FOOTWEAR/TIRE TRACK PROCEDURE MANUAL EDITING & UPDATES

05/06/98 ASCLD reviewer's recommendations for changes added: QA/QC for reagents, expected results for comparisons.

06/23/98 Crime scene section added.

06/25/99 Shoe and tire manufacturer information added.

07/22/99 Some corrections of typos, tire track information added, new dividers, re-indexed.

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INDEX

Handling of footwear evidence.....1

Photography of impressions.....1,4

Physical lifting methods.....1,4

Chemical enhancement methods.....1,4

Substrate trouble shooting chart.....2

Test impression methods for shoes.....2

Footwear impression comparison outline.....2

Footwear impression conclusions.....3

Other information available from footwear impressions.....3

Handling of tire track evidence.....4,5

Test impression methods for tires.....5

Information needed for tire track test impressions.....5

Tire track impression comparison outline.....6

Tire track impression conclusions.....6,7

Other information available from tire track impressions.....7

Tire Sidewall Information.....8

General Tire Tread Information.....9

Tire Construction.....10

Crime scene procedures.....11

Reagent Formulas and Application Procedures.....13,14

APPENDICES

BIBLIOGRAPHY.....

FOOTWEAR IMPRESSION ENHANCEMENT LOG/CODES.....

FOOTWEAR DIAGRAMS.....

REFERENCES.....

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FOOTWEAR IMPRESSIONS

I. EVIDENCE DESCRIPTION:

A. Type of packaging.

B. Type of seal.

C. Description of contents.

D. Marking of items (depending on item).

II. TREATMENT OF QUESTIONED IMPRESSIONS:

A. None, if photographs and/or casts.

B. **Photography**

1. "As is" without scale or special lighting.

2. With scale and special lighting.

C. **Enhancement methods** (depending on type of impression)

1. **Physical**

a. Electrostatic dust lift.

b. Gelatin lift.

c. Adhesive lift.

d. Brush powdering.

e. Cascade powdering.

f. Magnetic powdering.

g. Small particle reagent.

2. **Chemical**

a. 8-hydroxyquinoline for Ca++, Mg++, Al+++, etc. in residues, and UV photography.

b. Ammonium thiocyanate for iron in residues.

c. Iodine fuming and 7,8 benzoflavone spray and photography for fatty, oily and other organic materials in residues.

d. Physical developer.

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e. Silver nitrate for chloride ions.

f. Antimony chloride for wet footprints on raw metal surfaces.

g. Ninhydrin for blood.

h. Amido black for blood.

i. Luminol for blood.

j. Crowle's staining solution for blood.

k. Tetramethylbenzidine for blood.

l. Leucomalachite green for blood.

Type of Substrate:

Soaks up water?	Yes	No: Use sprays & dips with care.
Texture?	Smooth	Rough: Powder with care.
Background?	Plain	Patterned: try transfer technique
Colored?	No	Colored: Determine color for enhancement sprays.
Dirty?	No	Yes: Try EDL to clean.

III. TEST IMPRESSIONS (as needed)

A. Fingerprint powder and white Handiprint.

B. Fingerprint powder and transparent Handiprint.

C. Black ink and dampened ROLLER TRANSPORT FILM.

D. Carbon paper.

E. Sandbox and photography.

F. Potter's clay.

G. Biofoam

IV. COMPARISON

A. Outsole design

1. Overall design.

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2. Mold-related characteristics.

B. Size

C. General wear

D. Specific wear-related characteristics.

V. CONCLUSION

A. If there is a difference in one or more of the following areas, the report will state that the shoes did not make the impression (or a variation on this wording):
   1. Outsole design.
   2. Size.
   3. Unexplainable variation in general wear pattern.
   4. Unexplainable variation in specific wear-related characteristics.

B. If the outsole design (size and /or general wear pattern may also be similar) is similar for the shoe or shoes and the questioned impression, the report will state that the shoe or shoes could have made the impression, but not exclusively (or other shoes with similar characteristics cannot be excluded), or a variation on this wording.

C. If the shoe and the questioned impression have similar outsole design, size (however limited an area is available for comparison) and have sufficient wear-related characteristics in common to make the analyst comfortable with calling a match, the report will state that the shoe made the impression to the exclusion of all other shoes (or a variation on this wording). General wear pattern may also be similar.

VI. OTHER INFORMATION

A. Comparison of impressions at different crime scenes (see report wording above):

   1. Same shoe made impressions.

   2. Same shoes could have made impressions.

   3. Not made by same shoes.

B. Shoe search for manufacturer brand names and descriptions based on outsole design.

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TIRE TRACK IMPRESSIONS

I. Evidence Description:

A. Type of packaging.

B. Type of seal.

C. Description of contents.

D. Marking of items (depending on item) with laboratory number, exhibit number and initials.

II. Treatment of Questioned Impressions:

A. None, if photographs and/or casts (but copies of all submitted photos and photographs of casts with scale are needed for the case file.

B. **Photography**

1. "As is" without scale or special lighting.

2. With scale and special lighting(if needed):
   a. Oblique lighting.
   b. Alternate light source.

C. **Enhancement methods** (depending on type of impression)

1. **Physical**

   a. Electrostatic dust lift.

   b. Gelatin lift.

   c. Adhesive lift.

   d. Brush powdering.

   e. Cascade powdering.

   f. Magnetic powdering.

   g. Small particle reagent.

2. **Chemical**

   a. 8-hydroxyquinoline for Ca++, Mg++, Al+++, etc. in residues, and UV photography.

