Approved:	
TL:	QM:

Training Manual
Footwear and Tire Track

1.0 Objective
Provide training for a prospective footwear/tire track examiner.

2.0 Procedure
A novice examiner will complete the entire training program, while one with prior experience may complete only those portions deemed applicable, depending on their background. Sometime during their training, the novice examiner should attend a recognized training class such as those offered by the FBI or CCI. The attendance will expedite their in-house training.

If the ultimate goal is qualification as an examiner in both footprints and tire tracks, the trainee should concentrate initially on footwear training. After qualifying as a shoe print examiner, the scientist can then repeat the training sequence focusing on tire tracks. As in shoe prints, the trainee should attend a recognized training class early in their course of study.

The trainee should maintain a notebook of important facts and techniques for use during training and as a useful reference in the future. By the completion of the training, the trainee should have identified two or three additional references to add to the bibliography.

As the trainee progresses, the student and trainer will indicate the completion of various topics by signing and dating the manual as indicated. When training is completed, the new analyst will receive a copy of the signed manual, with the original going to the QC manager.

3.0 History, Introduction

3.1. Become familiar with the history of footwear and tire track evidence.
3.2 Learn the value of footwear and tire track evidence
3.3 Gain a general knowledge of the types of tracks/marks, and methods available for recovery and comparison.
3.4 By the time the student completes readings for this section, he/she should have begun a notebook containing important facts, terms, and notes for future reference.

Completion date, section 3:_____

Criminalist:_____

Mentor:_____

Bibliography:

Bodziak, William J. 1984. Shoe and tire impression evidence. Identification News 34(12) pp. 3-5, 8-14.

Bodziak, William J. 1999. Footwear impression evidence, Ed 2: New York: Elsevier; chapters 1 and 14.

Fawcett, A.S. 1970. The role of the footmark examiner. Journal of the Forensic Science Society 10(4): 227-244.

Grogan, R.J., and Watson, T.R. 1971. Tyres and crime. Journal of the Forensic Science Society 11(1): 3-13.

Hamilton, Douglas. 1949. Traces of footwear, tyres, and tools, etc. in criminal investigation. The Police Journal (British) 22: 42-29 and 128-137.

Hamm, Ernest D. 1989. Track identification: An historical overview. Journal of Forensic Identification 39:6.

McDonald, Peter.1989. Tire Imprint Evidence. New York: Elsevier; Chapters 1,2,3 and 20.

4.0 Crime Scenes and Crime Scene Processing

4.1 Principles and procedures used in investigating a crime scene
4.2 Legal aspects
4.3 Chain of custody; evidence handling
4.4 Dynamics of the crime scene
4.5 Scene safety
4.6 Objectives of crime scene investigation
4.7 Principles of crime scene photography
4.8 Principles of evidence packaging

4.9 All or part of this section may be waived if the student has had practical experience with crime scene investigation, **or** has completed a recognized course in crime scene processing.

Completion date, section 4: _____

Criminalist: _____

Mentor: _____

Bibliography

Bodziak, 1999; *op. cit.*, chapters 1 and 2.

Idaho State Police Forensic Services Footprint/Tire Track Protocol, p. 8-9.

Fisher, Barry. 1993. Techniques of crime scene investigation. Boca Raton: CRC Press, pp. 1-87.

Rynearson, Joseph M. 1997. Evidence and crime scene reconstruction, 5th ed.; Redding, Ca.: National Crime Investigation and Training.

Saferstein, Richard. 1982. Forensic science handbook. Vol 1. Englewood Cliffs: Prentice-Hall. Pp. 16-20.

5.0 Manufacturing of footwear and tires

5.1.0 Shoe sole manufacturing
5.1.1 Molding processes
5.1.2 Wellman process
5.1.3 Other methods
5.1.4 Recognition of the manufacturing methods

5.2 Tire treads
5.2.1 Tire tread patterns
5.2.2 Tire manufacturing

Completion date, section 5: _____

Criminalist: _____

Mentor: _____

Bibliography:

Bodziak, William J. 1999. *op. cit.* Chapters 6, 7, and 10; also p. 315.

Davis, and DeHaan. 1977. A survey of men's footwear. Journal of Forensic Science Society; V. 17; p. 271-285.

Hamm, Ernest D. 1989. The individuality of class characteristics in converse all- star footwear. Journal of Forensic Identification, 39(5): 277-292.

McDonald, Peter. 1989. *op. cit.* Chapters 1,2,3.

Rossi, William. 1985. The seven basic shoe styles. Journal of the American Podiatric Medical Association, 75(3): p.169-171.

Schacter, R.J. 1983. The art and science of footwear manufacturing. Footwear Industries of America, Inc.; Philadelphia.
Tread design guide. Product book, Tire Guides Inc. New York. An annual publication.

Web site: http://members.aol.com/varfee/mastssite/content.html

Web site, tires: http://gallery.uunet.be/Gerrit.Volckeryck/cars_database.htm

6.0 Two Dimensional Footwear Impressions

6.1 Definition
6.2 Surfaces on which they may be found.
6.3 Visible versus latent prints.
6.4 Methods of documentation and recovery
6.4.1 Lifting methods
6.4.1.1 Safety concerns
6.4.2 Photography
6.4.2.1 Cameras
6.4.2.2 Film
6.4.2.3 Lighting
6.5 Practical exercises

6.6 Enhancement techniques
6.6.1 Safety concerns
6.6.2 Photographic
6.6.3 Physical
6.6.4 Chemical
6.6.4.1 Material data safety sheets
6.7 Practical exercises

Completion date, section 6: _____

Criminalist: _____

Mentor: _____

Bibliography:

Bodziak, 1999; *op. cit.*, chapters 2, 4, 5.

Cassidy, Michael J., 1980. Footwear identification. Quebec; Canadian Government Printing Center, pp. 41-65.

Mankevich, Alexander. 1990. Determination of shoe size in out-of-scale photographs. Journal of Forensic Identification 40:1, pp. 1-13.

Walsh, K.A.J. and Buckleton, J.S., 1987. An aid for the detection and correction of inaccuracies in photographic reproduction of shoeprints, AFTE Journal, 19:3 pp.271-275.

Hamm, Ernest D., 1988. The value of shadow in foot wear and tire track evidence recovered by photographic techniques. Journal of Forensic Identification, 38:3, pp. 91-97.

Idaho State Police Forensic Services Footprint/ Tire Track protocol.

McDonald, Peter. 1989. Tire imprint evidence. Elsevier: New York; p. 37-65.

7.0 Three-Dimensional Impressions

7.1 Why cast?
7.2 Casting materials
7.2.1 Safety concerns
7.2.2 Temperate weather
7.2.3 Snow casting
7.3 Preparing the cast
7.3.1 Packaging and transport
7.3.2 Cleaning
7.4 Practical exercises
7.5 Enhancement of three-dimensional impressions

Completion date, section 7: _____

Criminalist: _____

Mentor: _____

Bibliography:

Kodiak, William J. 1999. Footwear impression evidence, 2d Ed. New York: CRC Press; Chapters 3 and 5.

