SWGDE Guidelines for the Digital Imaging of Footwear and Tire Impressions

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SWGDE Guidelines for the Digital Imaging of Footwear and Tire Impressions

Table of Contents

(Note: This document was previously released as SWGIT Section 9 – General Guidelines for Photographing Footwear and Tire Impressions.)

1. Introduction

The purpose of this document is to describe the proper method of photographing evidence for the purpose of allowing comparison and analysis by qualified personnel.

2. Recommended Equipment

- Professional camera, digital single-lens reflex (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 having minimal distortion (e.g. prime lens with a normal field of view) (see ***Section 4, Technical Note: Lens Distortion*** below)
- Remote shutter release
- Sturdy tripod mount capable of adjustable angles and positions
- Artificial light sources (e.g. floodlights, flashlights, Alternate Light Source [ALS])
- Level/angle finder
- Suitable storage media
- Flat rigid scales
- Measuring tape (for tire impression)
- Reflector
- Device for blocking ambient light

3. Procedure for Impression Photography

A typical standard operating procedure should include the following:

1) Locate visible impressions to be photographed.
2) Photograph the area taking overall and midrange views, without identifying markers and scales.
3) Every impression should be documented with enough detail to be utilized in an examination unless otherwise directed by a qualified examiner. Photograph close-up views with identifying markers and scales. Each image must fill the frame with the impression and scales. See ***Figure 1*** for an example of correct orientation and ***Figure 2*** for an example of incorrect orientation.

Figure 1. Correct Orientation

Figure 2. Incorrect Orientation

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, even if that means digging next to the impression to achieve appropriate depth*.
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.
    i. Light each overlapping section of the impression to bring out maximum detail.
    ii. Separate close-up images of the heel and toe box area should be taken.
    iii. Each image should contain an identifier and scale.

e. (Tires only) Due to the length of tire impressions, photographing tire impressions have unique needs.
    i. If needed, take multiple overlapping exposures of the entire impression.
    ii. For continuity and orientation purposes, a tape measure should be positioned flat and extended along the side of the entire length of the impression. This overall scale should remain in place for all the photographs.
    iii. Each image should contain an identifying marker and scale in addition to the tape measure.

f. Multiple images using various lighting techniques may be required. Typically, using oblique light to show detail by creating shadows on the surface of the impression is sufficient. When possible photographs lighted from the four cardinal points shall be taken of the entire impression. If the impression is in a brightly lit area it may be necessary to shade the impression.

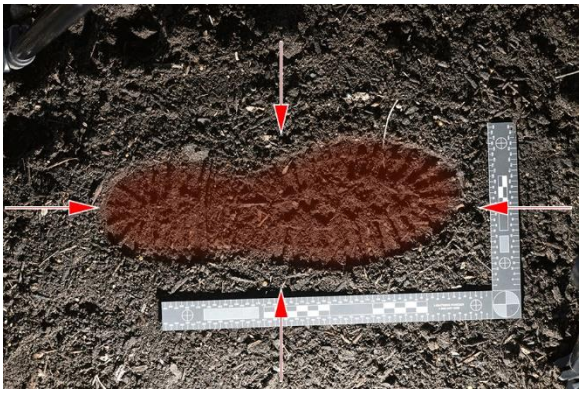

Figure 3. Cardinal Points

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

4. 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.

Note: *SWGDE recommends the use of a prime lens with a normal field of view for impression photography (e.g. 50-mm).*

Figure 4 and ***Figure 5*** 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. ***Figure 4*** was set for a 50-millimeter (mm) focal length. ***Figure 5*** was set for an 18-mm focal length. Notice the circular area on the right is elongated.

