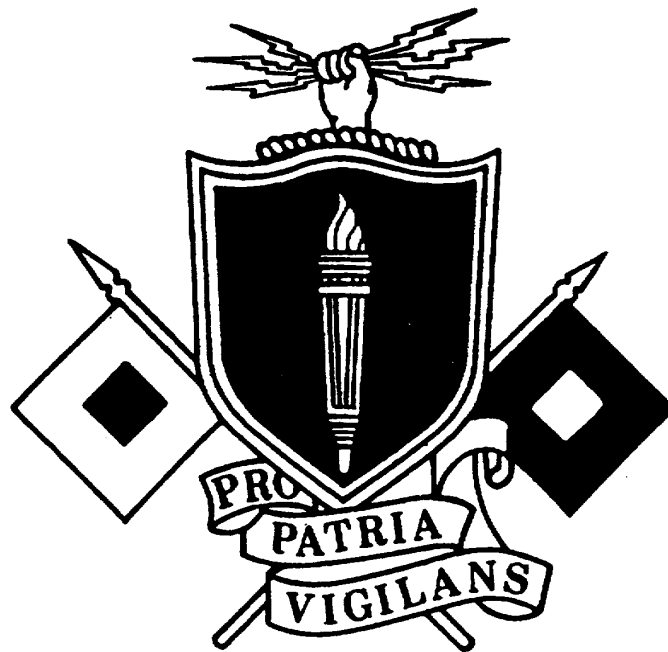


**SUBCOURSE
SS0573**

**EDITION
7**

PHOTOGRAPHY IN CLIMATIC EXTREMES

(DEVELOPMENT DATE: 3 JUNE 1987)



**THE ARMY INSTITUTE FOR PROFESSIONAL DEVELOPMENT
ARMY CORRESPONDENCE COURSE PROGRAM**

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**READINESS /
PROFESSIONALISM**



**THRU
GROWTH**

US ARMY STILL PHOTOGRAPHIC SPECIALIST
MOS 84B SKILL LEVEL 1 COURSE

PHOTOGRAPHY IN CLIMATIC EXTREMES
(Developmental Date: 30 June 1987)

SUBCOURSE NO. SS0573-7

US Army Signal Center and Fort Gordon
Fort Gordon, Georgia

Two Credit Hours

GENERAL

This Photography in Climatic Extremes subcourse is designed to teach you the knowledge necessary to perform tasks relating to operating photographic equipment in various parts of the world. It provides information on operating in cold, desert, dusty, humid, and hot regions. This course is presented in three lessons, each lesson corresponding to a terminal objective listed below.

Lesson 1: PHOTOGRAPHY IN DESERT REGIONS

TASK: Describe the procedures for operating and protecting camera and laboratory equipment in desert or dust-laden climates.

CONDITIONS: Given information about desert conditions and protective procedures for cameras and laboratory equipment.

STANDARDS: Demonstrate competency of the task skills and knowledge by correctly responding to 80 percent of the multiple-choice test covering the operation and protection of photographic equipment in desert conditions.

(This task supports SM Tasks 113-578-1002, Operate Still Cameras in Desert Conditions; and 113-578-3004, Operate Laboratory Equipment in Desert Conditions.)

Lesson 2: OPERATING AND STORING PHOTOGRAPHIC EQUIPMENT AND SUPPLIES IN TROPICAL CLIMATES

TASK: Describe the procedures for operating camera and laboratory equipment and the procedures for storing and handling photographic films and paper in hot and tropical climates.

CONDITIONS: Given information and diagrams about operating and protecting camera and laboratory equipment and methods of storing, packing, and processing films and paper in hot and tropical climates.

STANDARDS: Demonstrate competency of the task skills and knowledge by correctly responding to 80 percent of the multiple-choice test covering the operation and protection of photographic equipment in hot and tropical climates.

(This objective supports SM tasks 113-578-1003, Operate Still Cameras in Tropical Conditions; and 113-578-3003, Operate Laboratory Equipment in Tropical Climates.)

Lesson 3: PHOTOGRAPHY IN COLD CLIMATES

TASK: Describe the operation and protection of camera and laboratory equipment in cold climates.

CONDITIONS: Given information and diagrams about procedures for operating and protecting photographic equipment in cold climates.

STANDARDS: Demonstrate competency of the tasks skills and knowledge by correctly responding to 80 percent of the multiple-choice test covering the operation and protection of photographic equipment in cold climates.

(This subcourse supports SM tasks 113-578-1001, Operate Still Cameras in Cold Climates; and 113-578-3005, Operate Laboratory Equipment in Cold Climates.)

***** IMPORTANT NOTICE *****

THE PASSING SCORE FOR ALL ACCP MATERIAL IS NOW 70%.

