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# WEST VIRGINIA STATE POLICE

## LABORATORY FIELD MANUAL

### 8<sup>th</sup> Edition

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#### IMPRESSION EVIDENCE AT THE CRIME SCENE

1. Secure and preserve the crime scene
2. Walk the crime scene from the perimeter ... inwards
  - a. Interpret crime scene footwear and tire track impressions for assistance in reconstructing events of the crime. For example, direction of travel by suspect(s) and/or victim(s) to, from and while at the scene may be determined. Also the number of suspects involved at the scene may be determined.
  - b. Use any video surveillance or witness accounts to pinpoint searches for impression evidence.
  - c. Mark the impression(s) with a numbered cone or card for reference when taking any crime scene photographs
3. Impression evidence, such as footwear and tire track, are often overlooked. To avoid contamination, visualize this type of evidence first!
4. Visualization techniques
  - a. Oblique light with flashlight or other light source – in low light or total darkness if possible
  - b. Electrostatic Dust Print Lifter
5. Recording impression evidence

Take examination quality photographs first (see #8) before using any chemical or physical enhancement techniques. If three-dimensional impressions are located, cast with dental stone (see # 9). **Whenever possible, submit the original evidence.**
6. Photography Equipment (Key Areas)

35mm camera with manual settings for exposure (Digital Cameras not recommended)  
50mm lens (macro)  
Cable shutter release (to minimize camera shake)  
Tripod  
400 or less ASA color *or* black & white film  
Photo scale (with matte, non-reflective finish)  
Extension cord for flash (for oblique light photos)  
A tarp, blanket or some way of blocking ambient light when using oblique flash

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7. Photography Techniques for Examination Quality Photos
- a. Examination quality photographs need to be within a 3-foot range of the subject impression. **The camera lens must be parallel to impression.**
  - b. Include a scale that is located at the same depth as the impression.
  - c. Include as much information about each photo as possible (i.e., direction of travel on a tire track; the tire position/location on the vehicle (LF, RF, LR, RR)).
  - d. Use a higher 'F stop' (F16 or higher) for a better depth of field. Bracket each exposure and document settings. Consider side lighting (while blocking ambient light) to enhance shadows within impression.
  - e. If the impression is long, photograph in 12 to 18 inch segments with a slight overlapping until at least a 3-foot length is recorded. **Focus on the impression.**
  - f. Prior to any enhancement technique or casting, **photograph the impression in its original condition.**
  - g. Below is an example of proper camera set-up



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- h. Detailed instructions for photography; see Handbook of Forensic Services: Evidence Examinations—Shoeprint and Tire Tread (1990)

## **HANDBOOK of FORENSIC SERVICES**

### Evidence Examinations

#### **Photographing Shoeprint and Tire Tread Impressions**

General crime scene photographs should be taken to relate the impressions to the crime scene. Examination-quality photographs should then be taken to obtain maximum detail for forensic examination. All impressions should be photographed using both methods.

#### **General Crime Scene Photographs**

General crime scene photographs of shoeprint or tire tread impressions should include close-range and long-range photographs. ISO 400 color film should be used. The photographs should show the relationship of the impressions to the surrounding area. General crime scene photographs are not suitable for footwear or tire examinations.

#### **Examination-Quality Photographs**

Examination-quality photographs should be taken directly over the impressions using a tripod and lighting. A scale should be in every photograph. The purpose of these photographs is to produce a detailed negative that can be enlarged to natural size. These photographs should be taken as follows:

- Place a linear scale such as a ruler next to and on the same plane as the impression. Place a label in the picture to correlate the impression with crime scene notes and general photographs.
- Images should be taken using a 35-mm or medium-format film camera. Low cost digital cameras do not provide sufficient image detail for examination-quality photographs. Use a manual focus camera and black-and-white film with an ISO 400 or less.
- Place the camera on a tripod and position it directly over the impression. Adjust the height of the camera or adjust the zoom lens so the frame is filled with the impression and scale. Position the camera so the film plane is parallel to the impression.
- Set the f-stop on f/16 or f/22 for a greater depth of field.
- Attach an electronic flash with a long extension cord to the camera.
- Block out bright ambient light with a sunscreen to maximize the light from the flash.

