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**Best Practices for the Preparation of Test Impressions
from Footwear and Tires**

DRAFT



Best Practices for the Preparation of Test Impressions from Footwear and Tires

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Academy Standards Board
4200 Wisconsin Avenue, NW
Suite 106-310
Washington, DC 20016-2143

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Foreword

This document covers the procedure for documenting two- and three-dimensional test impressions of footwear and tires. The particular procedures and methods employed in a given case will depend on the examination needs and may not cover all aspects of unusual or uncommon conditions.

This document is based on the original document created by the Scientific Working Group for Shoeprint and Tire Tread Evidence (SWGTTREAD) "Guide for the Preparation of Test Impressions from Footwear and Tires". That document was updated by the Footwear and Tire Subcommittee of the Physics and Pattern Interpretation Committee under the Organization of Scientific Area Committees (OSAC) to the Academy Standards Board (ASB), which submitted it to the AAFS Standards Board for consideration. The Footwear and Tire Tracks Consensus Body of the AAFS Standards Board finalized and voted upon this document. All hyperlinks and web addresses shown in this document are current as the publication date of this standard

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Best Practices for the Preparation of Test Impressions from Footwear and Tires

1. Scope

This document provides forensic footwear and tire impression examiners guidance in the preparation of two- and three-dimensional test impressions from footwear and tires for use in the comparison process. The purpose of creating test impressions from known footwear or tires is to record the characteristics on the outsole or tread and attempt to reproduce the conditions present when the questioned impression was made. The methods included in this document are not all inclusive and may not cover all aspects of unusual or uncommon conditions. This document is not intended to replace a professional training program.

2. Normative References

There are no normative reference documents, Annex B, Bibliography, contains informative references.

3. Terms and Definitions

3.1 Chart board: A solid laminated board with a covering of white paper on at least one side (not foam core board) used to provide a firm and smooth backing when obtaining known tire impressions.

3.2 Known footwear or tire: An item of footwear or tire that is compared to a questioned footwear or tire impression.

3.3 Outsole design: A term used to describe a specific pattern or arrangement of design elements on an outsole typically associated with a manufacturer and having a name and/or style number.

3.4 Roller transport film: A seven-mil Estar film base material designed to wet rollers and pick up loose particles on all types of roller transport photo-processing machines used along with fingerprint powder to produce known impressions of footwear and tires.

3.5 Rolling circumference: The linear distance traveled by a tire in one revolution under load.

3.6 Test impression: An impression made from a footwear or tire used as an aid for comparison purposes.

3.7 Tread design: A term used to describe a specific pattern or arrangement of design elements on a tire tread typically associated with a manufacturer and having a name and/or style number (also used to describe footwear outsoles).

3.8 Tread wear indicator: Bands of raised rubber, sometimes called “wear bars”, that are 2/32 of an inch above the bottom of the main grooves of a tire.

4. Recommendations

4.1. General

Prior to making test impressions, the examiner should recognize and preserve other relevant physical evidence as well as document and photograph the original condition of the shoes, outsoles, tires and tread design. The examiner should select the method of producing test impressions based on the known footwear or tire, case circumstances and products available. Multiple test impression methods may be used if needed.

4.2. Footwear Test Impressions

4.2.1. Test impressions should record fine detail with appropriate contrast and/or three dimensional features of accurate size, shape and clarity.

4.2.2. Relevant identifying information should be recorded on test impressions which may include but is not limited to case number, item number, make, model, size, etc.

4.2.3. Test impressions should be made of the entire outsole. Test impressions of specific areas of the outsole may also be made. When appropriate, test impressions should be made of the entire outsole. Test impressions of specific areas of the outsole may also be made. Replicate test impressions should be made to capture variability among different impressions.

4.2.4. Excess dirt should be removed from the outsole with care so as to not damage the outsole or remove any stone holds or other objects present within the design elements before test impressions are made.

In some cases, test impressions may be taken prior to removal of excess dirt from the outsole.

