again, contact a preservation professional for advice on current products. *Be sure to avoid the use of oil-based sealants of any kind.*

Are There Other Barriers?

Items should never be placed directly on a wood surface in a case. A barrier should be placed between the items and the wood to prevent them from coming into direct contact with damaging substances given off by the wood, even a coated one. Barriers to use include polyester film, products made from polyethylene or polypropylene, and 100 percent cotton or linen rag board or an otherwise lignin-free, chemically purified conservation mounting board. One material that forms an especially good barrier between items and wood is a laminate of aluminized polyethylene and polypropylene, sold under the trade name of Marvelseal. This product is even capable of serving as a sealant if it can be applied to all wood surfaces in such a way as to completely isolate them from the interior of the case. It is heat sensitive on one side and can be ironed onto wood surfaces.

Display Fabrics

What Types of Fabrics Are Safe to Use?

Several factors determine a fabric's acceptability for use in a display case. One is the fiber from which the fabric is made. Certain fibers, such as silk, are by nature acidic and should not come in direct contact with items that are vulnerable to acid, such as those made of cotton, linen, or paper. Other fibers emit harmful substances, such as sulfur compounds, which can lead to the formation of corrosion on metals. Wool fabrics and felts are an example. Wool is also a food source for some museum pests. These fabrics should be avoided. In most instances the safest fiber

choice is cotton or linen because these fibers are chemically stable. If these are not available, an alternative is polyester.

Knit fabrics are found by some museum staff to be easier to shape neatly when covering the base of display cases because they can be stretched. Fabrics that have a nap or “tooth” (small raised lint-like fibers) help hold flat items in place on a slanted board.

What Types of Fabric Finishes and Sizings Should You Be Concerned About?

Commercially available fabrics may be treated with finishes to make them suitable for a specific end use. Finishes can make fabrics flame retardant, soil/stain resistant, and water repellent. Because these finishes can give off gasses or cause fading, fabrics with finishes should be avoided if possible. In addition, an unsized fabric is preferred. Sizing is a substance often applied to textiles in the factory while the fabric is being processed. Typically a sizing is composed of starch or a similar compound that stiffens the fabric and allows it to run more easily through the milling machines. All fabrics should be washed before use to remove any of these potentially harmful substances.

Dyed Fabrics

The use of dyed fabrics for lining a case is problematic because of the concern that colors may bleed or transfer to items if accidentally exposed to high relative humidity or water. Ideally, only undyed fabrics should be used in the enclosed environment of a display case. Undyed linen or cotton fabrics work well because they come in a variety of natural shades that range from light to dark and may provide the appearance required. Colors range from beige to brown to green. Also, linen can be woven in a variety of weaves from fine to heavily textured that look well with different types of items, and jersey knits are available as well. These linens and cottons are available through commercial suppliers.

How Do You Test for Color Fastness?

If a dyed fabric must be used, the fabric needs to be tested carefully. Color fastness is a concern because, as noted above, permanent damage can occur if the dye

transfers or bleeds onto an item due to contact with high relative humidity or water. There are two easy tests for color fastness. First, wash a sample of the fabric repeatedly until no color appears in the rinse. Do not add bleach, and add only a small amount of soap to the wash water. When the sample is dry, test the fastness of the dye by spraying the fabric with water and weighting it against a clean white blotter or similar material. If no color is transferred to the blotter, the fabric is probably safe to use. To further check color fastness, wrap the washed fabric around your finger, and rub it back and forth across a piece of white muslin. If no color transfers, then it is safe. As an added precaution, an item on display should not be placed in direct contact with the fabric. Place a barrier material, such as polyester, polyethylene, polypropylene or conservation mounting board, beneath the item.

Are There Other Concerns with Dyes?

An additional concern is that dyes may emit chemical substances harmful to items in a closed case, particularly a tightly sealed one. The fabric should be tested with metal coupons to determine if volatiles are being emitted. Talk with a preservation professional for information about this.

