

Appendix K: Photography

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APPENDIX K: PHOTOGRAPHY

A. Museum Record Photography

1. Why should I photograph museum collections?

Photography is an excellent supplement to cataloging. In most cases, photos are more effective than words in describing objects. Narrative description of texture, marks, damage and materials is difficult. Most of these qualities are apparent in a good photograph. Photographs are especially useful for recording the condition of an object. In the case of a loss or theft, a good photograph can help in recovering the object.

Photographs also reduce the need for handling objects. In many cases, you can use a photo for initial research rather than handling the objects.

2. When should I photograph museum collections?

You should photograph objects:

- as part of the cataloging process
- to document accessions and the condition of incoming loans
- to document the condition of outgoing loans
- before deaccessioning them

3. Do I need to hire a photographer if I have no photography experience?

No. You should be able to take acceptable record photos using the procedures in this appendix. If you have a large collection to photograph or want photos for publications, you may want to hire a professional photographer.

4. How can I learn how to photograph objects?

Become familiar with the equipment, especially how the camera operates. Read the camera operating manual, and practice. You will gain expertise through trial and error and experience.

5. Do I need to follow the procedures in this appendix?

No. This appendix gives you a list of the necessary equipment and a simple process for photographing museum objects. If you are an experienced photographer you can use your own methods and setup.

6. Do I need to photograph the entire collection?

No. You should photograph all controlled property. You must decide if a photograph is useful for non-controlled property. You can photocopy, rather than photograph, some archival materials. Refer to Sections C.9 and C.10 in Chapter 3 of this handbook for information about collections to photograph.

7. When should I photograph archival materials?

Photograph, rather than photocopy, archival materials if the item:

- is of very high artifactual value and is a continuous tone photograph (silver gelatin photoprint, platinum print, or similar process)
- is a detailed visual image with many nuances, such as an original drawing or architectural plan
- has nuances that can't be captured by a photocopy machine, such as a beautifully handwritten letter
- is of high evidential value, such as a land document

Note: Archival collections usually have very few items that you will need to photograph for documentation purposes. Consider the importance of the collection when deciding what to photograph.

You may want to photograph many archival items for access and use such as posting on the Web. These aren't photographs for documentation.

8. *Can I use digital imaging for record photography?*

No. Digital images are wonderful for access but, at present, not good for long-term preservation. Digital data can fail and vanish overnight. It is much more fragile than film, and has a shorter life expectancy. It also requires frequent migration to be compatible with rapidly changing hardware and software. There is a high cost to managing, refreshing, and migrating digital files over time.

You may want to purchase a digital camera to take images at the same time you are doing record photography. ANCS+ allows you to attach digital images to your catalog records. See Section VIII in Chapter 6 of the *ANCS+ User Manual* for information on using images with ANCS+.

Note: Video can also be useful for documenting collection storage, exhibit installations, and other collection activities.

9. *Should I use color or black and white film for record photography?*

Use black and white film for record photography. Black and white acetate film should last 100 years if stored at temperatures below 70° F and 30 - 50% relative humidity levels. Color film doesn't last nearly as long, but you may want to use it for additional images of your objects.

10. *How many photos do I need for each object?*

The number of photos you need for each object depends on the object. Complex objects may require several shots at different angles. If you are documenting condition, marks, or inscriptions, you may need close-up shots of particular areas. On the other hand, many objects may need only one photo taken at different exposures.

11. *What's the most important point to remember about museum record photography?*

Be sure to cross-reference the photographs to the catalog records so that you can easily retrieve the photos. Also make sure to record the documentation associated with the photography, such as recording roll and frame numbers. Use of the photo identification stand ensures documentation of the object in the photo. Refer to Section E in this appendix for information on documenting and storing the photographs.

B. Equipment

1. *What equipment will I need for record photography?*

Camera

The following list includes the equipment you'll need for record photography:

Use a 35mm single lens reflex camera. It offers flexibility and quality at a reasonable price. Be sure that you can set the aperture and shutter speed manually on the camera. Automatic cameras must have an override that allows for manual adjustment.

Lens

A 50mm lens has the most useful focal length. A 55mm macro lens is a good choice for small objects and close-up work as well as general use. For wide angle shots, use a 35mm or 28mm lens or a 28-85 or 35-105 lens with a macro feature.

You can use a close-up lens kit to increase focusing capability for small details.

