



# Physical Evidence Bulletin

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## Documentation of Shoe and Tire Impression Evidence

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- Purpose** The Physical Evidence Bulletin (PEB) is a guideline intended for law enforcement agencies to follow when submitting evidence to Bureau of Forensic Services (BFS) Laboratories. Physical Evidence Bulletins are not intended to be used in lieu of training in the collection of evidence.
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- Analysis and results that may be obtained** The Bureau of Forensic Services provides analytical support to law enforcement agencies through the examination of shoe and tire impression evidence. It may be possible to identify or eliminate shoes or tires as having made impressions at crime scenes.
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- Introduction** Tire and shoe impression evidence is commonly encountered at crime scenes in soil, snow, on counters, hard floors, doors, and paper. These impressions can be compared to suspect shoes or tires and may connect them to the crime scene. However, the evidentiary value of a comparison depends upon the quality of the impression, the manner in which it is recorded, and the length of time between the event and the acquisition of the suspect shoes or tires.
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- Documenting Impressions - Photography** As with all evidence, overall photographs should be taken using a standard format lens showing the impressions/imprint in relation to the other features of the scene.
- Photography is the most valuable way of collecting impression evidence for later comparison. It is critical that distortions are minimized by adhering to the following:
- Impression photography requires the use of a tripod and detachable flash or flood light.
  - A 35mm emulsion film format camera or a quality digital camera is adequate.
  - **Instant or fixed-focus cameras are not suitable for impression photography.**
  - The photo must include a non-reflective rigid scale and identifying information (case number, item number, orientation and date). Photographs of tire impressions should also include a tape measure positioned lengthwise along the impression. These items must not be within or interfere with the impression. It is important that the scale be placed at the same depth as the impression.
  - **The camera must be mounted on the tripod directly over the pattern with the film plain parallel to the pattern.** If the impression is on an incline, the camera must be adjusted so the back of the camera is at the same angle as the impression.

If in a lighted environment, create a shadow over the pattern. Using the detachable flash or flood light, light the pattern at a 45<sup>0</sup> angle or lower from a minimum of four different directions. The less depth to the impression, the more acute the light angle should be. The impression, scale and identification information should fill the frame. The camera mount may need to be inverted so that the legs do not interfere with the photograph.

- A tire impression should have the entire length of the tire's circumference (approximately 8 to 10 feet) photographed if available. A tape measure is placed alongside the entire length photographed. Additionally, a non-reflective rigid scale should be placed in each section of the impression photographed. Overlap the frames by as much as 20%. No more than 2 feet of impression should appear in each frame.

Submit all photographs to the Laboratory regardless of their apparent quality.

After the initial photography, carefully remove any vegetation or stones which may have fallen into the impression **after** it was made. Any debris that was pressed into the soil with the impression should not be disturbed. Photograph the impression again with the debris removed.

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### **Documenting 3-dimensional Impressions**

After photography, casting may be performed to document the impression three-dimensionally. The decision to cast is affected by the soil conditions. Coarse soils do not lend themselves well to casting. Impressions in fine humus soil and even snow are excellent candidates for casting. The recommended casting materials are Dental Stone, Traxtone, or Diecast. These proprietary products are superior to plaster in the amount of detail retained, ease of preparation, shorter setting time, and lack of need for borders or reinforcements. Most companies supplying fingerprint identification supplies also carry casting materials.

Dental Stone is mixed in the proportion of 1 lb./6 oz. of water. Diecast is mixed in the proportion of 1 lb./5 oz. of water. It is easiest to pre-weigh one pound portions into large ziplock bags. Traxtone is prepackaged and takes 7 oz. of water to mix in its one gallon ziplock bag. Add the water and mix thoroughly until the consistency of a thin pancake batter is achieved. Begin pouring the mixture outside the impression from a height no greater than 3 inches to prevent disturbing details in the impression. The cast should be approximately 3/4 inch thick to prevent breaking. The material requires 20-30 minutes to set under normal conditions and longer under cold conditions. Mark the back side of the cast with identifying information. Do not remove any soil adhering to the cast after recovery. Place each cast in a sturdy box for transportation. Spray impressions in snow with Snow Print Wax before pouring mixture. This product is also available from companies that carry fingerprint identification supplies. Casting impressions in shallow water may be successful with dental stone products. When casting this type of impression, mix the casting material with slightly less water. Overview photographs of impression casts prior to lifting may be helpful in positioning the location(s) of the impressions at the scene.