Light Fastness

Light fastness can also be an issue with some fabrics. There are no simple and quick tests for this that are accurate. To get a rough indication of light fastness, some preservation professionals suggest covering half of a piece of the fabric with a light-blocking material and exposing it to light in a north-facing window for five days. If a color difference is seen, the fabric is not light fast.

What Is the Best Way to Attach Fabric to the Exhibit Case?

The method used to attach the fabric to the case should be carefully considered. Although sewing is usually the safest option, rustproof staples, such as stainless steel or Monel, or rustproof nails or tacks can be employed. The use of adhesives should be avoided if possible. If you must use adhesives, 3M double-sided tape #415 and ethylene vinyl acetate (clear) glue sticks in a glue gun are two choices.

Supports and Mounts

Supports and mounts are used in displays to protect items. They provide a structure for inherently weak or deteriorated items and allow them to be displayed to best advantage. The information on supports and mounts for storage in *Storage Containers, Supports, and Mounts* is equally applicable to display.

Ideally, a support or mount should be custom-made to fully support the item in its display position. Some standard-sized supports and mounts available from conservation suppliers work well, but these can be expensive. Another alternative is to improvise by adapting relatively low-cost commercially available products to meet some of your display needs. For example, acrylic mounts and book, document, and photograph holders or stands can be used in creative ways to hold items. Some museums use these upside down or on their side, or even cut them up to create a support that will provide the protection necessary for an item on display. Photo holders work well for display labels too. Inexpensive glass clip frames can be used with an acid-free window mat for the display of flat items. These frames can also be used for signage in display areas. If you prefer to make your own clip frames, you can buy the clips separately. All of these mounts, holders, stands, frames, and clips are readily available at large art and office supply stores and at large discount stores. Remember, it is essential that items on display be fully supported in a non-damaging way at all times.

Display Without Cases

Many museums use dioramas to realistically depict scenes from day-to-day life or from nature. Often these dioramas are not in a case or behind glass but are in an open space in the display area. The same is true for large or irregularly shaped items that will not fit into a case. In these situations, security should be carefully considered. Housekeeping is another concern, and items in an open display should be monitored for dirt and cleaned as often as needed.

Oil paintings and art on paper are usually displayed in frames, as are some other flat items. The framing should be done to preservation standards. These standards vary depending on the type of item being framed. Contact a preservation professional for guidance if needed.

Oversized items, such as quilts, are sometimes hung on walls for display.

Such items have special needs. It is best to contact a preservation professional for guidance regarding these.

If possible, avoid hanging items on an outside wall, which may be damp or experience significant shifts in relative humidity. If you must use an outside wall that may pose a problem, insert a moisture barrier, such as polyester film or Marvelseal, between the wall and the back of the item. Also, when possible, be sure the item is held away from the wall slightly so that air can circulate between the item and the wall. For example, small plastic or felt bumpers or pushpins can be attached to the back of a frame to accomplish this.

Security

Items are often most vulnerable to theft and vandalism when they are on display, and precautions should be taken to protect them. The building in general and the display area in particular should be made as secure as possible. The extent of the measures you take will depend on what you perceive the level of risk to be in your display area and how much security you think is needed. The minimum is to have display cases that lock with tamper-resistant fasteners. In addition, display cases can be attached to their bases and the floor with security screws. For framed items, security devices can be attached to the frames and then screwed to the wall, again using security screws. Oversized items that are hung on the wall can have a protective barrier, such as acrylic sheeting, screwed over them if vandalism and theft are serious concerns. Stanchions and other types of barriers can be used to keep visitors a safe distance away from open displays. Motion-detecting alarms also work well for this. Security cameras can serve as a deterrent as well as provide a record of people in the display area. Security personnel who are a visible presence are also a good deterrent. Whenever a single item is removed from display, a sign indicating its removal should be put in place of the item so it is clear that it was removed for a specific purpose and not stolen. Finally, when displaying collections it is also important to be aware of safety considerations for those viewing the items. The placement of display cases and items hanging on the walls should be such that safe viewing and traffic flow will not endanger them or the viewer.