Brennan, J.S. 1982. Dental stones for casting depressed shoemarks and tyremarks. MPFSL report 24, November 1982.

Geller, Joel. 1990. Casting on road surfaces. Journal of Forensic Identification, 40(5): p. 279-282.

Hueske, Edward E. 1991 Photographing and casting footwear/tire track impressions in snow. Journal of Forensic Identification, 41(2): p. 92-95.

Nause, Lawren A. 1992. Casting footwear impressions in snow: snowprint-wax vs. prill sulphur. R.C.M.P. Gazette; 54(12); p. 1-7.

Vandiver, James V. 1980. Easier casting and better casts. Identification news; 30(5); p. 3-10.

8.0 Comparative Examinations

8.1 Standards and test impressions
8.1.1 Trace evidence
8.1.2 Blood
8.1.2.1 Safety concerns
8.1.3 Two dimensional test impressions
8.1.3.1 Photographic standards
8.1.4 Three-dimensional test impressions
8.1.5 Overlays
8.2 Class and identifying characteristics
8.2.1 Wear characteristics
8.2.2 What constitutes a positive identification?
8.3 Comparative examinations
8.3.1 Side-by-side
8.3.2 Measurements
8.3.3 Superimposition

8.4 Training bibliography updated

Completion date, section 8: _____

Criminalist: _____

Mentor: _____

Bibliography:

Abbott, John R. 1964. Footwear evidence. Springfield: Charles C. Thomas; chapters 4 and 5.

Bodziak, William J. 1999. *op. cit.* Chapters 8-11.

Idaho State Police Footwear and Tire Track protocols.

Jay, Daniel R. 1983 A method for preparing high resolution test impressions for footwear comparison. Identification News; 23(10): p. 5.

McDonald, Peter. 1989. *op. cit.* Chapters 10, 11, 14, 15.

McQuire, Dennis L., and Kennington, Robert H. 1977. Comparative micrography techniques. AFTE Journal 9(1): 7-14.

Hamm, Ernest D. 1988. The value of shadow in footwear and tire track evidence recovered by photographic techniques. Journal of Forensic Identification; 38(3): p. 91-97.

Hueske, Edward E. 1991. A superior method for obtaining test prints from footwear and tires. Journal of Forensic Identification; 41(3): p. 165-167.

Nause, Lawren A. 1987. The science of tire impression identification. R.C.M.P. Gazette; 49(1): p. 1-2.

9.0 Competency Testing

Completion date: _____

Criminalist: _____

Mentor: _____

10.0 Report writing and testimony
10.1 Wording of the final report
10.1.1 Administrative and peer reviews
10.2 Testifying in court

11.0 Mock Trial

At the discretion of the trainer, the trial will be based on either a competency test **or** a cosigned case worked under section 12.

Completion date, sections 10, 11: _____

New Examiner: _____

Mentor: _____

12.0 Cosigned Casework

The new examiner will cosign casework with an experienced examiner. The new examiner has the responsibility of working the case, reaching conclusions, and writing the report. The experienced examiner is responsible for examining the evidence and case notes, and for determining that the conclusions are correct.

Date cosigned casework is completed: _____

Number of cosigned cases completed: _____

New Examiner: _____

Mentor: _____

Footwear Training
History Page

Version	Issue Date	History
0.0	Oct. 1999	Original
1.0	June 2001	Minor changes in terminology
1.1	Nov 2002	Change "section 10" to "section 12" in section 11.0

Tire Impression
SOP

1.0 Background

The initial interest in tire marks began with traffic accident investigation in the late 1920s. One of the earliest uses of tire impression evidence was in England in the early 1940s. Today, forensic tire investigation is probably the most commonly available and effective method of arriving at a positive identification of a vehicle at a crime scene (McDonald, 1989).

2.0 Scope

This SOP lists steps/procedures to be taken in evaluati tire track evidence. Depending on the nature of the evidence, it is unlikely that all steps/procedur ere will apply in any one case; the examiner will make the ultimate determination since each c evidence and circumstances and requires individual assessment.

3.0 Equipment, Reagents

3.1 Photography

3.1.1 A 35 m ble of the resolution required for ev

3.1 l files and use the copies for red condition.

ntained, either electronic or

3.1.2 Camera ti

3.1.3 Film: Reco X Pan; Kodak Technical Pa of 400 or less. Kodak, Fuji, o

3.1.4 Suitable light so

3.1.4.1 Oblique lig

3.1.4.2 Direct lightin ulbs are recommended.

3.1.4.3 Alternate light xamine the evidence using the available filter/ wavelength com he combination that produces the most visible result is then used for phot aphy.

3.1.4.3.1 Orange glasses in combination with ALS wavelengths less than 530 nm but greater than 400 nm.

3.1.4.3.2 Red glasses with 570 nm wavelength.

3.1.4.3.3 Yellow glasses with less than 400 nm wavelength (ultraviolet).

3.1.5 Suitable scales.

3.1.5.1 Metric scales are preferred. When practical, utilize the L-shaped Bureau Scale (Bodziak).

3.2 Reagents. ACS grade or better when available. Utilize a fume hood or appropriate respiratory protection. See the appendix for formulations.

3.2.1 8-hydroxyquinoline (8-quinolinol).
3.2.2 Ammonium thiocyanate.
3.2.3 Iodine and benzoflavone (alpha-naphthoflavone).
3.2.4 Physical developer.
3.2.5 Small particle reagent.
3.2.6 Amido black.
3.2.7 Leucomalachite green.
3.2.8 Fingerprint ink.
3.2.9 Potassium sulfate.
3.2.10 Dental stone.

3.3 Other equipment.

3.3.1 White poster board or equivalent
3.3.2 Calipers.
3.3.3 Magnifying glasses.

4.0 Safety

4.1 The chemicals and reagents used must be considered potentially hazardous. For safety, many must be used in fume hoods or with respiratory protection. Consult the material safety data sheets or NFR/NFPA data before using any of the reagents/chemicals.

4.2 The preparation of tire test impressions frequently requires the Criminalist to crawl partially under the vehicle. Never rely solely on a jack to support a vehicle; use additional support. Do not attempt to jack up the vehicle on a sloping surface. The surface should be flat and smooth.

5.0 Document the evidence

5.1 Mark, photograph, and photocopy the items as necessary.

5.1.1 Photographs submitted by the agency may be retained in the case file. If not already submitted, request the negatives from the investigating agency.

5.1.1.1 When digital images are received as part of a case, the image files are to be copied and any alterations or enhancements must be done using the copies. The original files are to be saved in an unaltered condition, although JPEG files may be saved as TIFF files.

5.1.1.2 A written or an electronic log of the various enhancement steps should be kept.

5.1.2 When evidence can only be recorded or collected by photography and the image itself is not recoverable, the photograph or negative of the image must be treated as evidence.

6.0 Preliminary evidence examination

6.1 Tires

6.1.1 Trace or biological evidence.

6.1.1.1 Document if present, preferably with photography. Determine if the item(s) may have contributed characteristics noted in the imprint evidence and/or casts.

6.1.1.2 Some trace evidence, such as small fragments of glass, may be left adhering to the tires while test impressions are made. Consider the facts of the case and the potential significance of the trace.