Filter

Use a polarizing filter to reduce reflections and glare. Use an ultraviolet

(UV) filter to protect the front surface of each lens. For black and white images, it may cause a negligible increase in image contrast. For color films it may make the image slightly more reddish if there are light sources other than photoflood lights. You also might want to use polarizing gelatin filters on your lights to reduce reflections and glare.

Lights

Use EBW Number B2 photoflood lamps (500 watts each) mounted in reflectors. The reflectors should be between 10 and 16 inches in diameter with a preferred size of 12 or 14 inches. Quality and cost vary greatly. Some reflectors attach to adjustable lights stands, and others have clamps that you may attach to stable objects such as chairs. Lights are available through most photography supply stores.

Film, Black and White

The following film is recommended for record photography:

- Kodak T-Max 100 and 400
- Ilford Delta 100 and 400
- Kodak Plus-X 125
- Kodak Tri-X

You can get film at bulk rates through the General Services Administration.

Note: There is a new monochrome chromogenic film on the market that is advertised as black and white film. Kodak Advantix is one of the brand names. You can get this film processed at a color lab. The image is a black dye image, rather than silver grains, and is processed the same as standard color negatives. Because the image is dye based, the monochrome chromogenic negatives won't be as stable as traditional black and white films with silver-based images. This film is not recommended for museum record photography.

Film, Color

The following film is recommended for color photography.

- Fuji 160 NPS (daylight) and 160 NPL (tungsten) for color prints (very good dye stability)
- Kodachrome 25 or 64 for color transparencies

Note: Kodachrome is the most stable color transparency film, but it's sometimes difficult to find laboratories to process it.

Developer

For in-house processing, use the developer that the manufacturer recommends. For commercial processing, use the same lab so that processing will be consistent.

Refer to Section D of this appendix for information on processing film.

<i>Tripod</i>	You must have a sturdy tripod to hold the camera steady when using slow shutter speeds. A tripod with 2 or 3 telescoping section legs and a swivel or pan head is best.
<i>Shutter Release Cable</i>	Use a shutter release cable for slow shutter speeds to avoid moving the camera when releasing the shutter cable. The cable attaches to the shutter button. Movement of the camera will result in blurry images. Spending a little more on a cable release by a known manufacturer will ensure longer use.
<i>Exposure Meter</i>	You may use a reflected-light meter, either built into the camera or handheld, for metering the objects. This meter measures the amount of light reflected off the object. You should use it with a gray card. Another type of meter is a handheld incident-light meter, which measures the amount of light falling on an object. You don't need a gray card with an incident-light meter.
<i>Gray Card</i>	Use a gray card to take accurate exposure meter readings under lights with a reflected-light meter. The light reflected from the gray card gives a better reading than the light reflected from the object. An 8 X 10 inch, 18% gray card is available in photography supply stores. See Figure K.1 for instructions on using the Kodak gray card.
<i>Background Paper</i>	Use light gray and dark gray. You can buy this inexpensive paper at any professional photography supply store. It comes in widths of 54 inches to 11 feet by lengths up to 100 feet. There should be a distinct contrast between the object and the background. You can lose detail if the object is the same color or has the same contrast in shades as the background. For example, a piece of wrought iron would not show up well against a black background or a bone against a white background. In certain instances, black may create the best contrast. A large piece (3 X 6 feet) of black velveteen or dense black matte board is useful to have on hand.
<i>Identification Stand</i>	<i>Place a stand with the film roll number and the object's catalog number (including park acronym) in every photograph.</i> This information identifies the object and the photograph. You will need stands for both large and small objects, a roll label, and changeable magnetic numbers and letters. Stands, roll labels, and park acronym letters are available from the Supply and Equipment Program of the Museum Management Program (MMP). Refer to the <i>Tools of the Trade</i> catalog.
<i>Meter Scale</i>	<i>Place a standard metric scale next to or on the identification stand in every photograph.</i> The scale should have alternating black and white blocks in standard metric units. You will need a large and small centimeter scale for objects of different sizes. Scales are available from the Supply and Equipment Program, MMP. Refer to the <i>Tools of the Trade</i> catalog.
<i>Color Control Card</i>	<i>Place a color control card next to the identification card in every color photograph.</i> It provides a control for determining correct color in color printing and for identifying colors in the object. Color control cards are available from photography supply stores.

Gray Scale Control Card

Include a gray scale control card in black and white photographs to provide control for determining correct shades in black and white printing. It's especially good for two-dimensional printed materials. Gray scale control cards are available from photography supply stores.