Use of Substitutes

Everyone enjoys having the opportunity to see cultural items used for display. As noted earlier, though, the display of items is a preservation compromise no matter how carefully it is done and how well protected the items on display are. An effective way to have a meaningful display while at the same time protecting especially light-sensitive items is to use non-original items. For example, displaying a copy of a color photograph will protect the original from fading. Sometimes it is possible to produce newly made examples of items that are similar to the originals. These new items have less significance than the originals; they are created for the purpose of being a substitute, so they are not the same as the original. Displaying a substitute instead of the original is becoming an increasingly accepted strategy in museums. Using substitutes for display may not seem as dramatic as using the original, but if done with care, displaying substitutes can be nearly as satisfying and can offer many preservation advantages over displaying the originals.

Substitution works especially well for paper items. While all materials are susceptible to the environmental and security hazards presented by display, paper is particularly vulnerable. Many items made of paper are easy to copy, and thanks to new technologies, the copies look similar to the original. Some examples follow:

- High-quality laser color copiers produce excellent substitutes of documents, newspapers, book pages, and some art on paper. If the substitute is made on a sheet of paper that is similar in texture to the original, it is even more convincing. Check your telephone directory for a copy service in your area.
- A substitute of a photograph can be made from the original negative, if it is available and in acceptable condition, or from a copy negative, if that is available. If not, it can be made from the original print. This latter alternative will give you a copy negative to keep for future use. Often a local photographer can do this.
- Digital scanning technology also can be used to produce substitutes of documents, newspapers, book pages, photographs, and some art on paper. This technology allows the image to be manipulated in a variety of ways so that blemishes and evidence of physical damage can be lessened if this is deemed appropriate.

While it may be easiest to produce substitutes of two-dimensional paper items, it often is possible to make substitutes of other types of items as well. It is possible that the person who made the original item is still available and is able to make another for use in a display so the original can be preserved, particularly if it is in fragile condition. Or perhaps someone else has the necessary skills to make a substitute of an original item for display. Note, however, that although this option may be effective aesthetically, it may be too expensive or take too long. Another alternative is to ask a commercial manufacturer to reproduce an item. The Pendleton Woolen Mills in Portland, Oregon, and the Faribault Woolen Mills in Faribault, Minnesota, have reproduced American Indian blankets. Such manufacturers, however, usually prefer to reproduce items in large quantities rather than single items, which is much more costly. Whatever the item, be sure to permanently mark it as a substitute so it will never be mistaken for the original.

Loans

Lending items is standard practice in many museums, as is borrowing. There are specific procedures to follow when lending and borrowing. These procedures are intended to protect the items while on display and in transit. One important example is the use of loan documents. Standard museum loan documents—incoming and outgoing—not only say that an item is/has been on loan, but they also contain additional useful information, including a description of the item, its dimensions, the purpose of the loan, and how it was received and sent. Another document with which you should be familiar is the American Association of Museums (AAM) - Standard Facilities Report. This document provides detailed information about the borrower's building and procedures related to security, object handling, and environmental controls. If you ask to borrow items from another museum, you will probably be asked to complete this document.

Basic Display Checklist

1. Are substitutes acceptable for use instead of the original item?
2. Does the item's condition permit display? Is the item sound enough?
3. Do the display criteria, especially light levels and duration, meet the needs of the most sensitive item on display?
4. Have light levels and exposure times been determined? What are they?

5. Can appropriate levels of temperature and relative humidity be maintained for all items on display?
6. Heating and cooling sources should be considered. Are any items placed near radiators, heat vents, or air conditioners?
7. Pollution from the air as well as from all display cases, supports, and mounts should be minimized. Are all materials in the construction of cases, supports, and mounts chemically stable? Are you sure they pose no threat to items on display?
8. All supports and mounts should provide total support for the item and avoid the concentration of stress on any one area. Have the effects of gravity been considered when constructing supports and mounts?
9. If security is an issue, have all possible precautions been taken?