Figure 4. 50-mm

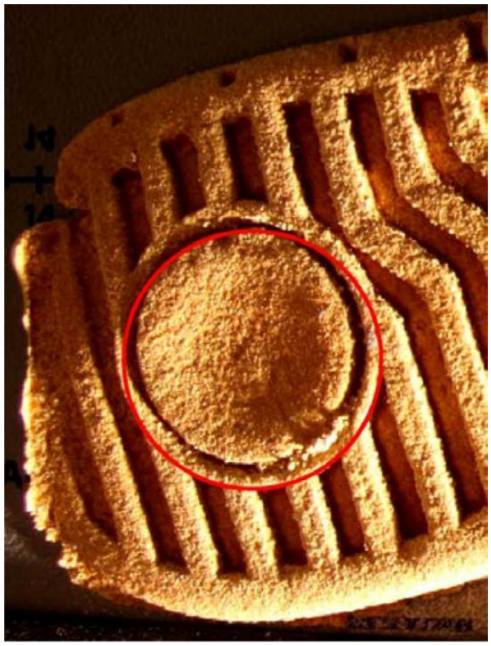

Figure 5. 18-mm

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:

1) Ensure the camera has the latest version of firmware.
2) Mount camera on a tripod or copy stand.
3) Using a leveling device, ensure that the camera's sensor plane is parallel to the target to prevent image distortion.
4) Lay down a sheet of graph paper or target grid.
5) Fill the frame with the target.
6) Square the lines in the viewfinder.
7) Take a photograph at each focal length and note the value.
8) From the resulting images, identify the focal length where no visible distortion occurs. ***Figure 6***, ***Figure 7***, and ***Figure 8*** below demonstrate different types of visible distortion.

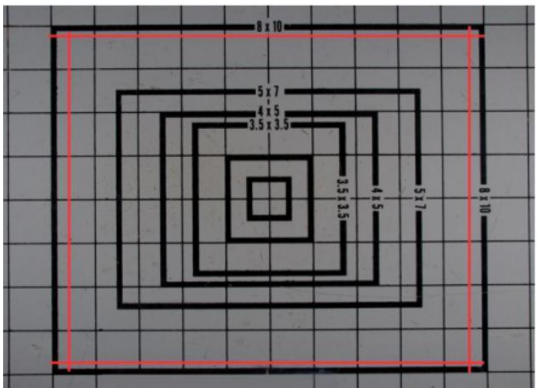

Figure 6. Minimal Distortion

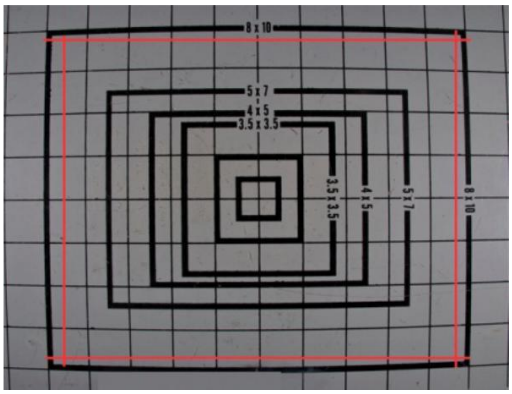

Figure 7. Barrel Distortion

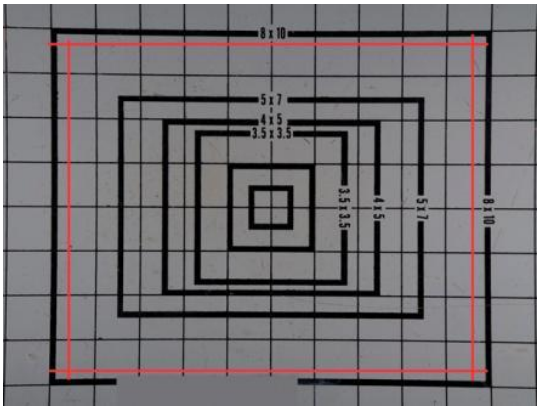

Figure 8. Pincushion Distortion

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History

Revision	Issue Date	Section	History
1.0 DRAFT	2017-08-24	All	Initial draft created and SWGDE voted to release as a Draft for Public Comment.
1.0 DRAFT	2012-09-25	All	Formatted and technical edit performed for release as a Draft for Public Comment.
1.0 DRAFT	2018-01-11	1; 3	Updates made in response to public comments. Voted by SWGDE for release as an Approved document.
1.0	2018-04-25	--	Formatted and published as Approved Version 1.0.