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### **Documenting 2-dimensional**

Hard surface or two-dimensional imprints may be found on doors, counters, tile floors, paper, cement, windowsills, etc. They generally include two types: (1) voids in the

## Impressions

pattern created by removal of a surface material such as dust adhering to and being removed by the shoe or tire; and (2) the deposition of material from the shoe or tire, such as blood, dirt, oil, etc. Again, photography is the most valuable way to document the imprint (see photography section). If possible, submit the entire item bearing the impression. If that is not practical, the impression may be lifted using a commercially available print lifter. An electrostatic dust print lifter or gel print lifter may be employed. Avoid using makeshift print lifting materials such as cellophane or tape.

## Enhancements

Laboratory personnel may provide chemical enhancement techniques for impressions in blood. Photographs should be taken prior to any enhancement attempts.

Alternate light sources such as UV and laser may enhance visualization and photography, especially with impression evidence.

Dusting with latent fingerprint powder may develop impressions not previously visible. Dusting should not be performed prior to the documentation of any visible impressions.

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## Making Test Impressions

Suspect shoes or tires should be collected as soon after the incident as possible to minimize the amount of change to the tread or sole through additional wear.

Test impressions from shoes will be made at the laboratory at the time of comparison. If shoes are to be examined for soil, glass, fibers, etc., each shoe should be individually packaged to avoid contamination.

It is recommended that the sole patterns of family members, law enforcement employees, and other personnel present at the scene be documented for elimination purposes. Companies that carry fingerprint identification supplies also provide products that can easily produce actual size (1:1) test impressions. Photography is also appropriate when a proper scale is included in the photograph.

Tires should remain mounted on the suspect vehicle such that position, wear, and load duplicate the conditions at the time the evidence impression was produced. The vehicle may be trailered to the laboratory for obtaining tire test impressions.

A trained investigator may obtain the tire test imprints in the following manner:

1. Use a smooth, clean flat surface such as concrete, of appropriate length.
2. Drafting film or non-waxed butcher paper with a width of at least one foot is affixed to cardboard. Drafting film is a transparent plastic which may be purchased at any drafting supply company. Prepare several lengths sufficient to document the entire circumference of the tire (approximately 8 to 10 feet).
3. Mark the **sidewall** of the tire into sections. Label each section (A, B, C, etc.).
4. Using a gloved hand, cover the tread with a **thin** film of petroleum jelly. Too little petroleum jelly will result in incomplete documentation. Too much Vaseline will result in filling in of fine details of the tread pattern.
5. Line up the drafting film attached to the cardboard with the tire. Slowly roll the tire either forward or backward making an imprint on the film. As you roll, mark the drafting film with the corresponding sidewall sections and direction of roll. The end of the film under the body of the vehicle may need to be partially lifted to prevent overlap with the tire on the other axle.