6.2 Casts

6.2.1 Dental stone casts may be cleaned by soaking in saturated potassium sulfate for approximately one hour, then rinsed thoroughly. Plaster of Paris casts must not be soaked in water; detail will be lost. Plaster of Paris casts must be hand cleaned.

6.3 Paper, dust impressions

6.3.1 Photograph with scale.

6.3.2 Electrostatic dust lift.

6.4 Other Two-dimensional impressions

6.4.1 Photograph. Refer to 3.1.

6.4.2 Physical enhancement, if required. The method chosen will depend on the nature of the evidence.

6.4.2.1 Photocopy.

6.4.2.2 Electrostatic dust lift.

6.4.2.3 Gelatin lift.

6.4.2.4 Adhesive lift.

6.4.2.5 Brush powdering.

6.5 Preliminary pattern examination against known items.

6.5.1 Have 1:1 enlargements of the photographs made if the vehicle is in custody and the tread design(s) correspond to what is present in the photos.

6.5.1.1 The 1:1 enlargements are not made:

6.5.1.1.1 If immediate elimination of the tire is possible from available photographs.

6.5.1.1.2 If the ruler (scale) in the photographs is clearly incorrectly positioned.

7.0 Chemical enhancement, if required Consult MSDS or NFR/NFPA data for hazards and proper handling of these reagents. Techniques are listed here according to the composition of the impression and/or the surface it is on. See the appendix for formulations.

7.1 Fatty, oily, organic materials

7.1.1 Iodine fuming, followed by spraying with 7,8 benzoflavone.

7.1.1.1 Non-destructive; additional techniques may be used following iodine.

7.2 Blood

7.2.1 Amido black.

7.2.2 Leucomalachite green.

7.3 Soils

7.3.1 8-hydroxyquinoline.

7.3.2 Ammonium thiocyanate.

7.4 Paper, cardboard

7.4.1 Physical developer.

7.4.2 Small particle reagent.

7.5 Wet origin impressions: the tire or the receiving surface is wet or damp

7.5.1 Fingerprint powder.

7.5.1.1 Lift with Handiprint® or fingerprint tape.

7.6 Other recognized techniques may be utilized when appropriate.

7.6.1 Consult the ISP Forensic Services Quality Manual for steps to be followed in validating a method not listed here.

8.0 Tire Search

Trace the design from the cast or photograph onto clear plastic. This may be used as an aid in searching the tread design guides and/or the tread assistant software.

9.0 Test Impressions

The tires should be mounted on the vehicle. Photograph the vehicle and tires. On the test impressions mark the inside and outside of the tire, tire location on the vehicle, direction of rotation, and manufacturing information. Use a jack stand or equivalent to support a jacked-up vehicle. **Relying solely on a jack for vehicle support is dangerous.**

9.1 Black fingerprint ink, white poster board or white cardboard.
9.2 Vaseline and white poster board or white cardboard.
9.3 Black ink and dampened roller transport film.
9.4 Sandbox, photography equipment, casting materials.

10.0 Comparison

The actual comparison proceeds from the general (class characteristics) to the specific (individual characteristics). At any step an unexplained difference between the known tire and the impression leads to elimination of the tire.

10.1 Tread design, width.
10.2 Noise treatment.
10.3 Mold-related characteristics.
10.4 General wear pattern.
10.5 Individual characteristics.

11.0 Conclusions

11.1 Examination of class and individual characteristics will lead to one of the following conclusions:
- 11.1.1 The tire did not make the impression.
- 11.1.2 The tire could have made the impression but others with similar characteristics cannot be excluded. This conclusion is based on the impression and the tire having the same class characteristics. The tire cannot be excluded.
- 11.1.3 An association exists between the impression and the tire, but there are insufficient individual characteristics to associate the tire with the impression to the exclusion of all other tires.
- 11.1.4 The tire made the impression to the exclusion of all other tires.

11.2 When appropriate the results of a search for manufacturer brand names and descriptions based on the tread design of an imprint may be reported.

12.0 Case File contents

The following should be present in the case file:

12.1 Copies of photographs that were examined and/or used in the comparison process.
12.2 Photographs of submitted evidence and any photographs taken in the laboratory. Photographs should be labeled with the laboratory case number and Criminalist initials.
12.3 Original case notes.
12.4 Copies of correspondence.
12.5 Copy of the photo log.
12.6 Printout of the results of a computer tire search.

13.0 References

Given, Bruce W.; Nehrich, Richard B.; Shields, James C. 1977. Tire tracks and tread marks. Houston: Gulf Publishing Co.

McDonald, Peter. 1989. Tire imprint evidence. New York: Elsevier Science Publishing Co.

Recommendations and guidelines for the use of digital image processing in the criminal justice system. Version 1.2. Scientific Working Group on Imaging Technologies, June 2002.

Definitions and guidelines for the use of imaging technologies in the criminal justice system. Version 2.3. Scientific Working Group on Imaging Technologies, June 2002.

Idaho State Police
Forensic Services
Trace Section

History Page
Tire Impression SOP

Revision #	Issue Date	History
1	4/19/02	Current methodology used by ISPFS.
2	12/17/04	Digital imaging guidelines.

Approval:

Technical Leader: _____ Date:
Dave Laycock

Issuance:

QC Manager: _____ **Date:**
Rick D. Groff

Footwear Impressions
SOP

1.0 Background

Footwear identification may be one of the oldest forms of forensic identification in the western world, dating back to a 1786 homicide investigation. Footwear evidence may provide the type, make, description, and approximate size of a shoe, as well as the number of suspects, sequence of events, and points of entry and exit. Footwear evidence may link crimes occurring in different jurisdictions. Specialized techniques may be required to locate and document the impressions, especially if they are latent.

2.0 Scope

This SOP lists steps/procedures to be taken in evaluating footwear impression evidence. Depending on the nature of the evidence, it is unlikely that all steps/procedures listed here will apply in any one case; the examiner will make the ultimate determination since each case has its own evidence and circumstances and requires individual assessment.

3.0 Equipment, Reagents

3.1 Photography

3.1.1 A 35 mm camera.

3.1.1.1 Digital cameras m… …itsole design, but the analyst must en… …il. Use of the tag image file format (…

3.1.1.1.1 Copy the o… …ent purposes. The original in… …although JPEG files may b…

3.1.1.1.2 A written e… …ps should be kept.

3.1.2 Camera tripod.

3.1.3 Film: Recommended: black-… …dak Technical Pan 2415. Color print film n… …k, Fuji, or Agfa film.

3.1.4 Suitable light sources.

3.1.4.1 Oblique lighting.

3.1.4.2 Direct lighting. Blue fi…

3.1.4.3 Alternate light source (… …vidence using the available filter/ wavelength combinations. The combination that produces the most visible result is then used for photography.