2. What additional equipment might be useful for photographing objects?

Materials to Support Objects

The following list includes some equipment that you might find useful when photographing objects.

Materials for supporting objects include: styrofoam, plexiglass, cardboard, wood blocks, display easels, and wall hooks.

Diffusion Materials

You can place materials such as Rolux diffusion directly in front of the lights to diffuse them and create more muted shadows. For example, you can create a cone with this material and place it around an object such as a coin. The lights penetrate the material and create smooth, less specular highlights.

It's important to buy diffusion materials designed for use with photo lights. Buy diffusions materials from photography supply stores.

Light Form Panels

Use light form panels to add fill light to an image. They will soften shadows and bring out details that would otherwise be lost in the image. You can place a piece of white poster board in front of an object at an angle to reflect light into shadowed areas. Light form panels are available from photography supply stores.

Copy Stand

Use a standard photography copy stand to take photographs of small or two-dimensional objects. The stand has two or four lights with a temperature of 3200° Kelvin.

C. Procedures

1. What are the basic procedures for taking photographs of museum objects?

The following basic procedures for taking photographs should result in good record photographs. These procedures aren't the only way to photograph museum objects. Photographers with more knowledge and experience may use different techniques and equipment. The procedures in this section provide a simple process that anyone can use.

- group objects by size and type
- prepare background
- place object, identification card, metric scale, gray scale control card (color control card for color) on background paper
- load camera with film, and set the camera to the film speed (ASA, ISO, or EI)
- arrange lights
- mount camera on tripod
- attach shutter release cable
- compose the picture

- turn on lights
- place gray card in front of object and determine exposure
- remove gray card
- take photograph
- turn off lights, or change objects and repeat steps as appropriate
- record information about the photograph

Note: Turning lights on and off helps protect the objects from heat build-up but significantly reduces the life of the bulb. It's important to set up the photograph as much as possible before turning on the lights. It's more efficient to leave the lights on and move the object from under the lights. However, moving the object may not be possible and requires you to handle the object more. You can use a dimmer switch with halogen lights that have appropriate bulbs. Don't leave the objects under the lights for more than a few minutes.

2. *What are the step-by-step procedures for taking record photographs?*

Grouping Objects by Size and Type

Grouping the objects to be photographed by size and type will save you time and energy. You won't have to adjust distances or heights of the lights or camera for every object. It will also minimize the need to turn the lights on and off. You can remove one object and replace it with another one without having to change the lighting or camera setup.

Preparing the Background

A table against a wall works well for objects under 3 feet in size. Hang the background material on the wall, using drafting tape or gaffer's tape that won't mark the wall. Let the material drape over the table without forming a crease or seam. Larger objects will usually be easier to handle on the floor. For very large objects, you usually won't need a background material.

Placing the Object

Place the object in the middle third of the flat working surface, if possible. This placement avoids having the front edge of the background in the photograph or the back portion of the background in focus. See Figure K.2.

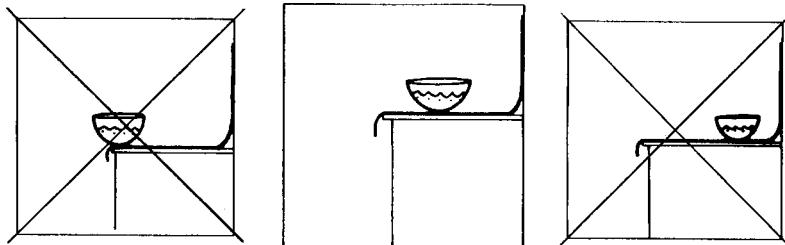


Figure K.2. Placement of Object

Place the identification information near the front of the object without blocking any part of the object. See Figure K.3. The identification information includes:

- identification stand with the catalog number and roll and frame number
- metric scale
- gray scale control card (color control card for color)

Note: Different size objects require different size identification information.