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b. Ammonium thiocyanate for iron in residues.

c. Iodine fuming and 7,8 benzoflavone spray and photography for fatty, oily and other organic materials in residues.

d. Physical developer.

e. Silver nitrate for chloride ions.

f. Antimony chloride for wet footprints on raw metal surfaces.

g. Ninhydrin for blood.

h. Amido black for blood.

i. Luminol for blood.

j. Crowle's staining solution for blood.

k. Tetramethylbenzidine for blood.

l. Leukomalachite green for blood.

III. TEST IMPRESSIONS of tires on original vehicle

A. Vaseline/butcher paper method.

B. Black ink/poster board method.

C. Three dimensional method in sand.

D. Information needed from tire and vehicle:

a. All manufacturer info about tire model and size from side walls of tire.

b. DOT number from inside of tire near edge.

c. Mold number from inside of tire near rim.

d. Direction of rotation, if can be determined by investigator by "kick back" of dirt, witness observation, common sense, or other methods.

e. Inside/outside of tire, if it can be determined by the investigator by tire position, witness observation, common sense, or other methods.

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f. Start/stop of test impression by mark on tire and impression.

g. Which tire - left or right, front or back.

h. All information about make, model, year and license number of vehicle.

IV. COMPARISON

A. Tread design.

B. Tread width.

C. General wear.

D. Specific characteristics:

1. Determine manufacturer of tire from DOT number.
eg. DOT W2 L8 L0K 216
W2 - code for tire manufacturing plant.
L8 - manufacturer's code for tire size.
L0K- manufacturer's code for design characteristics.
216- week(21) and year(86 or 96) of tire manufacture

2. Contact company headquarters technical staff for mold drawings for specific tire(s).

3. From mold drawings, do pitch sequence or noise treatment for test impressions.

4. Determine noise treatment for casts and photographs.

5. Compare related areas of test impressions and question impressions.

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V. CONCLUSIONS

A. If there is a difference in on or more of the following areas, the report will state that a the tire did not make the impression (or a variation on this wording):
1. Tread design.
2. Tread width.
3. Unexplainable variations in studs.
4. Unexplainable variations in general wear pattern.

5. Unexplainable variations in specific wear-related characteristics.

B. If the tread design is similar (size and/or other characteristics may also be similar), the report will read that the tire could have made the impression, but not exclusively (or other tires with similar characteristics cannot be excluded), or a variation on this wording.

C. If the tire and the impression have similar tread design and sufficient specific wear-related characteristics in the same noise treatment section for the analyst to feel comfortable with calling a match (other characteristics such as tread width, studding and general wear pattern may also be comparable, and if so, must be similar), the report will state that the tire made the impression exclusively, to the exclusion of all other tires or a variation on this wording.

VI. OTHER INFORMATION

A. Comparison of impressions at different crime scenes based on the previously described characteristics.

B. What type and size of tire made impressions based on tread design and tread width.

C. Type of vehicle, i.e. truck or passenger vehicle based on tread design and tread width.

D. Specific model and year of vehicle if certain styles of tire are original equipment on a certain kind of vehicle.

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REAGENT FORMULAS AND APPLICATION METHODS

1. **8-Hydroxyquinoline (0.5%)**

Reagent
Dissolve 0.5 gm. 8-hydroxyquinoline, with stirring, in 100 ml 90:10 (v/v) acetone:water.

Application
Spray application. View in 254/365 nm UV light.

Theory
Fluorescent chelates formed with certain metal ions such as Mg^{2+} and Ca^{2+}.

Quality Assurance
Test with known marks made with chalk dust. A positive reaction would be purple fluorescence on the mark.

2. **7,8-benzoflavone 0.2%)**

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

Application
Fume with iodine crystals in a sealed tank. Follow with a 10-second 7,8-benzoflavone dip or spray.

Theory
Absorbed by a range of organic materials.

Quality Assurance
Spray a known mark in starch. A positive result would be a purple color.

3. **Ammonium thiocyanate (2%)**

Reagent
Dissolve 2 gm. ammonium thiocyanate in a mixture of 10 ml 2N nitric acid and 40 ml acetone. Make up to 100 ml with acetone.

Application
Spray application. Reaction product water soluble, so great care is required with non-absorbent surfaces.

Theory
Soluble deep red product with Fe^{3+} ions.

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Quality Assurance
Spray a known mark made with ferric salts. A positive result would be a red reaction with the mark.

4. **Silver nitrate (1%)**

Reagent
Dissolve 1 gm silver nitrate, with stirring, in 100 ml 90:10 (v/v) acetone:water. 1% solution is sufficient for **dipping** non-absorbent substrates.

Application
Dip for 10 to 15 seconds (preferred) or spray. Expose to UV light or sunlight to develop marks.

Theory
Photo-active precipitate formed with halide ions.

Quality Assurance
Spray a known mark in a potassium salt. A positive result would be a blue-gray color when developed.

5. **Leucomalachite Green**

Reagent
0.06 gm leucomalachite green (kept in dark at room temp)
0.2 gm sodium perborate
20 ml alcohol
10 ml glacial acetic acid
Wrap a stopper with parafilm, stopper flask tightly and shake vigorously for 1 minute. Add 100 ml Freon-113 (trichlorotrifluoroethane) or 1,1,1-trichloroethane. Mix well.

Application
Spray surface lightly 2 or 3 times, holding sprayer 14 inches or more from surface. Photograph developed prints because they will fade.

Theory
Gives a green reaction with blood. Doesn't color background and doesn't need to be destained.

Quality Assurance
Spray a known mark in blood. A positive result would be a green color.

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