PLEASE DISREGARD ALL REFERENCES TO THE 75% REQUIREMENT.

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Whenever pronouns or other references denoting gender appear in this document, they are written to refer to either male or female unless otherwise noted.

INTRODUCTION TO PHOTOGRAPHY IN CLIMATIC EXTREMES

These three lessons on photography in climatic extremes are designed to teach you the methods of operating a camera and laboratory equipment under unusual conditions within your unit. Army Visual Information units are becoming more tactically oriented and will require efficient documentation photography and laboratory work. Most of this documentation will be performed in the field. Your ability to support the Army with usable documentation may well spell the difference between mission failure and mission accomplishment.

The term “visual information” has replaced “audiovisual” in the Army of Excellence.

LESSON 1

PHOTOGRAPHY IN DESERT REGIONS

TASK

Describe the procedures for operating and protecting camera and laboratory equipment in desert or dust-laden climates.

CONDITIONS

Given information about desert conditions and protective procedures for cameras and laboratory equipment.

STANDARDS

Demonstrate competency of the task skills and knowledge by correctly responding to 80 percent of the multiple-choice test covering the operation and protection of photographic equipment in desert conditions.

REFERENCES

TM 11-401
TM 11-401-1
TM 11-401-2
TM 11-6720-253-10
TM 11-6720-265-12
TM 11-6740-282-12
TM 11-6780-225-12

Learning Event 1:

OPERATE CAMERAS IN DESERT CONDITIONS

1. Photographic equipment, like any precision-made equipment, requires a great deal of care. Dust, dirt, and especially fine sand can render a camera or any other piece of photographic equipment useless. Photographers have been documenting operations in the desert for many years. It can be done, has been done, and is being done today. You may find yourself on a Visual Information Documentation Team working in the desert. Understanding how to operate in this climate will make your job easier.
2. The greatest problems in the desert are heat and blowing sand. You can become acclimated to heat but your equipment must be protected from the direct rays of the sun as much as possible. Sand is another problem. Desert sand can sometimes be as fine as powder. This fine sand can penetrate places you would not believe. Unfortunately, it can penetrate your camera equipment and ruin lenses, camera mechanisms, enlargers, and just about anything that moves. Many photographers, including Army photographers, use underwater cameras in the desert. The most popular is the 35mm camera made by a leading Japanese camera company. These cameras will keep water out and, therefore, will keep

sand out. The main problem is that the camera must be opened to load and remove film. At this point the camera is vulnerable to sand and dust.

3. There are a number of things that you MUST do as a photographer to keep your equipment operating.
 - a. First and foremost, keep your camera, lens, filters, flash unit, and tripod in its case when not in use. Expose the equipment to the elements for as short a time as possible.
 - b. Make sure the lens cap is in place when not shooting.
 - c. ALWAYS keep a filter over the lens even when not shooting. This will protect the lens from blowing sand.
 - d. Provide protection from sand and dust when changing lenses. It is during this time that the inside of the camera is vulnerable. Sand and dust can enter the major working parts of the camera when the lens is removed.
 - e. Make sure that all components are clean and free of sand and dust before attaching to the cameras.
 - f. While changing film, it is important to clean out the film chamber. Any film chips combined with sand will scratch your film and could ruin the entire roll of film.
4. The importance of keeping the camera and lens clean cannot be emphasized enough. Even a small amount of dust or sand can damage the camera. A photographer without a camera is a complete waste of vital manpower and resources. It could also cause your commander's mission to fail.
5. Since sand and dust can penetrate the most tightly closed container, it is necessary to take specific measures to keep these particles out of your equipment.
 - a. Always keep the lens hood and filter in place. The lens hood, in addition to shading the lens from the sun, which could cause flares, helps protect the lens and filter from blowing sand. A filter such as the Ultra-violet haze filter or a Skylight filter can be used to both protect the lens from blowing sand and can improve your color pictures. Remember, a filter costs much less than a lens. It is a good idea to carry extra filters of this type in the desert in case one is damaged.
 - b. In the desert, a neutral density filter can do two things for you. It will reduce exposure and also help to keep the lens free of sand and dust.
 - c. Use compressed air (canned air) to clean the lens, filters and other camera parts. NEVER use lens tissue on a dirty lens until all the sand has been removed. Rubbing a dirty lens will scratch the lens and render it useless. A simple air syringe can be used to remove sand, but is not as effective as canned air.

(1) After all sand and grit have been removed with air, you can then clean with a camel's hair brush. If necessary, follow this with lens cleaner and tissue.