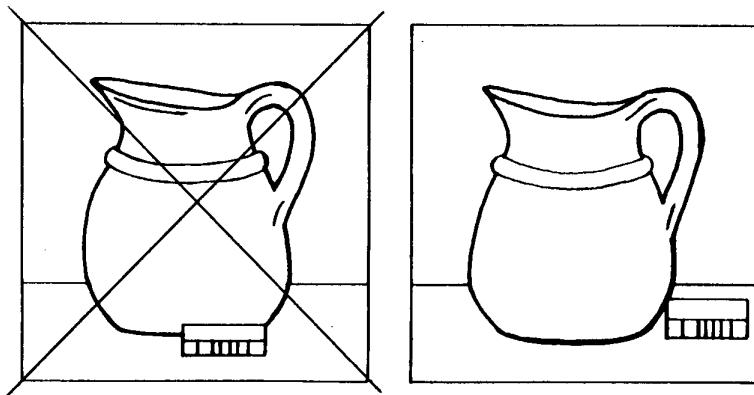


Figure K.3. Placement of Identification Information and Metric Scale

Loading the Film and Setting the Exposure Index

Load the film in the camera. Modern electronic cameras generally don't have rewind buttons. For older camera models or those with rewind knobs, check that the film is advancing properly. Wind to exposure "1" for manual cameras. Then turn the rewind knob carefully in the direction of the rewind arrow until you feel a slight tension. When the film is advanced after the first exposure, the rewind knob should rotate in the opposite direction of the rewind arrow. If the rewind knob doesn't rotate, then the film may not be loaded properly. Reload the film if necessary.

Follow the operating manual for your camera to set the camera to the film speed. Older camera models will use American Standards Association (ASA) to describe film speed. Usually you will see Exposure Index (EI) or International Standards Organization (ISO) on the film box. ASA is equivalent to ISO or EI. Set the Exposure Index on the camera to match the EI of the film.

Number each roll of film consecutively as it is used.

Arranging the Lights

The basic lighting setup for most objects will be a key light and fill light. The key light is the main source of light on the object. The fill light is the secondary light used to minimize shadows. See Figure K.4 and the information that follows below for the distance, angle, and height for the lights.

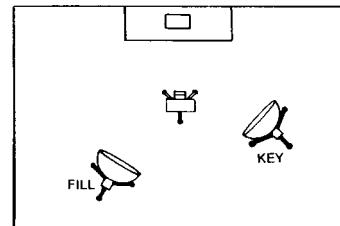


Figure K.4. Basic Lighting Setup

Carefully adjust the distance, angle, and height of the lights. This will make the difference between a properly lit object and one with many obscuring shadows. See Figure K.5 and K.6. Adjust the lights to best illuminate the object. Do this without overhead lights.

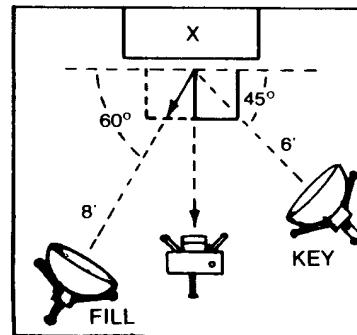


Figure K.5. Distance and Angles for Light Placement

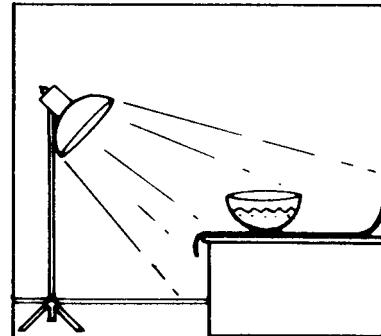


Figure K.6. Height of Light

Use the following standards to set up the lights, and then adjust them as needed for the best results:

- distance key light at 6 feet; fill light at 7 or 8 feet
- angle key light at 45° from the front plane of the object; fill light at 60° to 70° from the front plane of the object
- height high enough to light the top surface and front of the object

You can also use a piece of string and a 12 inch cardboard square to

determine the distance and angles of the lights. To use this procedure:

- draw a diagonal line on the card from point A (starting at a corner) to point D forming a 45° angle
- from point A (the same corner) draw a second line to point C forming a 60° angle
- place the same illustrations on the reverse, keeping the A-D axis on the same diagonal of the card
- cut the string to 8 feet and knot it at 6 and 7 feet
- attach the string at point A
- place the card on the background, with point A on the spot where the object will be and point B in the direction of the camera
- hold the string taut and move around until the string aligns with the A-D line (45° at 6 feet) for the key light
- flip the card and align the string with the A-C line (60° at 7 or 8 feet) to position the fill light

See Figure K.7. CD is half of BD.

