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Section 9

General Guidelines for Photographing Footwear and Tire Impressions

*** Previously released as " General Guidelines for Photographing Tire Impressions" and "General Guidelines for Photographing Footwear Impressions" ***

Introduction

The purpose of this document is to describe the proper method of photographing footwear and tire impression evidence by qualified personnel.

Recommended Equipment Includes:

- Professional camera, minimum 35mm or digital SLR with a minimum eight (8) megapixel native resolution, capable of interchangeable lenses, manual override for exposure and focus
- Detachable flash with a six (6) foot extension cord or a flash with remote capabilities to allow for side lighting
- Professional quality lens capable of filling the frame with the impression and having minimal distortion (see *Technical Note* below)
- Remote shutter release
- Sturdy tripod mount capable of adjustable angles and positions
- Artificial light sources (e.g., floodlights, flashlights)
- Level/Angle finder
- Suitable storage media
- Flat rigid scales
- Measuring tape (Tire Impression)
- Photographic log
- Reflector
- Device for blocking ambient light

Procedure for Impression Photography¹

A typical standard operating procedure should include the following:

- 1) Locate visible impressions to be photographed.
 - 2) Prepare photographic log or worksheet as per agency policy.
 - 3) Select suitable film or digital media.
 - 4) Once the overall, midrange and close-up views of the area have been documented without scales and markers, photograph the overall and midrange views of the area with identifying markers and scales using appropriate lighting.
 - 5) To document details of the impression for examination, photograph close-up views of the impression with identifiers and scales using appropriate lighting. Each image must fill the frame with the impression and scales:
 - a) Mount camera on a tripod with the focal plane parallel to the impression.
 - b) Manually focus on the bottom of the impression and close aperture to optimize depth of field (e.g. generally two stops below the largest f-stop or smallest aperture opening).
- Note:** The scale should be at the same level plane as the impression.
- c) Set camera to the highest resolution using uncompressed or lossless compression. (e.g. RAW or TIFF).
 - d) (Footwear only) In addition to close-up photographs of the entire impression, take multiple overlapping exposures mapping the entire impression. Light each overlapping section of the impression to bring out maximum detail. Separate close-up images of the heel and toe box area should be taken. Each image will contain an identifier and scale.
 - e) (Tires only) Take multiple overlapping exposures of the entire impression. Light each overlapping section of the impression to bring out maximum detail. For a long tire impression, a series of overlapping photographs of 12 inches each should be taken. For continuity and orientation purposes, a tape measure should be positioned flat and extended along the side of the entire length of the impression. Each image will contain an identifier and scale in addition to the tape measure.
 - f) Multiple exposures using various settings/bracketing and lighting techniques may be required. A minimum of three images should be taken with oblique

¹ Reference SWGTREAD Guide for the Forensic Documentation and Photography of Footwear and Tire Impressions at the Crime Scene

lighting at least 100 degree increments around the entire footwear impression. Height of the light source should be sufficient to capture the detail in the bottom of the impression. Distance of the light source should be established to ensure even lighting. If the impression is in a brightly lit area, such as an area directly lit by the sun, it may be necessary to shade the impression.

- g) If the impression is processed (e.g. with fingerprint powder or chemicals), re-photograph after each process.

Technical Note: Lens Distortion

When capturing images for comparative analysis, it is important to minimize distortion. Professional quality fixed focal length (normal) lenses have significantly less optical distortion. The issues related to using variable focal length (zoom) lenses are highly complex. Due to their construction, they commonly produce distortions depending on the focal length. Wide angle settings can amplify these distortions and will affect a forensic examination. In most cases, distortions can be minimized when the focal length is set toward the middle range of the lens. Care should be taken when using variable focal length lenses.

Figure 1 demonstrates this point. In this example, both images were taken with the same camera and a variable focal length lens. The sole of the shoe has a circular pattern in the heel. The image on the left was set for a 50 mm focal length. The image on the right was set for an 18 mm focal length. Notice the circular area on the right is elongated.