3.1.4.3.1 Orange glasses in combination with ALS wavelengths less than 530 nm but greater than 400 nm.

3.1.4.3.2 Red glasses with 570 nm wavelength.

3.1.4.3.3 Yellow glasses with less than 400 nm wavelength (ultraviolet).

3.1.5 Suitable scales.

3.1.5.1 Metric scales are preferred. When practical, utilize the L-shaped Bureau Scale (Bodziak).

Footwear AM Rev 4
11/9/05 – 2/8/07
doc dated 1/18/07

3.2 Reagents. ACS grade or better when available. With the exception of dental stone (avoid inhalation of dental stone) these should be treated as hazardous substances. Utilize a fume hood or appropriate respiratory protection.

3.2.1 8-hydroxyquinoline (8-quinolinol).
3.2.2 Ammonium thiocyanate.
3.2.3 Iodine and benzoflavone (alpha-naphthoflavone).
3.2.4 Physical developer.
3.2.5 Small particle reagent.
3.2.6 Amido black.
3.2.7 Leucocrystal violet.
3.2.8 Fingerprint powder.
3.2.9 Potassium sulfate.
3.2.10 Dental stone.

3.3 Other equipment.

3.3.1 Sandbox with sand or diatomaceous earth.
3.3.2 Biofoam.
3.3.3 Potter's clay.
3.3.4 Carbon paper.
3.3.5 Roller transport film.
3.3.6 Transparency film
3.3.7 Electrostatic dust print lifter.
3.3.8 Calipers.
3.3.9 Magnifying glasses.

4.0 Safety

The chemicals and reagents used must be considered potentially hazardous. For safety, many must be used in fume hoods or with respiratory protection. Consult the **material safety data sheets** before using any of the reagents/chemicals.

5.0 Document the evidence

5.1 Mark, photograph, and photocopy the items as necessary.

5.1.1 Photographs submitted by the agency may be retained in the case file. If not already submitted, request the negatives from the investigating agency.

5.1.2 When evidence can only be recorded or collected by photography and the image itself is not recoverable, the photograph or negative of the image must be treated as evidence.

6.0 Preliminary evidence examination and enhancement

6.1 Shoes

6.1.1 Trace or serological evidence.

6.1.1.1 Document if present, preferably with photography. Determine if the item(s) may have contributed characteristics noted in the impression evidence and/or casts.

6.1.1.2 Some trace evidence, such as small fragments of glass, may be left adhering to the footwear while test impressions are made. Consider the facts of the case and the potential significance of the trace.

6.2 Casts

6.2.1 Dental stone casts may be cleaned by soaking in saturated potassium sulfate for approximately one hour, then rinsed thoroughly. Plaster of Paris casts must not be soaked in water; detail will be lost. Plaster of Paris casts must be hand cleaned.

6.3 Digital images received from agencies.

6.3.1 Agencies should be discouraged from using low resolution digital photography in shoe and tire cases. When digital images are received as part of a case, the image files are to be copied and any alterations or enhancements must be done using the copies. The original files are to be saved in an unaltered condition, although JPEG files may be saved as TIFF files.

6.3.2 A written or an electronic log of the various enhancement steps should be kept.

6.4 Paper, dust impressions

6.4.1 Photograph with scale.

6.4.2 Electrostatic dust print lifter.

6.3.2.1 Lifts must be treated and stored as evidence.

6.4.3 Electrostatic detection apparatus (ESDA) processing.

6.3.3.1 Processed items must be treated and stored as evidence.

6.5 Other Two-dimensional impressions

6.5.1 Photographs.

6.5.1.1 35 mm film is the medium of choice.

6.5.2 Specialized lighting.

6.5.3 Scan the impression into Photo Shop®

6.5.3.1 The history of image processing should be preserved.

6.5.3.1.1 printed or saved as a file.

6.5.3.1.2 preserved in the Photo Shop history log.

6.5.3.2 Save the image file in .tif format.

6.5.4 Other enhancement, as required. The method chosen will depend on the nature of the evidence.

6.5.4.1 Photocopy.

6.5.4.2 Gelatin lift.

6.5.4.3 Adhesive lift.

6.5.4.4 Brush powdering.

6.6 Chemical enhancement. Consult MSDS for hazards and proper handling of these reagents. Techniques are listed here according to the composition of the impression and/or the surface it is on. The enhanced impression should be photographed.

6.6.1 Fatty, oily, organic materials

6.6.1.1 Iodine fuming, followed by spraying with 7,8 benzoflavone.

6.6.1.1.1 Non-destructive; additional techniques may be used following iodine.

6.6.2 Blood

6.6.2.1 Amido black.

6.6.2.2 Leucocrystal violet.

6.6.3 Soils

6.6.3.1 8-hydroxyquinoline.

6.6.3.2 Ammonium thiocyanate.

6.6.4 Paper, cardboard

6.6.4.1 Physical developer.

6.6.4.2 Small particle reagent.

6.6.5 Wet origin impressions; the shoe or the receiving surface is wet or damp

6.6.5.1 Fingerprint powder.

6.6.5.2 Lift with Handiprint® or fingerprint tape.

6.6.6 Other recognized techniques may be utilized when appropriate. Consult the ISP Forensic Services Quality Manual for steps to be followed in utilizing a method not listed here.

7.0 Test Impressions

Test impressions are a valuable aid in the comparison process. They assist in the interpretation and identification of class and individual characteristics seen in the questioned impression.

7.1 Fingerprint powder and white Handiprint®.

7.2 Fingerprint powder and transparent Handiprint®.

7.3 Black ink and dampened roller transport film.

7.4 Sandbox and photography.

7.5 Potter's clay.

7.6 Biofoam.

7.7 Inkless shoe print kit.

7.8 1:1 Overlays

8.0 Comparison

The actual comparison proceeds from the general (class characteristics) to the specific (individual characteristics). At any step an unexplained difference between the known shoe and the impression leads to elimination of the shoe.

8.1 Outsole design.
- 8.1.1 Mold-related characteristics.

8.2 Size.

8.3 General wear pattern.

8.4 Individual characteristics.

8.5 Examination against known shoes.
- 8.5.1 If using photographs for the comparison, have 1:1 enlargements made.
  - 8.5.1.1 The 1:1 enlargements are not made:
    - 8.5.1.1.1 If immediate elimination of the shoe is possible from available photographs.
    - 8.5.1.1.2 If the ruler (scale) in the photographs is clearly incorrectly positioned.
    - 8.5.1.1.3 If the submitted negatives are of unsatisfactory quality.
  - 8.5.1.2 If working with jpeg (.jpg) digital photos save them in .tif format.
- 8.5.2 When using an overlay ensure that the image is actual size.

9.0 Conclusions

9.1 Reports must be technically reviewed before being released.

9.2 When appropriate the results of a search for manufacturer brand names and descriptions based on the outsole design of an impression may be reported.
- 9.2.1 This information may aid investigators who have not submitted shoes for comparison.
- 9.2.2 The information would come from a database, a recognized catalog, or a retail outlet.

