Basic Evidence Photography Workshop

for the Incident Scene Investigator

Presented by: Imprimus Forensic Services, LLC
www.imprimus.net

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Basic Evidence Photography Contents

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Basic Crime Scene & Evidence Photography

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The Lens

The camera lens is the most critical component of the imaging system in terms of capturing high quality, clear and sharp photos. All major camera manufacturers also manufacture lenses for their cameras. These lenses are generally high quality and are the preferred lens for a camera.

Image quality can be greatly affected by cheap lenses as well as dirt present on the lens. Both of the exposed glass elements at the front and rear of a lens can become dirty from normal handling as well as the natural accumulation of dirt particles in the air. Prior to starting any photo assignment, the photographer should check and clean the lens as necessary.

Every camera kit needs to have lens cleaning supplies. Either a micro-fiber cloth, lens tissue and cleaning solution or both.

Kit Tip!

There are several issues to consider when using lenses for scene and evidence photography. They are

- Focal length
- Viewing angle (normal lens)
- Close-up (macro) capabilities

Focal Length

The focal length of a lens is the measured distance from the optical center of the lens to the film plane when the lens is focused at infinity. Lenses will always be marked with their focal lengths and are available in a wide range of lengths. While lengths may range from 14mm to greater than 600mm, the most common focal lengths used for general scene and evidence photography are between 28mm and 80mm (with 35mm film).

Lenses can be purchased as fixed focal length (prime lens) or adjustable focal length (zoom lens).

Normal Lens & Angle of View

The angle of view provided by a particular lens is dependant upon the focal length of that lens and the diagonal measurement of the surface area (film frame or electronic sensor) that the image is being recorded to. Ideally, for evidence photography, the photographer should select a lens / diagonal measurement combination that provides a "normal" angle of view. A "normal" angle of view is one that allows the camera to record an image that very closely matches what the human eye sees and results in very little distortion of the image.

A "normal" lens for an imaging system is one whose focal length is about the same as the diagonal measurement of the surface area that the image is being recorded to. In 35mm film format, the diagonal measurement of a frame of film is about 43mm. Any lens having a focal length close to 43mm will provide a normal view. Most commonly, a 50mm lens is used providing a viewing angle of about 47^{O}.

ND filters can be used with either B&W or color film. They should only be used with the camera in manual or aperture priority mode.

Polarizing Filters

Polarizing filters are a specialty filters that are extremely useful for removing unwanted reflections from non-metallic surfaces. There are two types available and the type designated as "circular polarizer" should be purchased.

Polarizing filters are similar to neutral density filters in their gray appearance. They differ however because they have two glass elements, with one that rotates in front of the other. They are used under daylight conditions and block light entering the lens from a specific angle. Generally, they are not meant to be used with a flash.

Orange & Yellow Filters

When using an alternate light source to fluoresce fingerprints or biological fluids, these filters can be used with color or B&W film to photograph that evidence. Just like the goggles that the ALS operator wears to block unwanted light and better visualize the fluorescence, these filters will block excess light and enhance the image. The photographer should match the color of the filter to the goggles that produce the best visualization of the evidence.

U.V. and blue light wavelengths are the most frequently used for visualizing evidence by fluorescence. The filters most commonly used with these lights are –

Dark Orange - #21
Medium Yellow - #28 or Y2

Exposure Compensation

With the exception of skylight or UV filters, all other filters will reduce the amount of light entering the lens to some degree. If the camera has a built in exposure meter, then exposure compensation will be automatic. If the exposure is being determined by using a separate light meter, an exposure adjustment will need to be made. Refer to the manufacturer's literature for the filter being used to determine the appropriate compensation.

If a flash is being used with a filter, and the flash is a dedicated TTL (see the section on Flash on the following pages) unit, then the camera will take into account the filter on the lens and compensate for proper exposure. If the flash is a non-dedicated unit that has it's own meter, adjustments will need to be made to the flash settings to obtain correct exposure.

Size

Filters should be purchased that match the diameter of the lens (52mm, 57mm, etc.). The lens diameter is typically marked on the lens and is designated with the symbol **Ø**.