4.2.5. Footwear examiners should produce test impressions using one of the methods listed below. The following methods are suggested, but are not the only possible methods (other methods meeting the criteria of 3.2.1 may be used). The examiner should select the method of producing test impressions based on the known footwear, case circumstances, and products available. Multiple test impression methods may be used if needed. Sections 3.2.5.1 through 3.2.5.6 are acceptable examples of methods used to make footwear test impressions.

4.2.5.1. Roller transport film and fingerprint powder.

- a. Apply a heavy coat of fingerprint powder to the footwear outsole.
- b. Remove any excess powder by gently tapping the footwear onto a hard surface.
- c. Using water, moisten one side of a sheet of roller transport film of sufficient size.
- d. Remove excess water with a squeegee. Make an impression, preferably while wearing the shoe, by stepping onto the roller film. Allow the impression and film to dry.

4.2.5.2. Clear or white adhesive lift or white gelatin lift and fingerprint powder or printer's ink.

- a. Apply a heavy coat of fingerprint powder to the footwear outsole.

- b. Remove any excess powder by gently tapping the footwear onto a hard surface.
- c. Remove the protective cover from the adhesive sheet.
- d. Lay the sheet adhesive side up on the surface where the impression will be made. A semi-soft surface, such as newspaper or firm foam, can be used under the adhesive sheet to record the outsole details.
- e. Make an impression, while wearing the footwear, by stepping onto the adhesive sheet.
- f. If necessary, press the adhesive against the outsole to obtain a complete recording of the outsole.

NOTE: As an alternative method, if not wearing the footwear, the adhesive film can be pressed against the outsole.

- g. Cover the impression with a clear protective cover.

4.2.5.3. Inkless methods

- a. Make an impression while wearing the footwear or by pressing the outsole onto the inkless coater. The inkless coater may also be applied to the outsole using a roller and ensuring an even distribution of the inkless coater onto the entire outsole while preventing excess coating.
- b. Step or press the outsole onto the treated paper.

4.2.5.4. Silicone spray, wipes or other suitable substances and magnetic fingerprint powder.

- a. Coat the outsole of the footwear with the selected substance.
- b. Make an impression on a surface such as white paper or white cardboard.
- c. Apply black magnetic fingerprint powder to develop the impression.
- d. Apply aerosol clear lacquer or other suitable protective coating to the test impression.

4.2.5.5. Three-dimensional test impressions.

- a. Make an impression in a three-dimensional substrate (e.g. BIO-FOAM^{®1} or sand).

4.2.5.6. Outsole casting.

- a. Apply selected silicone product to the outsole of the footwear.
- b. Remove silicone from the outsole of the footwear when cured.

NOTE: The use of outsole casting is generally reserved for small areas.

¹ This term is used as an example only, and does not constitute an endorsement of this product by the AAFS Standards Board.

4.2.6. For elimination purposes, the footwear outsole may be photographed with a scale or may be documented using any of the methods listed in 4.2.

4.3. Tire Test Impressions

4.3.1. Test impressions should record fine detail with appropriate contrast and/or three dimensional features of accurate size, shape and clarity.

4.3.2. Relevant identifying information should be recorded on test impressions which may include but is not limited to case number, item number, make, model, size, DOT number, tire location on the vehicle, rolling direction of the tire, etc.

4.3.3. The location of the tread wear indicators and/or tire segments should be noted on the tire.

4.3.3.1. These can be used for marking off the tire in sections giving each section an alpha or numeric designator.

4.3.3.2. The location of the tread wear indicators and/or tire segments should be transferred to the test impression as it is rolled.

4.3.4. Test impressions should record the full and continuous circumference of a tire.

4.3.5. The test impression taken for each tire should be longer than the circumference of the tire, by approximately 3 feet, to ensure that the entire noise treatment pattern is collected.

4.3.5.1. Alternatively, two test impressions may be taken of each tire, offset 180 degrees of rotation, to ensure different start and end points.

4.3.5.2. Vehicles with dual tire assembly should have both tire test impressions taken simultaneously as to ensure that the relationship of the noise treatment between the two tires is appropriately recorded.

4.3.6. Test impressions should be made with the tire mounted on a vehicle, preferably the subject vehicle, while the vehicle is in neutral being pushed (not driven).