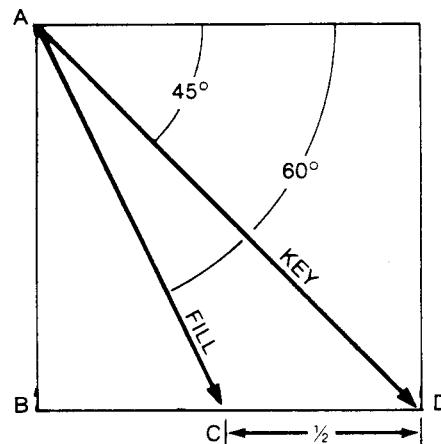


Figure K.7. Angles for Key and Fill Lights

The key light, at 6 feet, will create a harsh shadow. The fill light will lighten the shadow from the key light without creating a second harsh shadow. See Figure K.8.

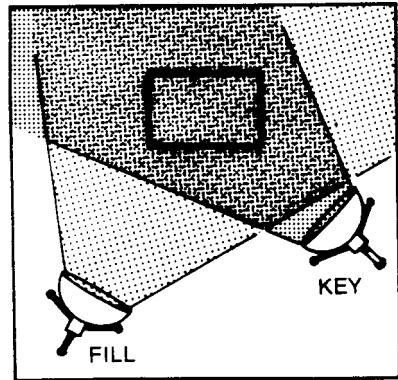


Figure K.8. Relationship of Shadows from Key and Fill Lights

Composing the Photograph

Mount the camera securely on the tripod, and attach the shutter release cable. Check the position of the identification information. Compose the photograph. Make sure the object fills up as much of the photograph as possible. Check the distance, angle, and format (horizontal versus vertical).

Adjust the distance of the camera to the object so that the object fills one-half to three-quarters of the frame. See Figure K.9.

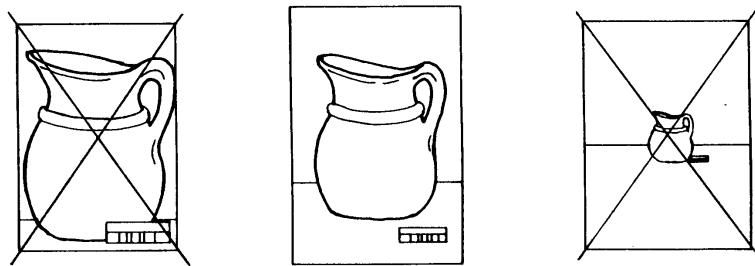


Figure K.9. Composing the Photograph: Distance

Determine the angle. For three-dimensional objects, place the camera slightly higher and looking down on the object. If you shoot the object on a straight line, it won't look three-dimensional. See Figure K.10

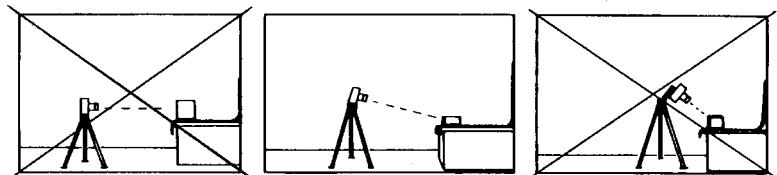


Figure K.10. Composing the Photograph: Camera Angle

For small, two-dimensional objects, use a copy stand that mounts the camera directly above the object. The stand usually includes fixed lights located about 30 inches from the copy board and at a 45° angle to the camera lens axis. Mount large two-dimensional objects on the wall. Place the two flood lights at equal distance and height, at a 45° angle from the object. The camera should be level and aimed at the center point of

the object. Use polarizing filters on the lights and camera lens when

photographing reflective surfaces, such as oil paintings and reflective glass. Use a gray scale control card when photographing black and white photographs.

Choose the format. You want to frame the object within the image so that the object isn't surrounded by extra space.

<i>If the object is...</i>	<i>Then...</i>
taller than it is wide,	use the camera in a vertical position.
wider than it is tall,	use the camera in a horizontal position.

See Figure K.11.

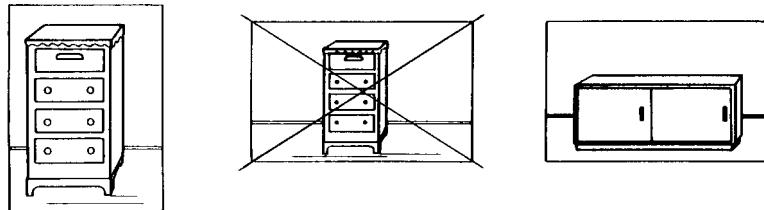


Figure K.11. Choosing Vertical or Horizontal Format

Turning on the Photoflood Lights

Remember that turning lights on and off reduces the life of the bulbs. It's possible to hook both lights up to a foot switch or a hand switch located next to the camera. Using a light switch will:

- minimize the length of time the lights are left on
- protect the objects from heat and humidity changes
- keep the work area cool

Ideally the photoflood lights should be the only source of light. Turn off overhead or other room lights (especially if they are fluorescent lights) because they:

- distort the color in color shots
- dilute the effects of the photoflood lights

Note: Be aware of how light from additional sources such as windows can affect the image, especially an image with a reflective surface. It may be necessary to cover windows or at least shoot the photograph on an overcast day. The room should be dark except for the photo lights.