Adapter rings are available that will allow you to attach filters that do not exactly match the diameter of your lens. These adapters are commonly referred to as **step-up rings** or **step-down rings**.

As the names imply, step-up rings allow you to attach a filter that is larger than your lens diameter and step-down rings allow a smaller filter to be attached. Typically, the conversion is printed on the side of the ring, e.g. 55mm -> 58mm or 62mm -> 58mm. The first diameter given must match your lens and the other, the filter. Extreme size differences should be avoided, particularly when using step-down adapters.

Step-Up Adapter Ring

Step-Down Adapter Ring

Film / Image Sensor

Despite the proliferation of digital cameras available today, film is still the most common medium used to record images. Considerations surrounding film selection are

- Format
- Color v. Black & White
- Speed
- Grain
- Exposure Latitude

Format

Format refers to the size of the film that is receiving the image. Film size directly impacts image quality because enlarging lowers the quality of the final print.

Cameras are available that use film in 8" x 10" and 4" x 5" sheets (large format), 6 x 7 cm and 6 x 4.5 cm roll (medium format), and 35mm or 24mm (APS) rolls. Specialty cameras using smaller film sizes are also available.

Historically, evidence photography was done with the 4" x 5" format "press camera". Photos taken with these cameras were incredibly sharp even when enlarged to more than 8" x 10" in size. The drawback to these cameras was their size and the cumbersomeness of carrying the sheet film.

- Select an automatic setting on the flash that corresponds to the aperture setting of the camera

Automatic Settings

This consideration is for non-dedicated flash units only. Using a non-dedicated flash in an "automatic" mode means that the flash is set to determine proper exposure based on the amount of light being reflected back from the subject to the light sensor on the front of the flash unit. In order to match this reading with the amount of light reaching the film in the camera, the flash unit will have settings that correspond to the aperture or f-stop setting of the camera (e.g. camera set at f-8, flash set to meter at f-8). Lower end flash units may only have three automatic settings while higher end units may have five or more. Having more settings gives the photographer greater control over the image.

A Nikon dedicated flash with TTL capabilities.

A Vivitar 283 non-dedicated flash.

Off-Camera Usage

Any secondary flash purchased should have the ability of being used "off-camera" that is, the flash will be used without being mounted on the camera's hot-shoe. Being able to move the flash unit away from the camera is a must for many types of evidence photography and serious evidence photography cannot be done without an off-camera flash. Typically this means that the flash will be connected to the camera by a cord so it can be positioned away from the camera. In the case of dedicated flash units, a dedicated cord can be purchased to connect the camera to the flash.

Example of a Nikon SC-28 off-camera dedicated flash cord.

Example of a Metz handle mount flash.

Large handle mounted flash units are the best choice for this purpose since they will have a quick release bracket allowing easy removal of the flash, as well as a high guide number. Hot-shoe mounted flash units can also be used off-camera, however the photographer will probably want to purchase a bracket that will hold the flash to the side of the camera.

If you and/or your agency are serious about doing proper crime scene photography work, a top quality handle mount flash is a must.

Here's an excellent example of what happens when you are using a shoe-mounted flash and trying to get a close-up shot. The flash head sits far above the camera lens and cannot effectively light the lower portion of the subject.

With a detachable handle mount flash, the photographer would have been able to aim the flash for the proper coverage.

Technical Note: Today's SLR cameras offer dedicated flash units that will work-off camera using an infrared wireless connection rather than a dedicated cord. The problem with this set-up is that it requires the pop-up flash on top of the camera to be open. This means that when the flash is fired, both the pop-up flash and the off-camera flash will discharge. This has a negative impact on some types of forensic photography work such as footwear impression photos. For this reason it is recommended that a dedicated cord be purchased and used.

Power Supply

The issue with flash unit power supplies is whether or not to use standard batteries vs. a rechargeable system.

Smaller hot-shoe mount flash units typically operate on standard batteries (usually AA size), although rechargeable batteries of the same size can be substituted. Larger handle mounted units will generally come with their own rechargeable ni-cad battery. As an option, manufacturers offer an adapter that will allow standard batteries to be used in their units. Large external power packs, usually worn on the photographer's belt, are also available.