9.3 Examination of class and individual characteristics will lead to one of the following conclusions:
- 9.3.1 The impression is not suitable for a meaningful comparison.
  - 9.3.1.1 The impression lacks class and individual characteristics.
- 9.3.2 The footwear did not make the impression.
  - 9.3.2.1 Class and/or individual characteristics of the footwear and impression are different.
- 9.3.3 The footwear could have made the impression but others with similar characteristics cannot be excluded. Also acceptable: The shoe cannot be excluded.
  - 9.3.3.1 This conclusion is based on the impression and the footwear having the same class characteristics.
  - 9.3.3.2 There is a lack of corresponding individual characteristics in the footwear and the impression.
- 9.3.4 An association exists between the impression and the footwear, but there are insufficient individual characteristics to associate the footwear with the impression to the exclusion of all other shoes.
  - 9.3.4.1 The impression and the footwear share class and some individual characteristics, but these characteristics are not sufficiently unique to allow an exclusive association between the impression and the shoe.

9.3.5 The footwear made the impression to the exclusion of all other shoes.

9.3.5.1 The impression and the footwear share confirmable class and random individual characteristics that could not be repeated on another outsole with the same class characteristics.

10.0 References

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Idaho State Police
Forensic Services
Trace Section

History Page
Footwear Impression SOP

Revision #	Issue Date	History
1	3/29/02	Current methodology used by ISPFS
2	3/04	Listed ESDA (6.3) as a technique. Modified 6.3 and 6.4 regarding handling of lifts/results.
3	12/04	Modified wording of conclusions. Added digital imaging guidelines.
4	11/4/05	Modified 6.5.3.1, image history; 6.3.1 regarding low resolution digital imaging; 7.0 regarding overlays.

Approval:

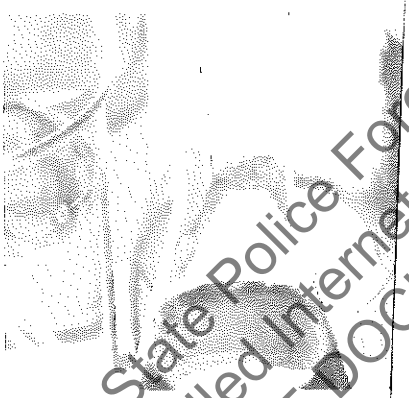
Technical Leader: _____ **Date:** _____
Dave Laycock

Issuance:

QC Manager: _____ **Date:** _____
Rick D. Groff

Idaho State Police
Forensic Services

Approval for Quality System Controlled Documents



Footwear/Tire Rev 5
2/8/07 - 7/2/07
7/18/07?

Discipline/Name of Document: Footwear and Tire Track Impressions

Revision Number: 5

Issue Date: 02/08/2007

APPROVED BY: _____ 2/8/2007
Quality Manager — Date Signed

Footwear and Tire Track Impressions
Analytical Method

1.0 Background

Footwear identification may be one of the oldest forms of forensic identification in the western world, dating back to a 1786 homicide investigation. Footwear evidence may provide the type, make, description, and approximate size of a shoe, as well as the number of suspects, sequence of events, and points of entry and exit. Footwear evidence may link crimes occurring in different jurisdictions. Specialized techniques may be required to locate and document the impressions, especially if they are latent.

The initial interest in tire marks began with traffic accident investigation in the late 1920s. One of the earliest uses of tire impression evidence was in England in the early 1940s. Today, forensic tire investigation is probably the most commonly available and effective method of arriving at a positive identification of a vehicle at a crime scene (McDonald, 1989).

2.0 Scope

This method lists steps/procedures to be taken in evaluating footwear and tire mark impression evidence. Depending on the nature of the evidence, it is unlikely that all steps/procedures listed here will apply in any one case; the examiner will make the ultimate determination since each case has its own evidence and circumstances and requires individual assessment.

3.0 Equipment, Reagents

3.1 Photography

3.1.1 Appropriate camera equipment.

3.1.1.1 Digital cameras may be used, but the analyst must ensure the resulting photos include appropriate detail. Use of the tag image file format (.tif) is strongly recommended.

3.1.1.1.1 Copy the original image file and use the copy for enhancement purposes. The original image file is to be saved in an unaltered condition, although .jpeg files may be saved in .tif format.

3.1.1.1.2 A written or an electronic log of the various enhancement steps must be kept.

3.1.2 Camera tripod.

3.1.3 Film. Recommended: black-and-white T-Max ISO100; Kodak Plus-X Pan; Kodak Technical Pan 2415. Color print film may be used with an ISO of 400 or less.

3.1.4 Suitable light sources.

3.1.4.1 Oblique lighting.

3.1.4.2 Direct lighting. Blue full spectrum bulbs are recommended.

3.1.4.3 Alternate light source (ALS). Examine the evidence using the available filter/ wavelength combinations. The combination that produces the most visible result is then used for photography.

3.1.4.3.1 Orange glasses in combination with ALS wavelengths less than 530 nm but greater than 400 nm.

3.1.4.3.2 Red glasses with 570 nm wavelength.

3.1.4.3.3 Yellow glasses with less than 400 nm wavelength (ultraviolet).

3.1.5 Suitable scales.

3.1.5.1 Metric scales are preferred. When practical, utilize the L-shaped Bureau Scale (Bodziak).

3.2 Reagents. ACS grade or better when available. See the appendix for reagent preparation.

3.2.1 8-hydroxyquinoline (8-quinolinol).
3.2.2 Ammonium thiocyanate.
3.2.3 Iodine and benzoflavone (alpha-naphthoflavone).
3.2.4 Physical developer.
3.2.5 Small particle reagent.
3.2.6 Amido black.
3.2.7 Leucocrystal violet.
3.2.8 Fingerprint powder.
3.2.9 Potassium sulfate.
3.2.10 Dental stone.
3.2.11 Black printing ink.
3.2.12 Cyanoacrylate.
3.2.13 5-Sulfosalicylic acid.

3.3 Other equipment.

3.3.1 Sandbox with sand or diatomaceous earth.
3.3.2 Biofoam.
3.3.3 Potter's clay.
3.3.4 Carbon paper.
3.3.5 Roller transport film.
3.3.6 4 mil transparent polyester film.
3.3.7 Transparency film.
3.3.8 White poster board.
3.3.9 Electrostatic dust print lifter.
3.3.10 Calipers.
3.3.11 Magnifying glasses.

4.0 Safety

4.1 The chemicals and reagents used must be considered potentially hazardous. For safety, many must be used in fume hoods or with respiratory protection. Consult the material data safety sheets, and **read the safety information included in the appendix before proceeding.**

4.2 The preparation of tire test impressions frequently requires the examiner to crawl partially under the vehicle. Never rely solely on a jack to support a vehicle; use additional support. Do not attempt to jack up the vehicle on a sloping surface. The surface should be flat and smooth.

5.0 Document the evidence

5.1 Mark, photograph, and photocopy the items as necessary.

5.1.1 When digital images are received as evidence, the original image files are to be copied and any alterations or enhancements must be done using the copies. The original files are to be left in an unaltered condition. The copies should be saved as .tif files.

5.1.1.1A written or an electronic log of the various enhancement steps must be kept.

5.1.2 When evidence can only be recorded or collected by photography and the image itself is not recoverable, the photograph, negative, or digital file of the image must be treated as evidence.

6.0 Preliminary evidence examination and enhancement

6.1 Shoes, Tires

6.1.1 Trace or biological evidence.

6.1.1.1 Document if present, preferably with photography. Determine if the item(s) may have contributed characteristics noted in the impression evidence and/or casts.