(2) Always use the least amount of cleaning required to get the job done. If compressed air cleans the lens, there is no need to use lens cleaner and tissue.

d. Keep your camera as cool as possible. Do not set it in the direct sun. Also, keep the lens pointed down when not shooting. This will cut down on the "sand blasting" effect of blowing sand.

e. Always load and unload the camera in a protected area. Keep the sun and blowing sand off your camera. This can be done in a vehicle, tent, or just by using your body to protect the camera. The smallest amount of sand in the camera could stop its operation or scratch the film while winding.

f. Use plastic bags to protect your equipment when not in use. Commercial brands such as Baggies or Ziploc bags work well.

g. A good field expedient is to place the camera, less lens hood, in a plastic bag, then screw on the lens hood over the plastic. You then cut out a hole for the lens and filter. The bag is loose enough to operate the controls and advance the film. Do NOT try to photograph through plastic. Remove the bag to take the film from the camera. Then use another bag with a hole cut in it. This technique cannot be used all the time, but it does come in handy when the wind is whipping up the sand.

h. Carry a roll of tape with you. This can be "gaffer" tape, a heavy strong tape some call "gun" tape. Medical tape works well. However, be careful if you are under camouflage conditions. Some tapes are very shiny and can reduce your camouflage conditions, so be cautious when selecting the tape. Plain masking tape can be used when nothing else is available. It has a tendency to break and then get caught in the seals of your camera or cases. When your equipment is in the case, use the tape to seal up the openings. Sand can get through the tightest seal.

Learning Event 2:

OPERATE LABORATORY EQUIPMENT IN DESERT CONDITIONS

1. The procedures for keeping your camera clean in the desert also apply to any laboratory equipment you may be using. Normal operating procedures for laboratory equipment requires cleanliness. In the desert, this is difficult but necessary. Whether you are using portable laboratories such as the EH-94 or mobile laboratories such as the ES-82A or ES-38C, keep the equipment clean.

2. Portable laboratories are semipermanent laboratories set up in buildings or tents. Keeping sand and dust away from the equipment in this situation requires constant cleaning and dusting.

a. If you are using a portable laboratory, make sure the case is sealed with tape when not in use. Remove the equipment just before you have to use it.

(1) Try to use a room or tent that is shaded from direct sunlight. High temperatures can cause problems when processing film and paper.

(2) If you set up in a building or tent with a floor, do NOT sweep the floor before processing. This will only stir up dust and sand and probably ruin your print due to scratches and dust marks (spots).

(3) Use canned air or an air syringe along with a camel's hair brush to clean the lenses and film holders. Use the same techniques as when cleaning a camera lens.

(4) Open the tanks and chemistry just prior to processing. Keep all chemical containers closed or covered.

b. Lenses must be cleaned as required. This may be done hourly or even more often.

c. Enlarger film carriers and negatives must be cleaned for every frame.

d. Processing tanks must be covered when not in use. Sand in the processing tanks could scratch the film, rendering it useless.

e. Every piece of equipment in the laboratory must have a cover. If not, sand and dust can ruin it.

3. Mobile laboratories such as the ES-82A are vans which can be closed to keep most of the sand and dust out. However, some sand will always enter the laboratory.

a. Shade the shelter from the direct sun. A camouflage net works very well.

b. Operate the air conditioner, but remember to cover the outside of the air conditioner when it is not being used. This will help keep out sand and dust.

c. Operate the space heater (without heat) to help ventilate the laboratory.

d. Keep the doors closed except when entering and exiting the laboratory.

e. Set up a schedule of shift changes and make sure the unit standing operating procedure (SOP) provides for absolute minimum entry and exit from the laboratory by personnel.

f. Pass verbal messages over the intercom. Written messages, film, or small articles are placed in the film drop in the escape door.

4. All photographic equipment will work in desert and dust-laden environments. You, the photographer, must keep it clean and free of sand, grit, and dust. This must be a constant effort on your part. Only you can keep your equipment operating under these conditions.

Lesson 1
PRACTICE EXERCISE

1. What is your main problem as a photographer in desert environment?
 - a. Using correct film
 - b. Fine sand
 - c. Processing
 - d. Camera

2. When is the camera most susceptible to dust and sand?
 - a. When loading or unloading film
 - b. When shooting pictures
 - c. When changing locations
 - d. When not using storage case

3. When shooting photographs in the desert, what should always be used on the camera?
 - a. Dataguide
 - b. Flash
 - c. Filter
 - d. Lens cap

4. When printing negatives in the desert, how often should you clean the negative and carrier?
 - a. Every five frames
 - b. Only when you start
 - c. Clean every frame
 - d. Only when needed

5. When working in a mobile laboratory, what do you use to keep entries and exits to a minimum?
 - a. Intercom
 - b. Telephone
 - c. Courier
 - d. Padlock

6. When a camera case is not available for your camera, what substitute is recommended for protection?
 - a. Tin can
 - b. Plastic bags
 - c. Vehicle
 - d. Trash bags

7. When in a desert environment, who is responsible for keeping equipment clean?
- a. Operator
 - b. Maintenance personnel
 - c. Your NCOIC
 - d. Commander

LESSON 2
OPERATING AND STORING PHOTOGRAPHIC EQUIPMENT AND
SUPPLIES IN TROPICAL CLIMATES

TASK

Describe the procedures for operating camera and laboratory equipment and the procedures for storing and handling photographic films and paper in hot and tropical climates.