Placing the Gray Card

Place the gray card perpendicular to the lens line of sight. Take the exposure meter reading using light reflected from the gray card. This reading will be more accurate than one taken using light reflected from the object and background.

Determining Exposure

Start by setting the aperture (f/stop). A larger f/stop number (small aperture) will result in greater depth-of-field (area of sharpness) in the photograph. Once you set the f/stop, match it with the appropriate shutter

speed setting.

To take an exposure reading, use a handheld meter or a camera with a built-in meter. To take a reading with the camera, place the meter near the gray card without casting any shadows on the card. Be certain that the gray card fills the entire viewing screen. The photoflood lights should be on. Take an exposure reading and set the camera f/stop and shutter speed to that reading.

Each package of film has exposure suggestions for different situations.

If a meter isn't available, use the following exposures as a guideline for Kodak T-Max 100 using two 500 watt photoflood lights. As the lights become older, greater exposures will be necessary. When taking photographs in this way, bracket to either side of the first shot. When you bracket, you take additional exposures around your first exposure. For example, for Kodak T-Max 100 ISO at f/16 for 1/8 second, use the following five settings:

- f/22 for 1/8 second
- between f/22 and f/16 for 1/8 second
- f/16 for 1/8 second
- between f/16 and f/11 for 1/8 second
- f/11 for 1/8 second

Exposures for 100 EI Film

Key Light	Fill Light	Exposure
6 ft.	6 ft.	f/16 at 1/8 second
6 ft.	7 ft.	f/16 at 1/8 second
6 ft.	8 ft.	f/16 at 1/4 to 1/8 second
7 ft.	8 ft.	f/16 at 1/4 second
8 ft.	10 ft.	f/16 at 1/2 second

Note: You can't use the guidelines for meterless exposure with overhead lights.

Review the negatives and the recorded exposures to judge if the settings are appropriate. Make sure that the negatives are not consistently overexposed or underexposed. Always shoot and process the first roll of film immediately to assess the correct exposure. Then complete the project.

Shooting the Photograph

Remove the gray card. Focus the camera. Squeeze or depress the shutter button slowly and smoothly. The shutter release cable is especially useful because it allows you to depress the shutter button without touching the camera. The shutter release cable eliminates the potential for camera movement, which causes blurry images.

Some objects may require more than one photograph to document detail accurately. After taking all the necessary shots, turn off the lights, and record the information about the photographs. If you're working with similar objects, put the next objects in place, focus, and take the next shots. For different objects, repeat the steps in this section to prepare the next setup.

Recording Information about the Photograph

Each time you use a new roll of film, start a new photograph record log that includes:

- roll number (check the roll number of the previous log sheet)
- exposure number (the frame number on the roll)
- exposure reading (f-stop and shutter speed)
- catalog number
- object name

When the film is processed, the frame number and object may not correspond with the frame number and object listed in the log. Correct the log to correspond with the frame number on the negative. Figures K.12a-b show a blank and sample object photograph record sheet.

D. Processing the Film

1. *Can I process the film at the park?*
2. *What do I need to know about using a commercial lab?*
3. *What if I can't find a lab that processes black and white film?*
4. *What kind of photos should I get?*

Yes. If the park has darkroom facilities, park staff can process the film following the technical data sheet for the developer. Use the appropriate developer for the particular film. For example, process Kodak T-Max 100 using T-Max developer or standard commercial developer. Using a toning solution helps longevity. Most problems with longevity come from insufficient washing.

Processing can affect the quality of the final image. It's important to find a good place for processing film and use it consistently. You're then sure that the film is processed the same way each time, and you have a consistently good product.

Finding a local lab that will process black and white film may be difficult for many parks. You can call Kodak at 1-800-242-2424 to find the professional processing lab nearest to your site. You can also use Kodak's web site at <<http://www.kodak.com>> to locate a lab near you or in your geographic area.

For record photos, make at least one black and white print for the photo file. Use either 3 X 5 inch prints or contact sheets. Contact sheets can be made exactly the same size as the negative or slightly larger (11 X 14).