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- Focus on the bottom of the impression not on the scale. Take an existing or reflected light photograph.
- Position the flash at a very low angle (10 to 15 degrees) to the impression. This will enhance the detail of the impression. For consistent exposure, hold the flash at least five to seven feet from the impression. Shoot several exposures, bracketing toward overexposure to obtain maximum image detail.
- Take the exposures, move the light to another position, adjust the sun screen, and repeat the previous two steps.

#### 8. Lifting Techniques for various two-dimensional surfaces

Lift or Technique	Nonporous Dry	Nonporous Wet	Porous Dry	Porous Wet	Comments
Electrostatic	Yes	No	Yes	No	Non destructive Useful for searching for latent impressions
White Adhesive	Yes	Yes	No	No	Also used with chemical enhancement methods and dark fingerprint powder
Transparent Adhesive	Only with fluorescent powder	Only with fluorescent powder	No	No	Do not use on an original impression
White Gelatin	Yes, if it contrasts with an impression	Yes, if it contrasts with an impression	Yes, if it contrasts with an impression	Yes, if it contrasts with an impression	Also used with some chemical methods and with fluorescent powder
Black Gelatin	Yes	Yes	Yes	Yes	Offers good contrast with most residue

#### 9. Casting Techniques – USE DENTAL STONE – not plaster of Paris

Mixing – for casts of smaller impression (footprint), use a 9 x 12 zip-lock bag. For larger impressions (3 foot tire track), use a bucket.

Bag Method: Premeasure 2 pounds of dental stone into the zip-lock bag and add 12 ounces of water. Mix in the bag by hand kneading. Mix for a minimum of 2 minutes! This bag of mixture should be enough for one footwear impression.

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Bucket Method: Mix 20 pounds of dental stone with 120 ounces of water (just under a gallon). Mix for a minimum of 6 minutes! This amount should be enough for a long tire track or multiple footwear impressions.

Add water during the mixing until proper consistency is obtained.

The consistency of the water and dental stone mixture should be equivalent to thin pancake batter. Make sure that all of the dental stone is thoroughly mixed!

Cast all impressions. The full length of a tire track is needed (3 foot length is desired).

Avoid pouring the mixture directly into the cast ... at a low height, deflect into the impression with a stir stick or small piece of cardboard.

Let the mixture slowly flow into the entire impression with at least ½” depth of dental stone.

The cast will normally “set up” in 30 minutes.

Photograph the cast at a distance to show location before it is removed.

After the cast is poured, and during hardening, note by an arrow the travel direction of the vehicle (if this can be determined). Also include the date of the cast and your initials.

Pry the cast carefully to avoid breaking and defacing, and allow to air dry for 48 hours.

**Do not package the cast in plastic!**

**DO NOT CLEAN THE CAST!** The Lab will do this.

10. Basic Tire Measurements at Crime Scene – see worksheet(s) provided in this handout

Wheelbase, Front and Rear Track Width, Turning Diameter

11. For impressions in snow, spray the impression with snow print wax (following the manufacturer’s instructions), then cast by placing snow in the dental stone to keep mixture cool. Dental stone should be thicker than normal pancake consistency. Cast can be lifted in 60 minutes.
12. Known impressions from vehicles are to be taken by the Lab ... need to submit the entire vehicle! It is permissible to take a quick shot photo of the known tires from the suspect vehicle to see if any of the tires could have made the questioned impression.

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**13.** Database searches for:

Footwear - Use the approved FBI request form that is attached at the end of this manual  
Tire Track - Send the impression to the WVSP lab

**14.** Submit any and all original evidence such as shoes, tires, photos, photographic negatives and lifts.

#### **REFERENCES:**

Forensic Tire Impression Identification by Lawren Nause

Footwear Impression Evidence by William Bodziak

Handbook of Forensic Sciences by the U.S. Dept. of Justice, Federal Bureau of Investigation  
<http://www.fbi.gov/hq/lab/handbook/examshoe.html>

#### **SUPPLIES**

Most of the various items and supplies needed to visualize and collect Footwear and Tire Track Evidence can be purchased through mail-order companies such as Evident Crime Scene Products 800-576-7606, [www.evidentcrimescene.com](http://www.evidentcrimescene.com); or Sirchie Finger Print Laboratories, Inc. 800-356-7311, E-Mail [sirchie@nando.net](mailto:sirchie@nando.net)

For additional information contact the Questioned Documents Section of the Laboratory at 304-746-2175.