CONDITIONS

Given information and diagrams about operating and protecting camera and laboratory equipment and methods of storing, packing, and processing films and papers in hot and tropical climates.

STANDARDS

Demonstrate competency of the task skills and knowledge by correctly responding to 80 percent of the multiple-choice test covering the operation and protection of photographic equipment in hot and tropical climates.

REFERENCES

TM 11-401
TM 11-401-1
TM 11-402-2
TM 11-6720-253-10
TM 11-6720-265-12
TM 11-6740-282-12
TM 11-6780-225-12
SB 11-632

Learning Event 1:

OPERATE CAMERAS AND LABORATORY EQUIPMENT IN TROPICAL CLIMATES

1. Excessive heat and humidity can cause a very high incidence of failure in photographic equipment. There is no known way to eliminate these failures completely. Failures can be reduced by proper preventive procedures. When you are working in tropical climates, you must know what to look for and how to protect your equipment from the excessive heat and humidity found in this environment.
2. There are two primary causes of equipment failure in tropical climates, corrosion and fungus.
 - a. Corrosion is a chemical action that eats away metal. Corrosion can attack and destroy metal and electrical contacts very quickly. This action increases with a rise in temperature. For each increase of 18°F or 10°C of

temperature, the corrosive action on metal doubles. This is why corrosion is so prevalent in the tropics. Centigrade is now commonly called celsius.

(1) When two dissimilar metals are brought into contact or are connected by an electrically conductive solution, such as water, corrosion begins. In the tropics, high humidity (water in the air) helps corrosion to start. Even though you think your equipment is dry, the moisture in the air is corroding the metal parts of your equipment.

(2) This corrosive action can be halted or slowed by protecting the metal parts with sealing or waterproof coating.

b. Fungus is a parasitic growth that is nourished by particles of organic material in the air or on material on which it rests. It cannot live without moisture and flourishes at temperatures of 75°F or higher. Fungus reduces the operating efficiency of your equipment in several ways.

(1) Fungus acts as a water collector and this promotes corrosion.

(2) Fungus releases corrosive by-products that are capable of etching glass and pitting weather-resistant materials.

(3) Fungus reduces the efficiency and resolving power of optical systems.

(4) Fungus causes leakage and interference in electrical components.

(5) Fungus slows down or stops delicate mechanisms, such as camera shutters.

(6) This deterioration can be controlled by keeping the equipment dry, by applying heat, and by using disinfectants and insect repellents.

3. In order to reduce the chance of corrosion and fungus attacking your equipment and rendering it useless, you can do a number of things.

a. Keep your equipment dry.

(1) Keep equipment in cases or camera bags.

(2) Wipe the equipment whenever it gets wet.

(3) Set the equipment out in the sun to help dry all components.

(4) Use silica gel packets in all camera bags and cases. Silica gel is a desiccant or dehydrating agent that absorbs moisture.

b. Apply heat.

(1) There are a number of ways to apply heat to your equipment.

(a) If you are in the field and have a mobile laboratory such as the ES-82A, you can place the equipment in the lab and use the air conditioner to remove moisture. If a building is available, turning on a heater will help dry out equipment. If the temperature is raised 5°F higher than the ambient (surrounding air) temperature, moisture will be removed from the air. This will only work inside a building or other closed structure. Of course, it gets difficult to work or operate in this higher temperature. This technique will work in a tent, if the tent is relatively air tight. Make sure that the equipment can stand the higher heat.

(b) Dry storage boxes are another way to keep equipment dry when air conditioning or buildings are not available. The box should have openings to allow air to circulate. A 100-watt lamp will provide the necessary heat. A tightly sealed box with silica gel will also work.

(c) Most camera equipment has hermetically sealed metal cases. These cases should be used whenever possible. If the camera is dry when packed in its case, there should be no problem with moisture. Silica gel can also be placed in the case to reduce moisture.

(2) Silica gel can be dried and reactivated by placing it in an oven for about 3 hours at 300°F (149°C). It is best to remove the gel from its packet to avoid scorching.

(3) A word of caution about heat. Most camera equipment cannot stand temperatures above 160°F (71°C). Plastic elements and lenses should not be heated above 140°F (60°C).

c. Use disinfectants and insect repellent.

(1) Wipe all camera cables and small openings with a mild solution of insect repellent. A mixture of 1 part repellent to 5 parts water works well. This will keep bugs out of your equipment. Make sure you wipe the equipment dry after applying the repellent. Do NOT use repellent on lenses, filters, or other glass areas.