E. Documentation and Storage

1. *Why is it important to document photographic negatives and prints?*
2. *What is the photograph number?*

You need to document the negatives and prints to access them. Use a numbering system as a cross-reference.

The photograph number is the roll number followed by the frame number. It serves as the cross-reference between the print, contact sheet, negative, object photograph log, and catalog record.

Roll	Frame	Photo Number
200	3	200/3
2050	25	2050/25

Note: Enter this number in the Images supplemental record in ANCS+. The most recent photo number in the Images supplemental record prints in the Photo Number field on the Museum Catalog Record, Form 10-254 Rev. Refer to Section VII in Chapter 3 of the *ANCS+ User Manual* for information on the Images supplemental record.

3. *How do I document the prints?*

The roll number and object catalog number appear in the photograph. In addition, you'll need to make a label with information about the photograph. Use acid-free paper or the front of an archival paper enclosure for the label. The label should include:

- catalog and accession numbers
- object name
- photo number (roll and frame number)
- date taken
- photographer
- remarks

See Figure K.13 for sample label information.

Note: The National Visual Inventory Card, Form 10-30 is no longer in use.

4. *How do I store the prints?*

File prints numerically by photograph number or catalog number depending on how you want to access the image. Store them in archival quality enclosures, either paper or polyester (Mylar®). There are several styles available. Refer to *Conserve-O-Gram (COG) 14/2, Storage Enclosures for Photographic Prints and Negatives*, and *MH-I, Appendix R: Care of Photographic Collections*. Both paper and polyester enclosures are available from the Supply and Equipment Program, MMP. See the *Tools of the Trade* catalog.

You can write the label information in pencil on the front of paper enclosures. For archival-quality polyester enclosures, place the photo and label back-to-back in double-sided photo sheets or envelopes. This method

allows you to view the photo and label without having to handle the photo. Some parks use a copy of the catalog card and photo back-to-back in a polyester sleeve.

Note: Use plastic materials only if you can maintain relative humidity below 70%.

5. *How do I store contact sheets?*

Place contact sheets or strips in polyester enclosures. Store them in archival quality three-ring binders with the matching photograph log sheets. Binders and enclosures are available from the Supply and Equipment Program, MMP. See the *Tools of the Trade* catalog.

6. *How do I document and store the negatives?*

Cut the negatives into strips. File them by roll and frame number in archival polyester holders. Place them in a three-ring archival quality binder. File one roll on each page. Shooting only 35 frames of a 36 exposure roll makes everything fit on one page.

Mark the roll number, with a permanent marker pen, in the space at the top of the page. You can use contact sheets as indexes to the negatives.

Binders and enclosures are available from the Supply and Equipment Program, MMP. See the *Tools of the Trade* catalog.

7. *Where do I store the object photograph log?*

Store the object photograph log in a three-ring binder and keep it with the museum collection records. File the sheets with the highest number on top. If you use contact sheets, store a copy of the pertinent log sheet with each contact sheet.

8. *What's the best storage environment for photographs and negatives?*

Storage conditions greatly contribute to the stability and longevity of your photographs and negatives. The storage environment is of prime importance. Carefully monitor the temperature and relative humidity (RH) to keep them constant.

Store black and white photographic prints and negatives at 20° C (68°F) or below at a constant RH between 30% and 50% in dark storage. Avoid RH fluctuations of more than 5%. Humidity is the important factor. High RH levels dramatically increase the rate of deterioration. Very dry conditions may cause cracking and embrittlement.

You can significantly increase the film life of black and white negatives by lowering the humidity below 50%.

Store color prints and negatives at 2-10° C (35-50°F) or below at 20-30% RH in dark storage. Temperature is the most significant factor in determining the rate of fading and staining.

You will also want to monitor and control the presence of pollutants in the air. Oxidizing gases and chlorides can greatly contribute to the destruction of photographic material. Dust is especially damaging because of its hygroscopic character. Dust causes abrasion when you move negatives. Never allow smoking in photographic storage areas.

Refer to the *MH-I*, Appendix R: Curatorial Care of Photographic Collections, for additional information on storage environment.

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* Figures K:2 – K.11 appear in text.

How to Use KODAK Gray Cards...