4.3.7. Excess dirt should be removed from the tire tread with care so as to not damage the tread or remove any stone holds or other objects present within the design elements before test impressions are made.

In some cases, test impressions may be taken prior to removal of excess dirt from the tire tread.

4.3.8. Tire examiners should produce test impressions using one of the methods listed below. The following methods are suggested, but are not the only possible methods (other methods meeting the criteria of 3.3.1 may be used). The examiner should select the method of producing test impressions based on the known tire, case circumstances, and products available. Multiple test impression methods may be used if needed. Sections 3.3.8.1 through 3.3.8.4 are acceptable examples of methods used to make tire test impressions.

4.3.8.1. Printer's ink with clear film.

- a. Prepare two sections of chart board, each of sufficient length to record a full rotation of the tire.
- b. Apply printer's ink to one section of chart board.
- c. Cut, position, and tape clear film on the second section of chart board.
- d. Roll the vehicle so that the tire travels over the inked chart board and then onto the clear film.
- e. Mark the film with relevant information regarding tire position and direction of travel.
- f. Allow the inked impression to dry.

4.3.8.2. Printer's ink with chart board.

Repeat 4.3.8.1, omitting the use of the clear film, so that the inked impression will be produced directly on the chart board.

4.3.8.3. Petroleum jelly or silicone wipes on clear film with magnetic fingerprint powder.

- a. Apply a light coat of the chosen substance to the tire tread.
- b. Cut, position and tape clear film onto the chart board.
- c. Roll the vehicle over chart board which has been covered with clear film to transfer the tire impression to the clear film.
- d. Mark the film with relevant information regarding the tire position and direction of travel.
- e. Develop the impression with black magnetic fingerprint powder.
- f. Remove excess powder from the film.
- g. Apply aerosol clear lacquer or other suitable protective coating to the test impression.

4.3.8.4. Petroleum jelly or silicone wipes on chart board with magnetic fingerprint powder.

Repeat 4.3.8.3 omitting the use of the clear film, so that the impression will be produced directly on the chart board.

4.3.9. For elimination purposes, the tire tread may be photographed with a scale or may be documented using any of the methods listed in 4.3.

4.4. Safety

4.4.1. Universal safety precautions should be taken when handling physical evidence due to potential biohazards or other hazardous materials.

4.4.2. Precautions to prevent contamination should be taken when wearing footwear during the production of test impressions, such as wearing gloves and wearing protective foot covers.

4.4.3. Precautions to prevent contamination should be taken when producing test impressions from tires using vehicles, such as wearing gloves, wearing protective suits over clothing and providing a safe environment for all individuals involved.

4.5. Limitations

4.5.1. Test impressions may not always fully reproduce characteristics due to inherent variability in the impression making process.

4.5.2. The limit of methodology/detection is defined by the substrate and the method chosen to take test impressions.

4.5.3. Test impressions are used in conjunction with the known shoe or tire for comparison with the questioned impression. Conclusions may be limited without a known shoe or tire.

4.5.4. Footwear and tire evidence may have inherent limitations that can interfere with the procedures in this document. Limitations, when known, should be noted and recorded.

4.5.5. Limitations most often include, but are not limited to substrate features, the method of collection, and the inability to accurately reproduce conditions under which the questioned impression was made.

NOTE: The inability to produce test impressions using the exact conditions under which the crime scene impressions were made does not necessarily interfere with the ability to compare the shoe or tire with those impressions.

Annex A **(informative)**

Foundational Principles

Forensic footwear and tire track examination is a forensic discipline that attempts to identify, exclude, or determine the degree of association/non-association between an item of footwear or tire and a questioned impression. It requires a broad range of knowledge, skills, and abilities to effectively apply appropriate scientific and technical methodologies and properly evaluate the findings in order to reach one of these appropriate conclusions. An important factor in any scientific or technical endeavor is to conduct appropriate and accurate experimentation. Making test impressions is a key part of the experimentation phase of footwear and tire track examination. This document lays out the foundational principles for making precise and reliable test impressions.

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Annex B **(informative)**

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