(2) You should also wipe your equipment with a weak solution of disinfectant and water. Again use a mixture of 1 part disinfectant to 5 parts of water. Liquid bleach works well. Do NOT use on your lenses, filters, or other glass areas.

d. After returning from a tropical environment, your equipment should be completely overhauled. This, of course, is a job for your maintenance people. At the first sign of fungus growth turn equipment into the maintenance personnel.

4. Remember equipment failures in a tropical climate can best be reduced by proper preventive procedures.

Learning Event 2:

STORING, PACKING, AND HANDLING PHOTOGRAPHIC FILM AND PAPER

1. Photographic films and papers are normally prepared for overseas shipment in tropical packing. In most cases you will have to carry your own basic load of supplies from supply sources at your post or station. This material most probably will not be packed for tropical use.

a. As with equipment, humidity and heat can ruin photographic film and paper. Deterioration of film and paper is normally not evident until the film or paper is processed. Image deterioration and high emulsion fog become evident at that time.

b. Always keep sensitized materials in the original container until ready to use. Where required, place unopened films and paper in containers that are airtight. Make sure that the expiration date has not been exceeded. Out-of-date film and paper is your second worst enemy.

c. If at all possible, keep sensitized materials in refrigerated storage until required. The temperature should be 50°F or lower while in storage. Film and paper must be removed from the refrigerator and allowed to warm up gradually before opening the packing. If this is not done, the film will "sweat" and be ruined. Usually one hour for a roll of 35mm film is sufficient. For larger packs of film and paper, more time is required.

d. If refrigeration is not available, keep the material shaded and never allow it to be placed in the direct sun or in a tin-roofed building. Sensitized material can be placed in a 1- to 2-foot hole in the ground. Temperatures decrease greatly at very shallow depths. The hole must be kept dry.

2. After exposure, film should be processed immediately. If this is not possible, the film must be packaged and kept dry.

a. Place the film in its original container and wrappings. Seal it and take it to the laboratory as soon as possible. If the film has been allowed to become moisture-laden, then you must dry it prior to shipping.

(1) Place the wrapped film in a metal or other waterproof container with silica gel. Wrap it again and ship it to the laboratory immediately. The film should NOT remain in the silica gel container longer than 48 hours. If it does, it may become too dry and brittle.

(2) If metal containers are not available, any container that can be completely sealed can be used. Plastic bags make good containers.

b. Sensitized materials must be kept dry and processed immediately after exposure. The longer you wait to process, the more chance you have of producing poor images.

Learning Event 3:

PROCESSING IN HIGH TEMPERATURES

1. When film is not developed for some time after exposure, the latent image is partly lost and there is a loss of quality in the final developed image. This deterioration of the latent image occurs to some extent under all conditions, but is greatly increased with heat and humidity. To prevent this deterioration and to minimize fog and softening of film emulsion, develop film within 24 hours after exposure.
2. With portable developing units such as the EH-94 and mobile photographic laboratories such as the ES-82A and ES-38C, this should not pose a great problem.
 - a. If you must set up a laboratory in a tent or building, then it is imperative that a way be found to keep chemistry at the correct temperature. For most processes, 75°F (24°C) is considered the upper limit for black and white films. There are processes that can be used up to 85°F (29.5°C). Check the manufacturer's instructions for high temperature processing.
 - b. Color film is not a problem since the normal developing temperatures for the C-41 process are 100°F (38°C) for the first developer and 75°F to 105°F (24°C to 41°C) for the remainder of the process. Transparency film process E6 requires temperatures from 92°F to 102°F (33°C to 39°C).
 - c. The main problem is maintaining each chemical at the required temperature.

Learning Event 4:

USING COLOR FILMS IN TROPICAL CLIMATES

1. Film, as with equipment, is susceptible to high humidity and heat. Film that has absorbed too much moisture can buckle or stick to itself or the camera mechanism. The following procedures will reduce this problem.
 - a. Keep film in the original packing until ready to use.
 - b. If possible, store the film at 50°F (10°C) or below until ready to use.
 - c. Allow the film to warm up for at least one hour before removing the wrapping. This will eliminate sweating.
 - d. Expose the film as soon as possible.
 - e. Protect the film in its original container but do not seal the film unless it can be dried. Process the film as soon as possible and no longer than 24 hours after exposure.

2. If you must ship your film to another location and it must be packed, then you will have to dry it before wrapping. There are a number of ways to dry the film.

a. Place the film cassettes in one pound of dry rice or tea leaves. Usually about a dozen rolls can be protected in this way. It takes about two hours to dry the film. It can then be wrapped in waterproof paper and sealed.

b. Tea leaves and rice can be dried in an oven to remove moisture.

c. Silica gel is another way to remove moisture. Usually two ounces (2 oz) of silica gel will protect one cubic foot (1 cu ft) of space. This is a general rule and amounts may vary. For example, if you have 8 cu ft of space to protect, you need 16 oz (2 oz X 8 cu ft) of silica gel.