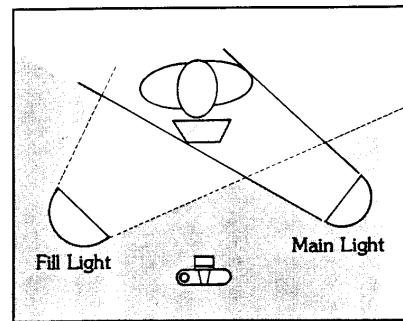
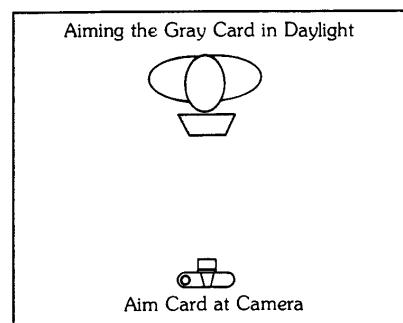
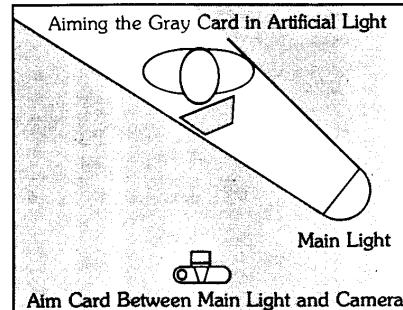
To Determine Exposure

- All meter readings of the gray card are reflection measurements of *incident* illumination on the card. To get accurate exposure information, be sure the gray card is receiving the same illumination as the subject to be photographed.
- Position the gray card facing the camera so there are no shadows on it, no brightly colored objects reflecting light on it, and no glaring (specular) reflections coming off the card itself.
- Normally you should use the gray side of the card and the rated ISO speed of the film to figure exposure. (Or, if the light is so dim that your meter will not read the gray side, divide the film speed by 5, reset your meter to this value, and read the white side of the card.)
- To be sure you read only the card, hold your meter about 6 inches (15 centimetres) away. Of course, if you are using a single-lens-reflex camera with a built-in meter or spot meter, you can see exactly what you are reading.
- In artificial light, position the card close to and in front of the subject, aimed halfway between the main light and the camera.
- In daylight, position the card facing the camera and as close to the subject as possible. Or, you can make an exposure reading of the card near your camera, as long as you position the card so it receives the same angle and intensity of illumination as the subject.
- If your subject is quite dark, *increase* your calculated exposure by $\frac{1}{2}$ to 1 stop.
- If your subject is quite light, *decrease* your calculated exposure by $\frac{1}{2}$ to 1 stop.
- Bracket your exposures in situations where you are unsure of the best exposure.

To Determine Lighting Ratios

- A lighting ratio expresses the relationship between main plus fill-in illumination and fill-in illumination alone.
- Generally, the lighting ratio should not exceed 3 to 1 for color or 5 to 1 for black-and-white when full detail is wanted in a final print.
- You can use a KODAK Gray Card to determine, and if necessary adjust, the lighting ratio of a particular setup even if the lighting arrangement is complex. To do so, follow these suggestions:
 - Position the card as close to the subject as possible.
 - When reading main plus fill-in illumination, turn the card to the position that gives the maximum reading on the scale of your light meter. For this reading, all lights should be on except those positioned so far to the side or back that they might influence the meter directly. Record the reading.
 - When reading fill-in illumination, turn the card so it faces the camera lens, and turn off the main light or lights. Record the reading.
 - With both readings recorded, you can determine the lighting ratio by using the table at right.

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Stops Difference	Lighting Ratio	Stops Difference	Lighting Ratio
$\frac{1}{3}$	1.5:1	$2\frac{1}{3}$	6:1
1	2:1	3	8:1
$1\frac{1}{3}$	2.5:1	$3\frac{1}{3}$	10:1
$1\frac{2}{3}$	3:1	$3\frac{2}{3}$	13:1
2	4:1	4	16:1
$2\frac{1}{3}$	5:1	5	32:1

Figure K.1. Kodak Gray Card Instructions

OBJECT PHOTOGRAPH RECORD SHEET

PARK

Photographer: _____ **Date:** _____ **Roll no.** _____

Figure K.12a. Object Photograph Record Sheet

OBJECT PHOTOGRAPH RECORD SHEET

PARK

Photographer: STEVE SMITH Date: 5 Jul 2000 Roll no. 1021

Figure K.12b. Object Photograph Record Sheet (Sample)

Catalog Number Accession Number	(Roll/Frame Number)
Object Name	
Date Taken Photographer Name	
Remarks	

Figure K.13. Labelling for Photo Enclosures (Sample)