If a flash unit is being used on a daily or almost daily basis, then a rechargeable battery system makes the most sense. Sufficient batteries should be purchased to allow for keeping several batteries in the camera case as well as having extra batteries to re-stock the case while others are being recharged. If flash usage is heavy or if the photographer is away from the office for extended time periods, then an external power pack is recommended.

If the flash unit is not being used regularly, then the better option is to use standard batteries only.

Purpose & Needs

As with other methods of crime scene documentation, proper crime scene photography will:

- Provide a permanent visual record of the scene
- Record the initial appearance of the scene
- Document elements of the crime
- Show the condition and location of evidence
- Show evidence relationships
- Allow for a reconstruction of events
- Refresh the memory of investigators and others
- Provide a record to the court
- Help relate the story to those that were not at the scene

Field notes, reports, sketches, videotape and photography are all interrelated in the scene documentation process. And while none can replace the other, photography is perhaps the most frequently used and readily accepted technique. Any person responsible for processing crime scenes must have a good working knowledge of photography or have ready access to someone who does.

Remember - photography is a means of communication. The goal of the incident scene photographer is to compile a photographic story that documents – from start to finish – what has happened at the incident scene.

Photography Requirements

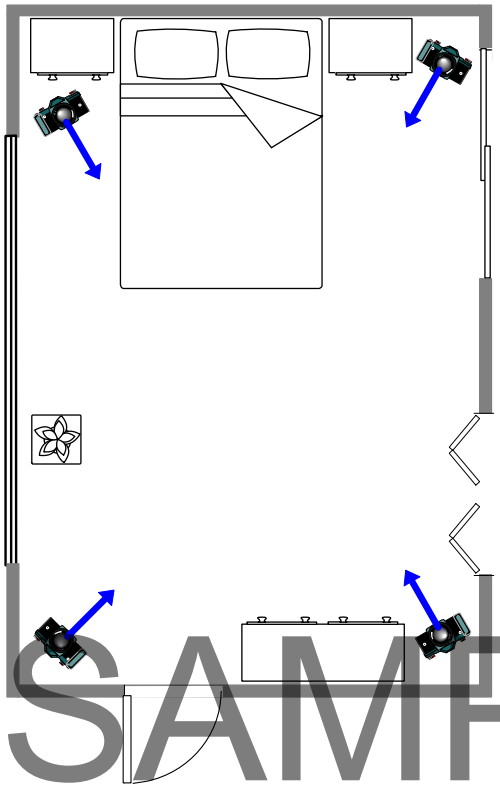
To be introduced at trial, photographs are required to be fair and accurate representations of the scene or items of evidence, as they existed when the photos were taken. Someone that is knowledgeable about what the photographs show must introduce the photos into evidence. Generally, although not necessarily, this will be the person who has taken the picture.

There are several requirements for crime scene photography.

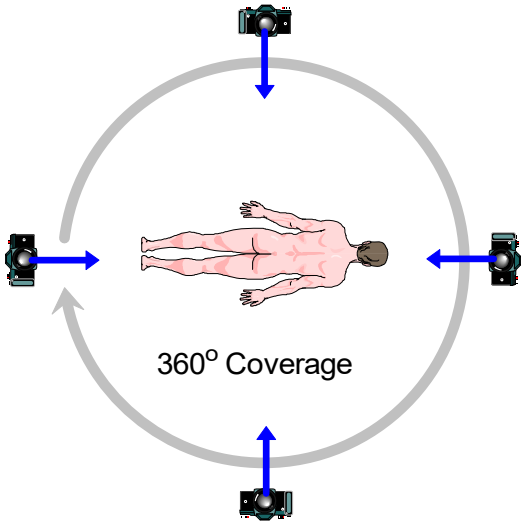
- Include an identifying shot in the first frame (I.D. card)
- Take photographs from a normal viewing angle
- Avoid using and extreme wide angle lens or lens setting
- Photograph from general to specific (overall & close-up photos)
- Photograph from a normal viewing position
- Include a scale in close-up photos of objects
- Complete a photo log

Beside the above, crime scene photos can be divided into two categories; General Scene Photos and Forensic Examination Quality Photos.