3. Keeping your film dry is a 24-hour-a-day job. Color film is much more sensitive to heat and humidity than black and white film. Loss of color and shifts in color balance can be avoided by keeping it dry and processing it as soon after exposure as possible.

Lesson 2
PRACTICE EXERCISE

1. What causes tropical deterioration of films and paper?
 - a. Improper handling and equipment
 - b. Poor equipment and storage
 - c. Heat and humidity
 - d. Low humidity and poor exposures

2. How do you store sensitized materials in the tropics?
 - a. Store in unopened containers until used
 - b. Store in vehicle
 - c. At high temperatures
 - d. Store in freezer until ready to use

3. What is the best storage temperature for films and papers in a refrigerator?
 - a. 50°F or higher
 - b. 50°F or lower
 - c. 60°F or higher
 - d. 70°F or lower

4. What is silica gel?
 - a. A desiccant that absorbs moisture
 - b. A solution for protecting metal components
 - c. A fungicidal spray that absorbs fungus
 - d. A tape for protecting film

5. How long after exposure should you develop still film?
 - a. Within 1 hour
 - b. Within 24 hours
 - c. Within 48 hours
 - d. Within 72 hours

6. If a silica gel is NOT available what other materials can be used?
 - a. Tea leaves or dried rice
 - b. Paper bag or leaves
 - c. Zip lock bags or rice
 - d. Camera case or refrigerator

7. What are the two primary causes of equipment failure in tropical climates?
- a. Fungus and sunlight
 - b. Corrosion and fungus
 - c. Heat and humidity
 - d. Water and salt
8. What is required for a dry storage box?
- a. Equipment, camera, and silica gel
 - b. Airtight box, film, and personnel
 - c. 100-watt lamp and camera
 - d. 100-watt lamp, ventilated box, and camera

LESSON 3 PHOTOGRAPHY IN COLD CLIMATES

TASK

Describe the operation and protection of camera and laboratory equipment in cold climates.

CONDITIONS

Given information and diagrams about procedures for operating and protecting photographic equipment in cold climates.

STANDARDS

Demonstrate competency of the task skills and knowledge by correctly responding to 80 percent of the multiple-choice test covering photography in cold climates.

REFERENCES

TM 11-401
TM 11-401-1
TM 11-401-2
TM 11-6720-253-10
TM 11-6720-265-12

Learning Event 1:

DESCRIBE THE DIFFICULTIES OF PHOTOGRAPHY IN COLD CLIMATES

1. In cold climates difficult operation of still cameras is usually associated with shutters and lenses. If a camera is properly lubricated and adjusted in cold temperatures, it will function if certain procedures are followed.

a. Shutters slow down in cold weather. Very cold temperatures will also reduce film sensitivity. On average, depending on the camera you are using, one half to one f/stop less light is required to compensate for slower shutter speeds. For example, if your basic exposure is 1/125 second at f/16, you should set your f/stop to f/22 to compensate for the slower shutter speed. This will require some testing to arrive at the right amount of change. The colder the temperature, the slower the shutter.

b. Focal plane shutters found on 35mm single lens reflex (SLR) cameras are made of cloth or rubberized cloth. These become brittle and can break if they become too cold. Keeping the camera warm is the best method of reducing this problem.

c. Between-the-lens shutters, such as those found on view cameras, are susceptible to moisture freezing on the internal mechanism. This can then cause rust or corrosion. Removing the lens elements and warming the internal mechanism will reduce the chance of rusting. The lens elements of most other cameras (35mm SLR, etc.) cannot be removed except by depot maintenance personnel. Remember, NEVER lubricate between the lens shutters.

d. Batteries lose much of their power and charge under very cold conditions. Dry cell and nickel cadmium (NiCad) batteries lose almost all their charge at -10°F (-23°C).

e. You must protect yourself from the cold. In addition to your regular issue of cold weather clothing, carry a pair of cotton gloves, the type used by film editors and members of color guards. These can be worn under your regular mittens. When it is necessary to handle the cold camera and adjust controls, your fingers will not stick to the bare metal if you are wearing gloves. People have been known to lose portions of their fingers because of the cold. Also remember to handle cold film carefully; it can cause severe cuts.

2. To keep your equipment operating in cold climates, the following steps should be taken.

a. Keep the camera dry and at the same relative temperature.