6.1.1.1.1 Before proceeding, determine if biological evidence should be collected.

6.1.1.2 Trace evidence, such as small fragments of glass, may be left adhering to the footwear while test impressions are made. Consider the facts of the case and the potential significance of the trace.

6.2 Casts

6.2.1 Dental stone casts should be cleaned by soaking in saturated potassium sulfate for approximately one hour, then rinsed thoroughly. Plaster of Paris casts must not be soaked in water; detail will be lost. Plaster of Paris casts must be hand cleaned.

6.3 Digital images received from agencies.

6.3.1 Agencies should be discouraged from using low resolution digital photography in shoe and tire cases. When digital images are received as part of a case, the image files are to be copied and any enhancements must be done using the copies. The original files are to be saved in an unaltered condition, although .jpeg files may be saved as .tif files.

6.3.2 A written or an electronic log of the various enhancement steps should be kept.

6.4 Paper, dust impressions

6.4.1 Photograph with scale.

6.4.2 Electrostatic dust print lifter.

6.4.2.1 Lifts must be treated and stored as evidence.

6.4.3 Electrostatic detection apparatus (ESDA) processing.

6.4.3.1 Processed items must be treated and stored as evidence.

6.5 Other Two-dimensional impressions

6.5.1 Photographs.

6.5.1.1 35 mm film and/or digital imaging may be used as appropriate.

6.5.2 Specialized lighting.

6.5.3 Scan the impression into Photo Shop®

6.5.3.1 The history of image processing shall be preserved.

6.5.3.1.1 Printed or saved as a digital file in the case folder.

6.5.3.1.2 Preserved in the Photo Shop history log.

6.5.3.1.2.1 Set under "Preferences, History Log" in Photo Shop.

6.5.3.1.2.2 Processing data will be part of the image file.

6.5.3.2 Save the image file in .tif format.

6.5.4 Other enhancement, as required. The method chosen will depend on the nature of the evidence.
6.5.4.1 Photocopy.
6.5.4.2 Gelatin lift.
6.5.4.3 Adhesive lift.
6.5.4.4 Brush powdering.

6.6 Chemical enhancement. Consult MSDS for hazards and proper handling of these reagents. **Read the safety information included in the appendix before proceeding.** Techniques are listed here according to the composition of the impression and/or the surface it is on. The enhanced impression should be photographed.
6.6.1 Fatty, oily, organic materials
6.6.1.1 Iodine fuming, followed by spraying with 7,8 benzoflavone.
6.6.1.1.1 Non-destructive; additional techniques may be used following iodine.
6.6.2 Blood
6.6.2.1 Amido black.
6.6.2.2 Leucocrystal violet.
6.6.3 Soils
6.6.3.1 8-hydroxyquinoline.
6.6.3.2 Ammonium thiocyanate.
6.6.4 Paper, cardboard
6.6.4.1 Physical developer.
6.6.4.2 Small particle reagent.
6.6.5 Wet origin impressions; the shoe or the receiving surface was wet or damp.
6.6.5.1 Fingerprint powder.
6.6.5.2 Lift with Handiprint® or fingerprint tape.
6.6.6 Other recognized techniques may be utilized when appropriate. Consult the ISP Forensic Services Quality Manual for steps to be followed in utilizing a method not listed here.

7.0 Test Impressions
Test impressions are a valuable aid in the comparison process. They assist in the interpretation and identification of class and individual characteristics seen in the questioned impression.
7.1 Shoes
7.1.1 Fingerprint powder and white Handiprint®.
7.1.2 Fingerprint powder and transparent Handiprint®.
7.1.3 Black ink and dampened roller transport film.
7.1.4 Sandbox and photography.
7.1.5 Potter's clay.
7.1.6 Biofoam.
7.1.7 Inkless shoe print kit.
7.1.8 1:1 Overlays

7.2 Tires

The tires should be mounted on the vehicle. Photograph the vehicle and tires. On the test impressions mark the inside and outside of the tire, tire location on the vehicle, direction of rotation, and manufacturing information. Use a jack stand or equivalent to support a jacked-up vehicle. **Relying solely on a jack for vehicle support is dangerous.**

7.2.1 Black fingerprint ink, white poster board or white cardboard.
7.2.2 Vaseline and white poster board or white cardboard.
7.2.3 Black ink and dampened roller transport film.
7.2.4 Printing ink and 4 mil film.
7.2.4 Sandbox, photography equipment, casting materials.

8.0 Comparison

The actual comparison proceeds from the general (class characteristics) to the specific (individual characteristics). At any step, an unexplained difference between the known and the impression leads to elimination of the known as the source of the impression. If using photographs in the comparison, have 1:1 enlargements made.

8.1 The 1:1 enlargements are not made:

8.1.1 If immediate elimination of the shoe/tire is possible from available photographs, or if the impression is not of value.
8.1.2 If the ruler (scale) in the photographs is clearly incorrectly positioned.
8.1.3 If the submitted negatives are of unsatisfactory quality.
8.1.3.1 If working with jpeg (.jpg) digital photos save them in .tif format.
8.1.4 When using an overlay, ensure that the image is actual size.

8.2 Tires.

8.2.1 Tracing the design from the cast or photograph onto clear plastic may provide an aid in searching the tread design guides and/or the tread assistant software.
8.2.2 Tread design, width.
8.2.3 Noise treatment.
8.2.4 Mold-related characteristics.
8.2.5 General wear pattern.
8.2.6 Individual characteristics.

8.3 Shoes.

8.3.1 Outsole design.
8.3.2 Size.
8.3.3 Mold-related characteristics.
8.3.4 General wear pattern.
8.3.5 Individual characteristics.

9.0 Conclusions

9.1 Identifications and associations must be recorded in one or more of the following manners:

9.1.1 A photocopy of the test impressions marked with corresponding individual characteristics.

9.1.2 Photographs of the outsole/tread marked with corresponding individual characteristics.

9.1.3 Photograph of an impression marked with corresponding individual characteristics.

9.2 When appropriate, the results of a search for manufacturer brand names and descriptions based on the outsole or tread design of an impression may be reported.

9.2.1 The information would come from a database, a recognized catalog, or a retail outlet.

9.3 Examination of class and individual characteristics will lead to one of the following conclusions:

9.3.1 The impression is not suitable for a meaningful comparison.

9.3.1.1 The impression lacks class and individual characteristics.

9.3.2 The footwear/tire did not make the impression.

9.3.2.1 Class and/or individual characteristics of the footwear/tire and the impression are different.

9.3.3 The footwear/tire could have made the impression but others with similar characteristics cannot be excluded. Also acceptable: The shoe/tire cannot be excluded.

9.3.3.1 There is a lack of corresponding individual characteristics in the footwear/tire and the impression, but they share class characteristics.

9.3.4 An association exists between the impression and the footwear/tire, but there are insufficient individual characteristics to associate the footwear with the impression to the exclusion of all other shoes/tires.

9.3.4.1 The impression and the footwear/tires share class and some individual characteristics, but these characteristics are not sufficiently unique to allow an exclusive association between the impression and the shoe/tire.