#### **PRIVATE COMPANIES THAT TEST TIRES**

The companies listed below routinely test tires for forensic and investigative reasons. They do not conduct impression comparisons, but do for condition, cause of failure, cause of wear, etc.

STL Trans Tech  
Investigative Services  
PO Box 592, 1845 Harsh Avenue S. E.  
Massillon, Ohio 44648  
800-833-8547

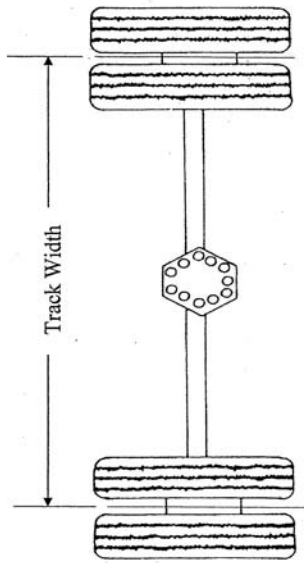
Smithers Scientific Services, Inc  
425 W. Market Street  
Akron, Ohio 44303  
216-762-7441

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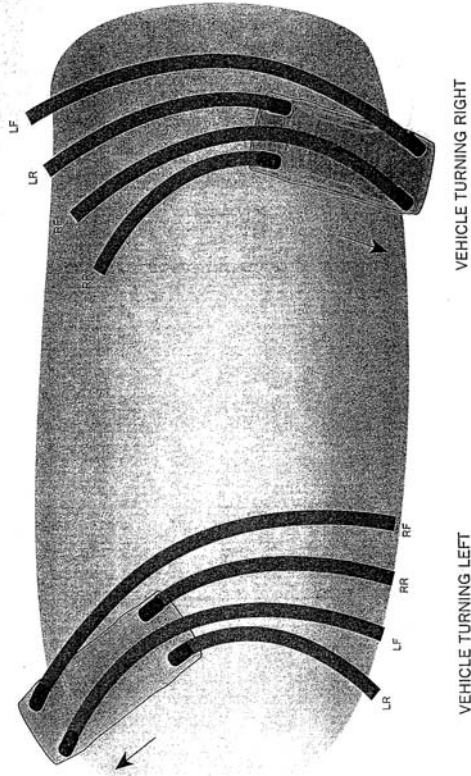
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Track Width Measurement of Dual-tired Axles



**Vehicle Turn Sequences**  
SHOWING TIRE TRACKS



### Track Measurement Worksheet

**TRACK WIDTH**

Tread Width \_\_\_\_\_

Center of tread to Center of tread \_\_\_\_\_

Outside to Outside **less** average tread width \_\_\_\_\_

Inside to Inside **plus** average tread width \_\_\_\_\_

Reference point in tread to identical point in opposite tire \_\_\_\_\_

**Track Width** \_\_\_\_\_

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QDU-8



**FBI LABORATORY**  
**SHOE PRINT DATABASE**  
**SEARCH REQUEST FORM**

The FBI Laboratory maintains a shoe print database which contains images of shoe sole designs. This database is used to identify the brand name or manufacturer of shoes based on the design in shoe impressions left at crime scenes.

All requests for searches should be submitted to the FBI Laboratory with a letter prepared on your department's **OFFICIAL** letterhead and should include your agency's address, telephone number and facsimile number. The best searches can be conducted with quality photographs of questioned impressions. For routine searches, it is recommended that the photographs be submitted to the FBI Laboratory at the below address. Expedite searches may be sent via express mail.

Drawings of impressions and facsimiled photographs often limit the extent of the search. If you choose to facsimile the request, attempt to transmit the best detail possible.

Whether the request is mailed or facsimiled, submit the cover letter together with this form providing the following information:

**SUBJECT'S NAME:** \_\_\_\_\_

**VICTIM'S NAME:** \_\_\_\_\_

**TYPE OF CRIME AND DATE:** \_\_\_\_\_

**CONTRIBUTOR'S CASE NUMBER:** \_\_\_\_\_

**ROUTINE**

**EXPEDITE**

All evidence being submitted to the Laboratory for examination should be sent to:

**FBI LABORATORY**  
**2501 INVESTIGATION PARKWAY**  
**QUANTICO, VA 22135**

**PHONE: 703-632-7314/7315/7288**

**FAX: 703-632-7316**