Example – Buildings, rooms & objects should be photographed from all sides.



For overall views of an interior room like the one shown, using a wide angle lens is acceptable (28mm lens for 35mm film format).

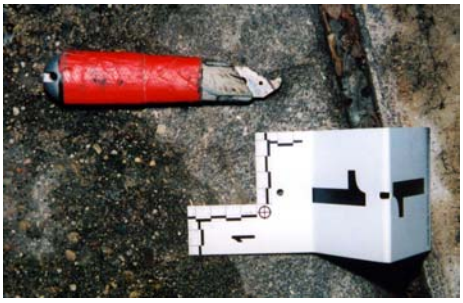


Close-up shots like these need to be taken without distortion. A "normal" focal length lens is required here (50mm for 35mm film format).

Example – 360° Coverage

Photographing the scene from a variety of angles helps the viewer to better understand the nature of the scene.

Individual Evidence Items

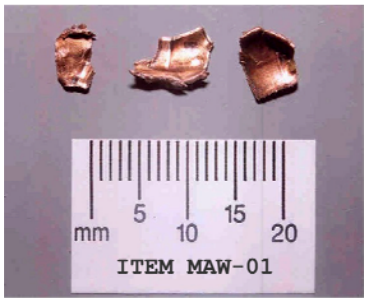


Close-up photographs should always be taken of individual evidence items at the scene. Whenever possible, additional photos of these items should be taken after collection but before final packaging. These types of photographs are especially beneficial in cases where items are contaminated with blood or other biological fluids. Having photographs available for viewing by investigators, prosecutors and the court can help minimize the handling of these items and reduce the possibility of exposure to bloodborne pathogens.

These close-up photos should include at least the part of the photo ID tent card marker bearing the number. Including the marker number in close-up photos allows them to be traced back and located within the overall scene photos.

Detailed photos should also be taken of items that are to be submitted for lab analysis when the analysis will result in the condition of the evidence being altered. A good example of this is when an item having small suspected bloodstains present is submitted for DNA analysis. The lab will generally either cut out or swab off the stains. When the item is returned it will appear much different than when the investigator originally viewed it. Photos of the item in its original condition will be invaluable in court.

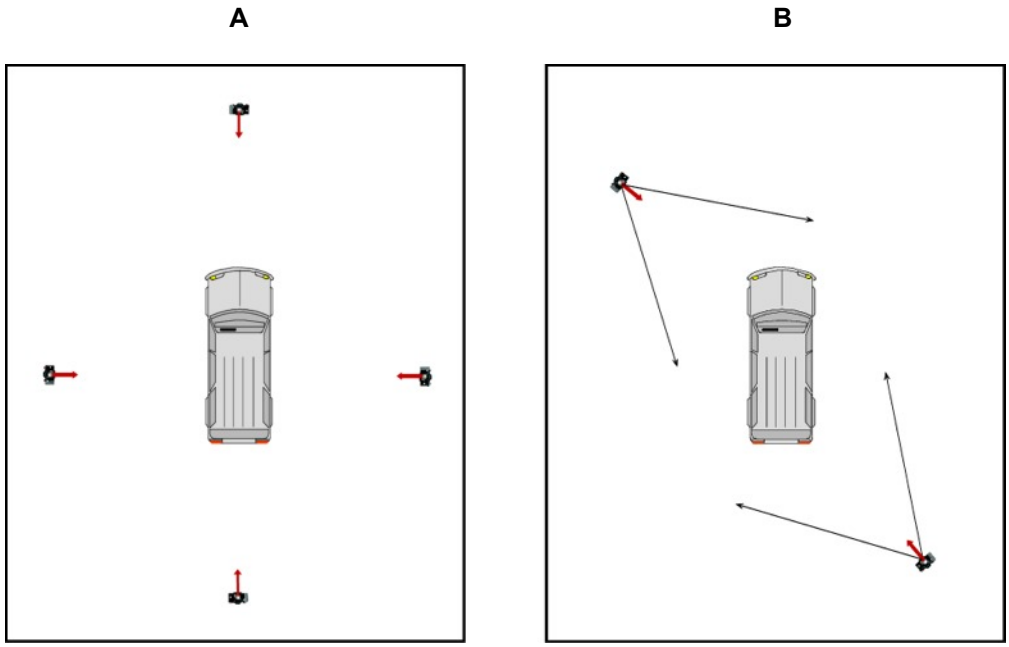
Scales should be used where necessary and a card showing the evidence items identifying number should also be included. In the image below, the scale makes the size of the bullet jacket fragments readily apparent to the viewer.