(1) If you are working out in the cold and must bring your camera into a heated room, NEVER return to the cold temperatures without first warming the camera equipment to room temperature. Moisture condensates on the camera, lenses, and mechanisms. Returning it to the cold temperature will cause this moisture to freeze, rendering your equipment useless.

(2) There are a number of ways to solve the problem of keeping the camera dry and at the same relative temperature.

(a) Keep your equipment outside. If you are in a permanent situation with buildings, you can build a cold box in a window. This will allow you to keep the equipment at relatively the same temperatures as outside and still be able to clean, service, and adjust the equipment in comfortable surroundings. The room that the cold box is in should not be a warm room.

(b) Another method is to place the camera equipment in a plastic bag before entering a warm room. Baggies, zip lock, or trash bags can be used. By sealing the camera in a plastic bag, the moisture will form on the bag and not on the camera.

(c) In field situations, the same principles apply. Never bring your camera into a warm tent and then return to cold temperatures. Always allow the camera to warm up before returning to the cold. Again, plastic bags can be used to keep moisture off camera equipment.

b. Protect your equipment from the elements.

(1) In addition to plastic bags, carry gaffer or gun tape, rubber bands, a small plastic bottle of dishwashing liquid, cotton swabs, and extra batteries.

(a) In order to reduce internal static buildup, which can ruin film, use a solution of 1 part dishwashing liquid to 10 parts of water and very lightly coat the film guide rails and film chamber of your camera using the cotton swab. This will help reduce static electricity.

(b) Since batteries lose their charge very quickly in the cold, make sure the extra batteries are charged at all times. NEVER use a fast charger on cold batteries. Always use a slow charger. The built-in charger in the KS-99C camera set is a slow charger. Carry extra camera batteries and keep them warm by placing them in an inside pocket close to your body.

(2) During snowstorms, keep the camera in its case, carrying bag, or in a plastic bag.

(3) Always use a filter over the lens and a lens hood. Usually a Skylight filter works best.

(4) Do NOT use a power winder in cold temperatures. This could cause the film, which is brittle when cold, to break.

(5) Change lenses as little as possible. Cold metal can break very easily. The lens and camera body have small metal clips, holders, and other contacts that can be very easily broken.

(6) A zoom lens should not be used in very cold temperatures. The working mechanism can get stiff and be damaged. Of course, if the situation requires use of the zoom, it should be used.

(7) Do NOT use canned air to clean your camera or lens in cold temperatures. Use a camel's hair brush and air syringe. As always, use the least amount of effort to clean the lens.

3. Arctic photography is difficult but not impossible. Keep your equipment as dry and warm as possible, keep yourself dry and warm, and carry extra batteries. By following the information in this lesson and the TM or manufacturer's manual for your equipment, you should be able to carry out your documentation mission.

Learning Event 2:

DESCRIBE THE WINTERIZATION OF EQUIPMENT

1. Winterization is the preparation of equipment for cold weather. It consists of adjusting equipment and where permissible and practical, cleaning and lubricating the equipment with low temperature lubricants. This, of course, is a job for your maintenance personnel. Only equipment used outdoors is

required to be winterized. Ensure that camera equipment has been lubricated before operating in a cold climate.

a. Whenever possible, use camera equipment that is well worn. If you take a new, unused camera to the arctic, you will find it very sluggish. A camera that has been operated for a least a few months will work better. This is because the parts have been worked and any microscopic burrs have been worn down.

b. As an operator, there is no lubrication you can perform on your equipment. This must be done by your maintenance personnel. If you are about to deploy to an arctic region, you should make arrangements to have your equipment winterized in accordance with applicable TMs. You should only operate a camera without lubrication in emergencies.

2. If for any reason you cannot have your equipment winterized, keep your camera and equipment clean. This will help keep them in good operating condition. A small film chip or lint could stop the function of equipment. Always clean out the film compartment of the camera before loading another roll of film.

Learning Event 3:

STORE AND OPERATE CAMERA EQUIPMENT IN COLD WEATHER

1. Cold weather conditions, and particularly sudden temperature changes, can have an adverse effect on photographic equipment and film. Special attention must be given to the storage of photographic items.

2. When cold photographic equipment or film is brought into warm places, moisture condenses on surfaces of equipment and film. This causes rusting of metal and swelling of film emulsion. If the equipment or film is returned before the moisture evaporates, the moisture will freeze and cause damage to these items.

a. Whenever possible, store camera equipment in unheated rooms. If you are shooting outdoors in very cold climates and need to shoot photographs indoors, allow the camera equipment to warm up slowly. If this is not done, there could be an adverse effect on the lenses, causing them to crack, check, or separate. After equipment is warm, do not place it in subfreezing temperatures without again cooling it down slowly, or you could cause similar problems.

b. Film should be stored at the same temperature as the equipment it will be used with. For short storage, film and paper should be stored at temperatures of 50°F or lower (10°C or lower).

