Technical Procedure for Footwear Impression Examinations

1.0 Purpose - This procedure describes the method of comparing a questioned footwear impression to a known footwear impression and the conclusions that may be drawn as a result of the examination.

2.0 Scope - This procedure applies to items of evidence that are to be examined for the presence of footwear impressions.

3.0 Definitions

- **Class characteristics -** An intentional or unavoidable characteristic imparted to an outsole during the manufacturing process. These characteristics repeat and are shared by more than one (1) shoe. These characteristics include, size, shape, outsole design, pre-determined nail holes, and any mold characteristics that appear in more than one (1) outsole.
- **Individual characteristics -** Cuts, wear, tears, holes, randomly placed nails, and other characteristics that are imparted to an outsole as a result of general wear. These characteristics, also called accidental characteristics, are unique to a particular outsole.
- **General wear characteristics -** Change of an outsole as a result of general wear and tear acquired as an outsole interacts with the walking surface.

4.0 Equipment, Materials and Reagents

4.1 Equipment and Materials

- Known footwear and/or known footwear standards
- Ruler

4.2 Reagents - N/A

5.0 Procedure

5.1 Conduct a visual examination using the clear acetate overlay of the known footwear (footwear standard), the known footwear and the questioned impression. If the impression is of a different outsole design than the known footwear, the known footwear can be eliminated as the source of the questioned impression and the examination is complete. Correspondence of this class characteristic (outsole design) dictates that the examination continues.

5.2 The footwear standard is then placed directly over the questioned impression (cast, photograph, or lift of a hard surface footwear impression) and visually compared to determine if the size, outsole elements, and general wear characteristics correspond to the known footwear standards.

Note: When the questioned footwear impression is submitted as a cast, a gelatin lifter, or an electrostatic dust lift, any photographs of the impressions or the known footwear standards must be reversed in order to compensate for the lifted orientation of the evidence.

5.3 If the class and general wear characteristics correspond, an in-depth examination of the questioned footwear impression is conducted to locate any unique, identifying characteristics that may be present within the impression. The known footwear, footwear standard and questioned impression are also examined for the presence of any unique characteristics. The unique characteristics present are then compared.

5.4 The Forensic Scientist shall then determine if the unique identifying characteristics present in both the questioned footwear impression and the known footwear are significant and sufficient to effect a positive identification. Identification indicates that the questioned footwear impression was made by a particular shoe to the exclusion of all others.

Note: A lack of unique identifying characteristics or insufficient characteristic significance does not eliminate the known footwear from having made a questioned footwear impression. A conclusion of *could have made* will then be rendered. The Forensic Scientist shall include the following statement in the report: *due to the lack of detail within the questioned footwear impression a more positive association could not be made* (See Section Technical Procedure for Writing Results Statements 5.2.5).

5.5 A copy of the questioned footwear impression(s) and the known footwear standards shall be retained in the object repository.

5.6 Standards and Controls - N/A

5.7 Calibration - N/A

5.8 Sampling - N/A

5.9 Calculations - N/A

5.10 Uncertainty of Measurement - N/A

6.0 Limitations - N/A

7.0 Safety - N/A

8.0 References

Adair, T. and M. Dobersen. "Lifting Dusty Shoe Impressions from Human Skin: A Review of Experimental Research from Colorado." *Journal of Forensic Identification*. Vol. 56, 3: 333 – 338 (2006).

Adair, T.W., et al. "The Mount Bierstadt Study: An Experiment in Unique Damage Formation in Footwear." *Journal of Forensic Identification.* Vol. 57, 2: 199 – 205 (2007).

Alexandre, G. "Computerized Classification of the Shoeprints of Burglars' Soles." *Forensic Science International.* (1996): 59-65.

Ashley, W. "What Shoe Was That? The Use of Computerised Image Database to Assist in Identification." *Forensic Science International.* (1996) 7-20.

Belcher, G.L. *Methods of Casting and Latent Print Recovery.* 14-15.

Black, J.P. "An Interesting Case Involving Footwear Distribution Information." *Journal of Forensic Identification.* Vol. 55, 4: 499 – 501 (2005).

Bodziak, W. "Use of Leuco Crystal Violet to Enhance Shoe Prints in Blood." *Forensic Science International.* (1996): 45-52.

Bodziak, W.J. *Footwear Impression Evidence.* CRC Press, New York (1990).

Bodziak, W.J. *Footwear Impression Evidence.* 2nd Edition. CRC Press, New York (2000).

Bodziak, W.J. *Lifting a Footwear Impression from a Hard Surface.* FBI Laboratory (Apr. 1984).