Documenting Photos in Reports

Some method of recording the photos taken should be used. In simple cases this may simply mean that the photographer includes a narrative section within his incident report explaining the photos. In more complex cases, the use of a Photo Log Sheet is recommended, a sample photo log form is provided at the end of this section.

Recording information about the photos taken is important, especially in major case investigations. If the case is not immediately cleared and subsequently re-opened years later, the cold case investigators will know how many scene photos should be in the files. Even in instances of current incidents, investigators, prosecutors and defense attorneys will know if they have been given access to all the information available.



Damage to a vehicle can be photographed in two ways. Diagram "A" above would be the preferred method, with the camera at right angles to each side of the car. In diagram "B", each photo will capture two sides of the car.

Documenting the injuries sustained by the victim(s) of a serious crash may also be important. This may help to establish whether or not seat belts were being worn, the position of the victim within the vehicle or the actions/movement by a pedestrian.

Battery / Domestic Battery

Photographing the injuries sustained by the victim of a battery is a critical component of this type of investigation. As part of the investigation, photographs should be taken of

- The victim
- The scene
- The offender

Immediate documentation of the victim's condition will support the victim's story; provide evidence should the victim become unwilling to cooperate later; and can preclude the victim from generating self inflicted wounds. The investigator taking the photos should be certain to interview the victim and include in the report exactly what injuries the victims says they have how the victim says the injuries were sustained.

All injuries should be photographed including those inside the mouth. Any area that the victim says was injured should be photographed even if no injuries are visible. Scales should be included and are particularly important in the cases of patterned injuries such as a bite mark or mark left by a weapon. Photographers that are the same sex as the victim, may need to be utilized. If the victim refuses to allow injuries to be photographed, this should be documented in the report.

While fire scene may be complex and varied the following photos are suggested.

Structure Fires

- Scene orientation and identification (street signs, building number)
- Positioning of fire apparatus
- All sides of the building exterior
- Aerial photos of the roof / surrounding area
- Damage done by fire suppression activities (forced entry)
- Utility service to the building (gas & electric)
- Breaker panel & breaker positioning
- Char & smoke patterns
- Fire area prior to debris removal
- Fire area at various stages of debris removal
- Area of origin indicators (low burning, "V" pattern)
- Equipment involved in the fire / positioning of switches / identifying markings / cords & plugs (photograph from all 4 sides)
- Items of evidence prior to collection (incendiary devices, footwear, tools, etc.)
- Evidence of tampering with utilities or equipment
- All other unusual conditions or items
- Conditions / items that support or refute statements of witnesses or involved persons

Vehicle Fires

- Scene orientation and identification
- Approach and/or flight paths (is the vehicle in a secluded area)
- Overalls exterior – all sides (vehicle condition including fire & non-fire damage)
- Overalls interior – from all doors
- Close-up of VIN (vehicle identification number)
- Close-up of manufacturer's tags (inside driver's door frame)
- Odometer reading
- Location of glass debris / positioning of windows, sun roof
- Interior contents, including trunk
- Engine compartment
- Trunk Interior
- Area of origin indicators
- Document presence or lack of electronic equipment (stereo, speakers, etc.)
- Damage consistent with auto theft (punched door locks, broken steering column)
- Items of evidence prior to collection (incendiary devices, other tire tracks, tools, etc.)
- Close-ups of tire / tire condition / remnants of tire pads
- All other unusual conditions or items
- Conditions / items that support or refute statements of witnesses or involved persons