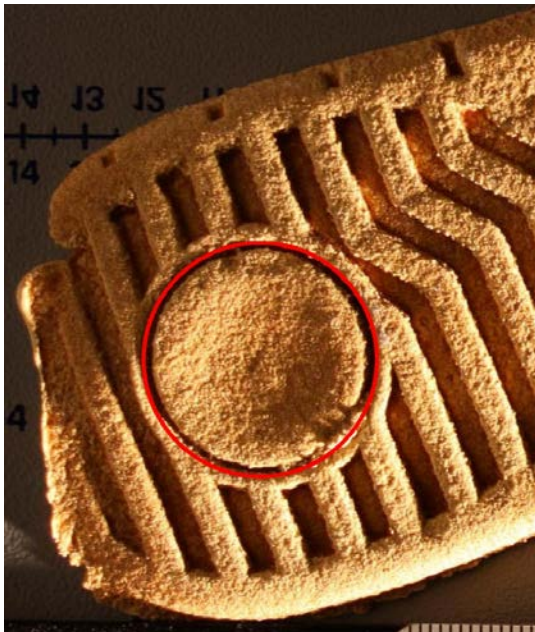


Figure 1. 50 mm

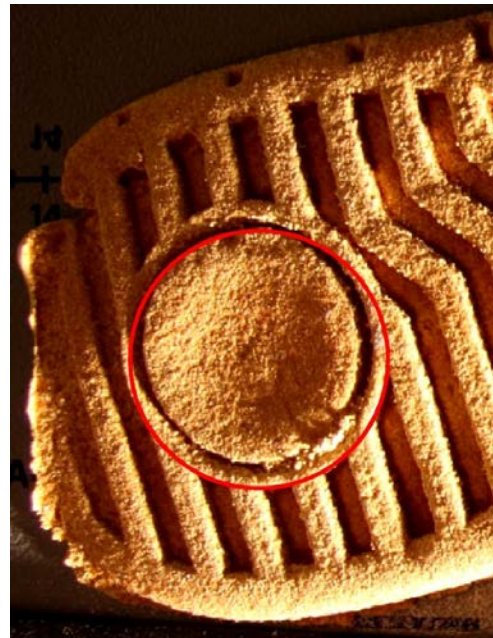


Figure 1. 18 mm

In addition to the design of the lens, some camera manufacturers address distortion through firmware and software updates. Because of the complexity of this issue, the simplest way to determine if your equipment is performing properly is to test it. Your specific setup can be tested using the following method:

- Ensure the camera has the latest version of firmware
- Mount camera on a tripod or copy stand
- Using a leveling device, ensure that the camera's sensor plane is parallel to the target to prevent keystone effect
- Lay down a sheet of graph paper or target grid
- Fill the frame with the target
- Square the lines in the viewfinder
- Using consistent camera settings and lighting, make an exposure at each focal length graduation and note the value
- Repeat this process through the range of the lens graduations
- From the resulting images, identify the focal length where no visible distortion occurs. Figures 2, 3 and 4 below demonstrate what you should be looking for.

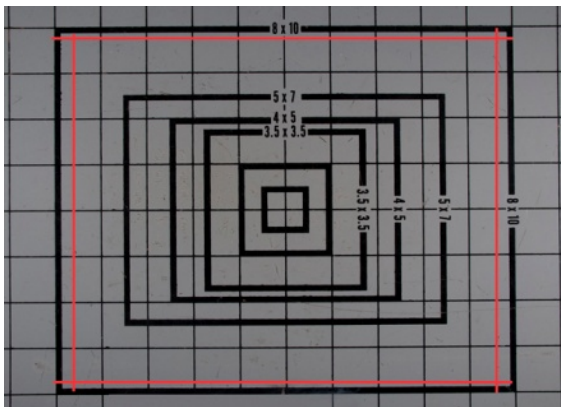


Figure 2. Minimal Distortion

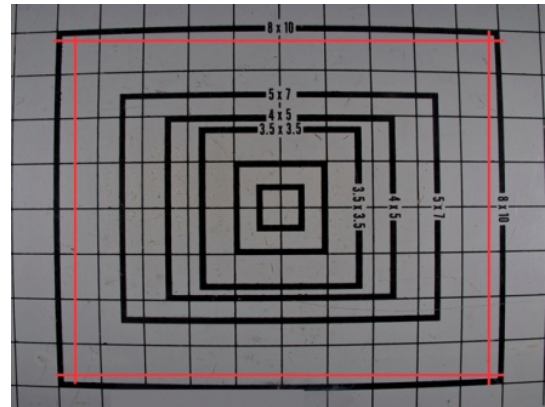


Figure 3. Barrel Distortion

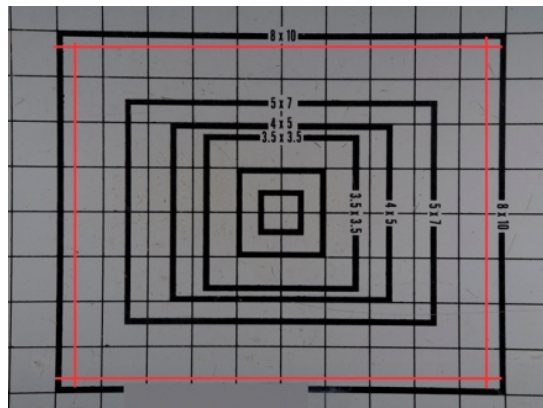


Figure 4. Pincushion Distortion

4 General Guidelines for Photographing Footwear and Tire Impressions

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