Bodziak, W.J. "Manufacturing Processes for Athletic Shoe Outsoles and Their Significance in the Examination of Footwear Impression Evidence." *Journal of Forensic Sciences.* Vol. 31, 1: 153-176 (1986).

Bodziak, W.J. "Shoe and Tire Impression Evidence." *FBI Law Enforcement Bulletin.* (July 1984): 1-11.

Bodziak, W.J. *Casting a Footwear or Tire Impression with Dental Stone.* 1-3.

Bodziak, W.J. and L. Hammer. "An Evaluation of Dental Stone, Traxtone, and Crime-Cast." *Journal of Forensic Identification.* Vol. 56, 5: 769 – 787 (2006).

Boyd, F.M. *Shoe Box and Side Labeling: A Most Valuable Piece of Evidence When Shoes are Missing.* Broward County Sheriff's Office, 1-4.

Brundage, D.J. *Physical Developer: A Chemical Enhancement Technique for Footwear Impressions.* Illinois State Police. (1994): 1-7.

Carlsson, K. and C.A. Maehly. "For Securing Impressions of Shoes and Tyres on Different Surfaces." *International Criminal Police Review.* (June-July 1976): 158-167.

Cassidy, M.J. *Footwear Identification.* Lightning Powder Company, Oregon (1995).

Cheskin, M.P. *The Complete Handbook of Athletic Footwear*. Fairchild Publications, New York (1987).

Davis, R. J. "Electrostatic Lifting." *Fingerprint Whorld.* (April 1984): 113.

Davis, R. J. "An Intelligence Approach to Footwear Marks and Toolmarks." *Journal of the Forensic Science Society.* Vol. 21: 183-193.

Davis, R.J. "Current Perspectives in Footwear Identification." *Identification News.* (Oct. 1986): 8 – 11.

DeHaan, J.D. *Footwear Evidence – An Update.* BATF Forensic Lab.

Dinkins, L.S. *Development and Enhancement of Footwear Impressions on Non-Porous Surfaces Using Refrigeration and Cyanoacrylate Fuming.* U.S. Army Criminal Investigation Laboratory.

Doller, D.W. *Interpretations of Shoe and Tire Impressions at the Crime Scene.* Suffolk County Crime Laboratory, 1-16.

Drexler, S.G. *Test Impressions of Footwear Outsoles Using Biofoam.*

Facey, O.E., et al. "Shoe Wear Patterns and Pressure Distribution Under Feet and Shoes, Determined by Image Analysis." *Journal of the Forensic Science Society.* Vol. 32, 1: 15-24 (1992).

Footwear Construction: Methods of Identification. American Footwear Industries Association. 1-12.

Freels, R.H. *Improved Test Impressions and Prints.* Kentucky State Police.

Geller, J. "Casting on Road Surfaces." *Journal of Forensic Identification.* Vol. 40, 5: 279 – 282 (1990).

Geller, J. *Dental Stone Verses Plaster of Paris.* 74th Annual Educational Conference, IAI. (June 1989): 1-4.

German, E.R. "A Microscopic Footwear Identification on Cloth." Fingerprint Whorld.

Hamm, E. "Chemical Developers in Footwear Prints." *Fingerprint Whorld.* (1984): 117-120.

Hamm, E.D. "Tire Tracks and Footwear Identification." *Identification News.* (January 1975): 3 – 6.

Hamm, E.D. "Track Identification: An Historical Overview." *Journal of Forensic Identification.* Vol. 39, 6: 333 – 338 (1989).

Heafner, H.J. *Demonstrative Evidence Preparation, Use and Effectiveness of Trial Exhibits for Courtroom Presentation.* 1-12.

Hebrard, J., et al. "Experimental and Comparative Study of New Casting Materials." *International Symposium of the Forensic Aspects of Footwear and Tire Impression Evidence.* (1994): 1-3.

Hilderbrand, D.S. "Using Manufacturing Companies to Assist in Footwear Cases." *Journal of Forensic Identification.* Vol. 44, 2: 130-132 (1994).

Hilderbrand, D.S. *Footwear, The Missed Evidence.* Staggs Publishing, California (1999).

Hueske, E.E. "A Superior Method for Obtaining Test Prints from Footwear and Tires." *Journal of Forensic Identification.* Vol. 41, 3: 165-167 (June 1991).

Hueske, E.E. "Photographing and Casting Footwear/Tire Track Impressions in Snow." *Journal of Forensic Identification.* Vol. 41, 2: 92-95 (April 1991).

Ineichen, M. and P.W. Pfefferli. *The Discriminating Power of a Computerized Shoeprint Reference Collection System.* Zurich Canton Police (1994).