9.3.5 The footwear/tire made the impression to the exclusion of all other shoes/tires.

9.3.5.1 The impression and the footwear/tire share confirmable class and random individual characteristics that could not be repeated on another shoe/tire with the same class characteristics.

10.0 Case File contents

Documentation must be sufficient to ensure that any qualified footwear and tire track examiner could evaluate what was done and replicate any comparisons.

10.1 Copies of photographs that were examined and/or used in the comparison process.

10.2 Photographs of submitted evidence and any photographs taken in the laboratory. Photographs should be labeled with the laboratory case number, date, and initials.

10.3 Original case notes.

10.4 Copies of correspondence.

10.5 The photo log.

10.6 Printout of the results of a computer shoe/tire database search.

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Appendix
Footwear/Tire Track Analytical Methods
Reagent Formulas

1. **Amido black**
Synonyms: Naphthalene black, Amido Black 10B, Amido Black 12B, or Napthol Blue Black
Blood Impressions/Non-porous surfaces

Theory: This is a dye that stains the protein portion of blood.

Reagents (three solutions): Dye solution: Amido black 0.2 g
Glacial acetic acid 10 ml
Methanol 90 ml

Rinse solution 1: Glacial acetic acid 10 ml
Methanol 90 ml

Rinse solution 2: Glacial acetic acid 5 ml
Methanol 98 ml

Application: Fix the impression with 5-sulfosalicylic acid.
Apply the dye solution, allow to react for about 2 minutes.
Apply rinse solutions, about 1 minute.

Quality assurance: Test against known blood. A blue-black color is a positive reaction.
The area surrounding the known blood should serve as a negative control.

Safety: For complete information consult the applicable MSDS. **Methanol**: The vapor mixes well with air, explosive mixtures are easily formed. **Amido black** is not a known carcinogen as of 5/2003. **Glacial acetic acid**: flammable liquid and vapor; health rating 3 (severe).

2. **Ammonium thiocyanate 2%**

Theory: Soluble deep red product with Fe^{+++} ions.

Reagent Preparation The following procedure produces a reagent that works well:
Mix 40 ml of acetone and 10 ml nitric acid. The mixture should be warm to the gloved hand but not hot. Allow time for cooling.
Dissolve 2 g ammonium thiocyanate in 50 ml of acetone.
Slowly add the ammonium thiocyanate/acetone mixture to the acetone/nitric acid; mix.
There may be a few bubbles formed; when these have cleared the reagent is ready for use.

There is no shelf life for this mixture; prepare just before use and discard.

Application: Spray with an open sprayer (not air tight). Use a fine mist or spray. The reaction
product is water-soluble; great care is required with non-absorbent surfaces.

Quality assurance: Spray a known mark made with iron salts. Red reaction indicates a

positive result. The area surrounding the mark should serve as a negative control.

Safety: Prepare and use the reagent in a fume hood. For complete information consult the applicable MSDS. **Ammonium thiocyanate:** MSDS lists it as incompatible with nitric acid Reacts with acid to liberate **hydrogen cyanide**. Harmful if absorbed thru skin. Not a known carcinogen as of 2/2004.

Nitric acid: Corrosive! Inhalation of vapors can cause breathing difficulties and lead to pneumonia and pulmonary edema, which may be fatal. Health rating: 4 (Poison).

Acetone: Extremely flammable; flash point -4° F (-20° C). Not a known carcinogen as of 5/04.

For safety, do not store or use in a closed container/sprayer. If in a closed container, gas pressure builds up and the container will rupture.

3. **Iodine**

Theory: impressions may contain materials that react with iodine.

Application Place iodine crystals in airtight chamber, along with the item to be fumed. A source of heat, approximately 37° C, and humidity must be included. The reaction should occur within a few minutes. Photograph the developed impression to preserve the enhancement.

Quality assurance: Test with a known oily print. The area around the print should serve as a negative control.
Safety: For complete information consult the applicable MSDS. Use in a fume hood.
Iodine: Health Rating: 3 - Severe (Life)/Reactivity Rating: 2 – Moderate (oxidizer)/Contact Rating: 3 - Severe (Corrosive) Causes burns to areas of contact.

4. **7,8-benzoflavone 0.2%**
Synonym: alpha-naphthoflavone
Iodine enhancement reagent

Theory: Absorbed by a range of organic materials after enhancement by iodine fuming.

Reagent preparation Dissolve 0.2 g 7,8-benzoflavone in 2 to 3 ml chloroform. Make up to 100 ml with petroleum ether.

Application: First fume the item with iodine crystals in a sealed tank. Follow with a 10-second dip in the benzoflavone reagent, or spray.

Quality assurance: Spray a known mark in starch. Positive result is a purple color.
The area surrounding the known starch mark should serve as a negative control.

Safety: For complete information consult the applicable MSDS. **Iodine:** Corrosive, toxic. Health rating (3) severe. Causes burns to areas of contact. Not a known carcinogen. **7,8-benzoflavone:** Irritant; not a known carcinogen as of 3/03. Mutagenic in experimental animals. **Chloroform:** Health rating 3 (poison). Investigated as a tumorigen, mutagen, and reproductive effector. Carcinogen.

5. **Cyanoacrylate or Super Glue**
Wet origin impressions

Theory: cyanoacrylate fumes adhere to impressions or to the surrounding substrate.

Application: Place the impression in an enclosed space with a container of water for humidity. The "super glue" may be placed on a mild heat source such as a coffee cup warmer, low wattage light bulb. Consult the references for exact methodology.

Quality control: Include a known latent print in the chamber. The print should develop. The area surrounding the known print should serve as a negative control.

Safety: For complete information consult the applicable MSDS. Skin contact may cause burns. Prolonged skin contact may result in dermatitis in sensitive persons. Will irritate eyes on contact. Vapors are potentially hazardous to persons wearing contact lenses; may bond the lenses to the cornea. Bonds skin rapidly and strongly. Generates hydrogen cyanide at temperatures above 200° C. Not a known carcinogen (2002).

6. **Dental stone**
Casting material

Preparation, shoe prints: The amount of water to be added to the dry powder is indicated by the manufacturer as milliliters of water/100 grams powder. Our pre-weighed bags of dental stone contain approximately 700 g powder. If no information is readily available, start with 7 ounces water/bag of powder, mix for 3 minutes. If the mixture is still too thick for easy pouring, add up to 15ml (1/2 ounce) additional water.

Preparation, tire tracks: Whenever possible, pour a long cast of the best portion of the impression, not exceeding three feet in length. For a three-foot cast, use 25 pounds dental stone mixed in a five gallon bucket with 120 ounces of water. The mixture should be the consistency of a thin pancake batter for pouring.

Quality assurance: not applicable. Ensure complete mixing.

Safety: For complete information consult the applicable MSDS. Causes irritation to skin, eyes and respiratory tract. May be harmful if swallowed. Health Rating: 1 – Slight. Flammability Rating: 0 – None. Contact Rating: 1 – Slight.

7. **Fingerprint Powders**
Smooth, waxed, polished, non-porous surfaces
Not suitable for porous or textured surfaces

Theory: Powder will adhere to the contact or non-contact areas of an impression.