(1) All film should be kept in its original container and packing until ready for use. Allow film and paper to come to the surrounding temperature before opening it.

(2) Film can be stored at very low temperatures. Storage at below freezing temperatures will not adversely affect film. For long term storage, film should be maintained at 0°F (-18°C).

c. Batteries should be stored in warm rooms. Keep NiCad batteries fully charged. Remove batteries from warm rooms just before you are required to use them. The colder a battery is, the less effective it will be.

Learning Event 4:

PROCESS FILM IN COLD TEMPERATURES

1. Most laboratory work will be done in permanent buildings or mobile photographic laboratories such as the ES-82A or ES-38C. With these facilities, there is little problem with cold temperatures. There may be occasions when you must set up a portable laboratory such as the EH-94A in a cold environment.

a. The activity of developer solution decreases as the temperature drops. Normal developing times are based on chemical temperatures of 68°F (20°C). Lower temperatures require longer development time. Always follow the chemical or film manufacturer's instructions for development times.

b. For short term processing, it is best to set up a portable laboratory in a well-heated room or tent. A mess tent works well because there is hot and cold water available. You must remain away from any cooking areas and avoid spilling any chemicals. You may have problems convincing the Mess Sergeant to let you use the mess facilities. An alternative is to set up as close to hot and cold water as possible. Immersion heaters can also be used to warm and maintain chemicals and wash water at correct temperatures.

c. The use of hypo eliminators is almost mandatory in the arctic. This requires very little water to wash film and prints. Use the following recipe to prepare hypo eliminator if you cannot obtain it through supply channels.

HYPO ELIMINATOR

Water	16 oz	(500 ml)
Hydrogen Peroxide (3%)	4 oz	(125 ml)
Ammonia solution (3%)	3 1/4 oz	(100 ml)
Add water to make	32 oz	(1 liter)

d. Dry the film in a warm room. If a hot air drier is used, keep the heat below 125°F (50.7°C). Place the negatives in negative preserver and handle them as little as possible. Paper prints must be treated the same way. Don't move prints from very warm to very cold temperatures. Make sure the prints stay flat.

2. Operating lab equipment in the arctic is difficult but not impossible. Make sure you have a reasonably warm room to operate in.

Lesson 3
PRACTICE EXERCISE

1. What are the main difficulties when using a camera in cold climates?
 - a. Batteries and film
 - b. Shutters and lenses
 - c. Flashes and film
 - d. Processing and exposures

2. When do you lubricate between the lens shutters?
 - a. Daily
 - b. Weekly
 - c. Monthly
 - d. Never

3. What are the main problems with exposures in low temperatures?
 - a. Dehydration of films
 - b. Stiffness in the shutter mechanism and film sensitivity
 - c. Lower emulsion sensitivities and illumination levels
 - d. Insolubility, precipitation, and low temperatures

4. What is meant by winterization?
 - a. Preparing equipment for summer operation
 - b. Pulling maintenance of all equipment
 - c. Preparing film for processing
 - d. Preparing equipment for cold weather operations

5. When can you operate a camera without lubricants?
 - a. Only in emergencies
 - b. It doesn't matter
 - c. Whenever you can
 - d. When parts move smoothly

6. Why is cleanliness so important in cold climates?
 - a. Camera equipment will operate even without cleaning
 - b. Equipment and film become dehydrated in cold climates
 - c. Small pieces of dust or lint can jam the moving parts
 - d. Equipment needs to be lubricated on a daily basis

7. What is your main concern when loading or handling cold film?
- a. Fingerprints
 - b. Exposure
 - c. Shutter speed
 - d. Cutting yourself
8. How should batteries be stored?
- a. Completely drained
 - b. Fully charged
 - c. In an unheated room
 - d. In a light-tight box
9. What is the normal processing temperature?
- a. 75°F
 - b. 70°F
 - c. 68°F
 - d. 58°F

ANSWERS TO PRACTICE EXERCISES

Test question Number	Correct Response	(Learning Event	<u>Reference</u> Paragraph	Page)
Lesson 1				
1	b	1	1	1
2	a	1	2	2
3	c	1	5a	2
4	c	2	2c	4
5	a	1	3f	5
6	b	2	5f	3
7	a	2	4	5
Lesson 2				
1	c	2	1a	11
2	a	2	1b	11
3	b	2	1c	11
4	a	1	3a(4)	9
5	b	3	1	12
6	a	4	2a	13
7	b	1	2	8
8	d	1	3b(1)(b)	10
Lesson 3				
1	b	1	1	16
2	d	2	1b	19
3	b	1	1a	16
4	d	2	1	18
5	a	2	1b	19
6	c	2	2	19
7	d	1	1e	17
8	b	1	2b(1)(b)	18
9	c	4	1a	20