Footwear & Tire Track Evidence

Required Equipment

Tripod
Cable Release
Footwear (Bureau) scale
Camera / Flash / Light source
Black & White Film
Small I.D. card or number

1. Align the film plane parallel to the impression.

2. Light Obliquely.

   Residue Imprints (two dimensional) – Light must be flat across the surface. Consider a strong ambient source (halogen light) rather than flash. DO NOT USE A FLASHLIGHT AS A LIGHT SOURCE.

   Indentations (three dimensional) – Light should be at an angle to the plane of the impression. This angle will vary with the depth of the impression but should be about 25 – 45 degrees to the surface.

3. Light from four sides if possible.

4. Keep the light source at least 5 feet from the impression.

5. Position the scale so that it is even with the bottom of the impression (black on dark / white on light).

6. Use an I.D. card in the photo to identify the impression number and orientate to north. I.D. cards for tire track impressions should identify which tire impression it is, which side is the outside of the track, and the direction of travel if known.

7. Get close. Fill the frame of the viewfinder with the image.

8. If using a flash, set the camera to manual mode and set the aperture based on the type of flash you are using.

   If your off-camera flash is a large handle mount unit, an aperture setting of f-16 to f-22 should work well.

   If the flash is a smaller hot shoe mount type flash, then an aperture of f-11 to f-16 should be best.

9. Use a sunscreen or neutral density filters to overcome the ambient light if outside during the day.

10. When documenting a tire impression remember to document the entire circumference of the tire.

Instant Photography

Generally not recommended for most forensic photography applications, instant photos do have their appropriate place in an investigation.

During major case investigations, taking an instant camera into the crime scene during the preliminary walk-through will allow the investigator to take photos that can immediately be shown to others. These photos can be used to:

- Brief command and investigative staff outside of the crime scene
- Outline the necessary steps to be taken for scene processing
- Allow for quick identification of persons or objects
- Supplement the reports used by a Forensic Pathologist at autopsy
- Provide a back-up to 35mm photos for the most critical items of evidence
- Assist in final report preparation.

While instant photos may appear to provide an easy photographic solution, 35mm film offers greater resolution, better detail, more accurate color rendition and better versatility than the film of the most commonly used instant cameras.

If taken at a scene, instant photos should be immediately marked with the date, time, subject, case number and photographers initials. Their presence should be documented in reports and as a product of the crime scene investigation; they should be retained as evidence.

Angle of View: The largest angle of light rays passing through the lens that will form an image of acceptable quality on the film.

Aperture: The opening inside the lens that regulates how much light enters the lens. Aperture opening sizes are designated as "f-stops". There is an inverse relationship between the f-stop number and the aperture opening. Smaller f-stops equate to larger aperture openings and vise versa.

Aperture Priority: An operational mode of a camera that lets the camera operator select the desired aperture while the camera automatically selects the appropriate corresponding shutter speed required for proper exposure.

Backlighting: A situation where there is a strong source of light coming in from behind your subject. The best way to photograph a backlit subject, is to use a flash, even when it appears that there is enough light in the scene.

Bracketing: Taking several photos of the same subject using varied exposure settings. This technique is generally used when the photographer is unsure of which exposure setting will give the best image, such as when doing a time exposure. For example if the initial photo on a time exposure is taken at f-11 & 5 seconds, additional photos may be taken at f-11 & 10 sec, f-11 & 15 sec and f-11 & 20 sec.

CCD: Charge-Coupled Device *(See - Image Sensor Chip)*

CMOS: Complimentary Metal-Oxide Semiconductor *(See – Image Sensor Chip)*

Color Saturation: Color saturation refers to the intensity of a specific color hue. A highly saturated hue appears vivid and intense while less saturated hues appear muted.

Appendix A

This appendix contains

- Example of a report with included photo log
- Example of a completed Photo Log Sheet
- Blank Photo Log Sheets