Conventional powders.
Fluorescent powders, applied while using ALS/UV light.

Quality assurance: not applicable.

Safety: For complete information consult the applicable MSDS. Use in a fume hood.
Carbon black powder: Carbon black is designated a nuisance dust.
Black magnetic powder: Designated a nuisance dust. Neither carbon black nor black magnetic are listed as carcinogens (2003).
Fluorescent powders: Irritants. Consult the appropriate MSDS.

8. **8-Hydroxyquinoline**
Synonym: 8-Quinolinol

Theory: fluorescent chelates formed with certain metal ions such as Mg^{++} and Ca^{++}. Especially useful for raw wood surfaces.

Reagent preparation Dissolve 0.5 g 8-hydroxyquinoline with stirring in 100 ml 90:10 v/v acetone: water.

Application: Lightly mist the area of interest. View in 254 to 365 nm UV light.

Quality assurance: Test with known marks made with chalk dust. A purple fluorescence within the chalk indicates positive reaction. Lack of fluorescence in the surrounding area serves as a negative control.

Safety: For complete information consult the applicable MSDS. Use in a fume hood. **Hydroxyquinoline:** Health Rating: 1 – Slight/Contact Rating: 1 – Slight. **Acetone:** Health Rating: 2 - Moderate Flammability Rating: 3 - Severe (Flammable)/Contact Rating: 3 – Severe.

9. Leuco Crystal Violet

Theory: Hemoglobin, hemoglobin derivatives cause formation of crystal violet, a violet colored dye.

Reagent preparation
A. 10 g 5-sulfosalicylic acid in 500 ml 3% hydrogen peroxide. Use the bottle in which the hydrogen peroxide is purchased.
B. 1.1 g leucocrystal violet in a 60 ml bottle.
C. 4.4 g sodium acetate in a 60 ml bottle.

Working solution: Add approximately 30 ml of **A** to bottle **B**; mix. Pour the contents back into bottle **A.** Then add approximately 30 ml of **A** to bottle **C;** mix. Pour contents back into bottle A. Shake bottle A thoroughly. This is the working solution, which will last approximately three months if refrigerated.

Alternate method: 10 g 5-sulfosalicylic acid in 500 ml 3% hydrogen peroxide
Add 3.7 g sodium acetate
Add 1 g leucocrystal violet

Application: spray, soak impression, flood surface.

Quality control: Test with known blood spot. The area around the known blood spot should serve as a negative control.

Safety: For complete information consult the applicable MSDS. Sulfosalicylic acid: Health Rating: 1 - Slight/Contact Rating: 1 – Slight. **Hydrogen peroxide 3%**: Health Rating: 2 – Moderate/Contact Rating: 2 – Moderate. **Leucocrystal violet**: May cause respiratory and digestive tract irritation. May cause eye and skin irritation. Light sensitive. Air sensitive. The toxicological properties of this material have not been fully investigated. **Sodium acetate:** Health Rating: 1 – Slight/Contact Rating: 1 – Slight.

10. **Physical developer**
Porous surfaces, especially paper
May be used after iodine or ninhydrin processing

Theory: Reacts with fats, oils, waxes present in the impression.

Reagent: May be mixed in the laboratory, see Bodziak, 2nd edition, or purchased commercially. Use fresh solution only.

Application: Metal forceps, rubber gloves, or bare fingers may leave deposits on the item; handle with non-serrated plastic forceps or gloves. Processing involves a specific sequence of steps; check the references.

Quality control: Test with a known impression such as a fingerprint or an impression made by metal forceps; results in a silver-gray impression. The area around the known impression should serve as a negative control.

Safety: For complete information consult the applicable MSDS. Maleic acid: Causes severe eye irritation and possible burns. Contact Rating: 3 - **Severe** (Corrosive). Causes skin and respiratory tract irritation. May be harmful if swallowed or absorbed through the skin. May cause kidney damage. Not a known carcinogen. **Ferric nitrate:** Health Rating: 2 – Moderate.
Reactivity Rating: 3 - **Severe** (Oxidizer) Contact Rating: 2 – Moderate. Contact with other material may cause fire. Harmful if swallowed or inhaled. Causes irritation to skin, eyes and respiratory tract. Affects the liver. Not a known carcinogen (2003). **Ferrous ammonium sulfate:** Health Rating: 1 – Slight. Reactivity Rating: 0 – None. Contact Rating: 1 – Slight. Causes irritation to skin, eyes and respiratory tract. Harmful if swallowed or inhaled. Not a known carcinogen (2004). **Citric acid:** Health Rating: 1 - Slight Flammability Rating: 1 – Slight. Reactivity Rating: 2 – Moderate. Contact Rating: 3 – **Severe.** Causes severe eye irritation. Causes irritation to skin and respiratory tract. Not a known carcinogen (2004). **Silver nitrate**: Health Rating: 3 - **Severe** (Poison). Reactivity Rating: 3 - **Severe** (Oxidizer). Contact Rating: 3 - **Severe** (Corrosive). Poison! Corrosive. Causes burns to any area of contact.
May be fatal if swallowed. Harmful if inhaled. Strong oxidizer. Contact with other material may cause fire. Not a known carcinogen (2004). **N-dodecylamine acetate:** May cause skin irritation and/or dermatitis.
May cause allergic skin reaction. May cause irritation of respiratory tract. Not a known carcinogen (2004). **Synperonic N:** (ethoxylated nonylphenol). Severe eye irritant; may cause **tissue destruction**. Inhalation of mists may cause respiratory tract irritation. Avoid open flame, strong oxidizers and reducing agents. Not considered carcinogenic (2002).

11. 5-Sulfosalicylic acid for fixing bloody impressions

Theory: Chemical fixing ensures the bloody impression is not washed away during chemical enhancement. Fresh bloody impressions can be damaged or totally destroyed if not fixed.

Reagent preparation: 20 g 5-sulfosalicylic acid in 1-liter water.

Application: Immerse the item in the solution for 10 minutes; then immerse in distilled water for 5 minutes. Large areas such as floors may be sprayed.

Safety: For complete information consult the applicable MSDS. Sulfosalicylic acid: Health Rating: 1 - Slight/Contact Rating: 1 – Slight.

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Idaho State Police
Forensic Services
Impression Evidence

History Page
Footwear Impression Analytical Method

Revision #	Issue Date	History
1	3/29/02	Current methodology used by ISPFS
2	3/04	Listed ESDA (6.3) as a technique. Modified 6.3 and 6.4 regarding handling of lifts/results.
3	12/04	Modified wording of conclusions. Added digital imaging guidelines.
4	11/4/05	Modified 6.5.3.1, image history; 6.3.1 regarding low resolution digital imaging; 7.0 regarding overlays.
5	1/18/07	Modified 3.1.1.1, use of digital cameras; changed "SOP" to "Analytical Method"; added 10.0, case file contents; merged separate tire and footwear AMs into one; merged reagent formula appendix with the AM.

Approval:

Discipline Leader: _____ **Date:** _____
Randy Parker

Issuance:

QC Manager: _____ **Date:** _____
Alan Spanbauer