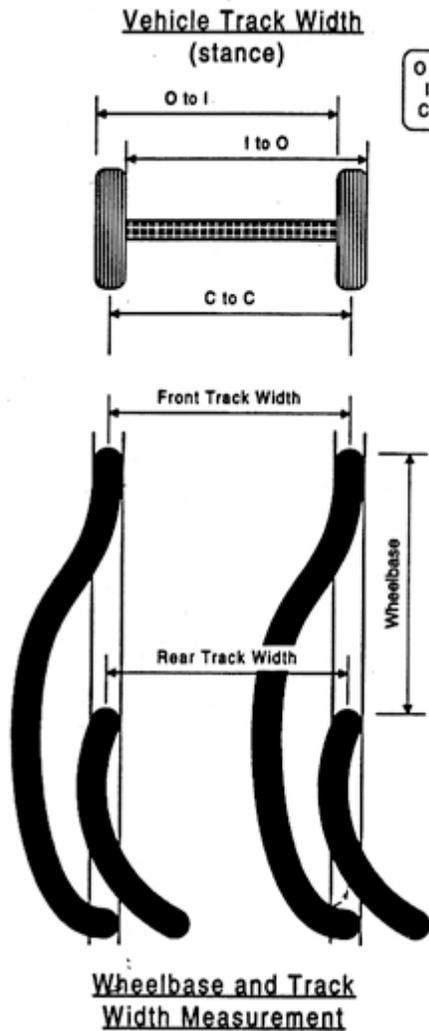
6. Label each test impression with the position in which the tire was mounted on the vehicle (right front, left rear, etc.) and the orientation of the vehicle relative to the test impression.
  7. Develop the impression with black fingerprint powder.
  8. Lightly spray the entire test impression with clear lacquer or hairspray to help prevent smudging.
  9. Roll the other three tires similarly.
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**Crime Scene Documentation**      **Vehicle Track Width and Wheelbase**

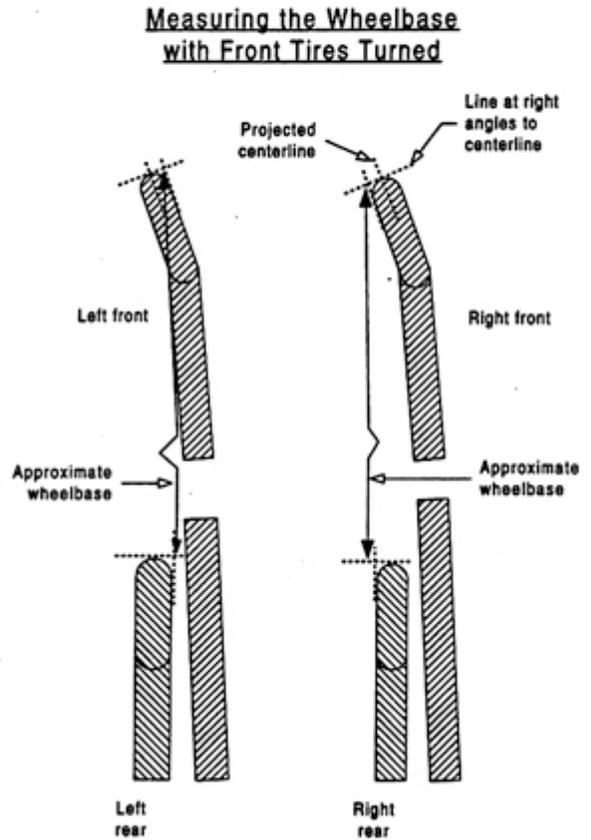
Crime scene measurements of the vehicle track width and/or wheelbase may be searched against a database to provide a list of vehicles which may have left the tire impression. Requests to search the database using the measurements obtained may be made directly to the California Department of Justice Riverside Criminalistics Laboratory at (951) 361-5000, or through your local laboratory.

The track width of a vehicle is the distance between the center of the tire mounted on one side of the vehicle and the center of the tire mounted on the opposite side of the vehicle. The distance is most easily measured as the distance between the outside edge of the left tire impression and the inside edge of the right tire impression (see diagrams). The front and rear track width measurements may be different.

The wheelbase of a vehicle is the distance between the center of the front axle and the center of the rear axle. The distance is most easily measured as the distance between the leading edge of the front tire impression and the leading edge of the rear tire impression (see diagrams).



O = Outside  
I = Inside  
C = Center



**For further information and additional resources**

Please contact your regional BFS laboratory with any further questions that you may have.

For a list of regional laboratories please go to:  
[http://ag.ca.gov/bfs/pdf/bfs\\_brochure.pdf](http://ag.ca.gov/bfs/pdf/bfs_brochure.pdf) or <http://ag.ca.gov/bfs/>

To locate the most current Physical Evidence Bulletins please go to:  
<http://ag.ca.gov/cci/reference/reference.php>