"Information Bulletin for Shoeprint/Toolmark Examiners." *Proceedings of the European Meeting for Shoeprint/Toolmark Examiners.* National Bureau of Investigation, Finland. Vol. 6, 1 (2000).

"Information Bulletin for Shoeprint/Toolmark Examiners." *Proceedings of the European Meeting for Shoeprint/Toolmark Examiners.* National Bureau of Investigation, Finland. Vol. 4, 1 (1998).

Kainuma, A. "Manufacturing Variations in a Die-Cut Footwear Model." *Journal of Forensic Identification.* Vol. 55, 4: 503 – 517 (2005).

Keijzer, J. "Identification Value of Imperfections in Shoes with Polyurethane Soles in Comparative Shoe Print Examination." *Journal of Forensic Identification.* Vol. 40, 4: 217 – 223 (1990).

Laskowski, G.E. An Improved Technique for the Visualization of Footprint Impressions in the Insoles of Athletic Shoes. *Journal of Forensic Sciences.* Vol. 32, 4: 1075-1078 (1987).

Laskowski, G.E. and V.L. Kyle. "Barefoot Impressions – A Preliminary Study of Identification Characteristics and Population Frequency of Their Morphological Features." *Journal of Forensic Sciences.* Vol. 33, 2: 378-388 (1988).

Majamaa, H. and E.D. Hamm. "Using the ESDA to Detect Dusty Shoe Prints." *Journal of Forensic Identification.* Vol. 41, 6: 421 – 425 (1991).

Mankevich, A. *The Determination of Shoe Size in Out-of-Scale Photographs.* Maryland State Police, 1-19.

Mikkonen, S., V. Suominen and P. Heinonen. "Use of Footwear Impressions in Crime Scene Investigations Assisted by Computerised Footwear Collection System." *Forensic Science International.* (1996): 67-79.

Miller, J. E. "Enhancing Footwear Casts." *Journal of Forensic Identification.* Vol. 43, 1: 13-19 (1993).

Morgan-Smith, R.K., D.A. Elliot and H. Adam. "Enhancement of Aged Shoeprints in Blood." *Journal of Forensic Identification.* Vol. 59, 1: 45 – 50 (2009).

Natarajan, N. and G.M. Cecil Ranjit. "Computer Assisted Analysis of Footprint Geometry." *Journal of Forensic Identification.* Vol. 55, 4: 489 – 497 (2005).

Navarro, R.L. *The Collection, Preservation, and Examination of Footwear and Tire Track Impressions* (Aug. 1987).

Nayar, P.S. and Das S.K. Gupta. "Personal Identification Based on Footprints Found on Footwear." *International Criminal Police Review.* (March 1979): 83-87.

Olsen, R.D. *Need for Defining Nomenclature of Class and Individual Characteristics.* Kansas Bureau of Investigation. 1-23.

Pasquier, Du E., et al. "Evaluation and Comparison of Casting Materials in Forensic Sciences Applications to Tool Marks and Foot/Shoe Impressions." *Forensic Science International.* (1996): 33-43.

Plaster Casting. Northern Illinois Police Crime Laboratory.

Preservation and Identification of Shoe and Tire Impressions. North Carolina State Bureau of Investigation.1-5.

Robbins, L.M. *Footprints: Collection, Analysis, and Interpretation.* Thomas Books, Illinois (1985).

Rousseau, L.J. *Reference File of Tread Designs on Athletic Shoes.* Florida Department of Law Enforcement, (Jan. 1985).

Shane, C.M. "Novel Means of Identifying Footprints Admissible." *The Criminal Law Reporter* (1984).

Shoe Factory Buyers Guide. Shoe Trader's Publishing Company. Massachusetts (1984).

Shoediction. American Footwear Industries Association. 1-30.

Steigmann, J.P. *An Inexpensive Latent Fingerprint, Footprint, Shoeprint, and Tire Mark Lifter.* 13.

Stone, R.S. *Mathematical Probabilities in Footwear Comparisons.* Albuquerque Police Department. 1-4.

"Tips on Making Casts of Shoe and Tire Prints." *FBI Law Enforcement Bulletin.* (Oct. 1963): 1-5.

"Tire 'Footprints' Help Solve Homicide Cases." *Law and Order*. (Dec. 1981): 36-39.

Vandiver, J.V., and J.H. Wolcott. "Identification of Suitable Plaster for Crime-Scene Casting." *Journal of Forensic Sciences.* (1977): 607 – 614.

Vanhoven, H. *A Correlation Between Shoeprint Measurements and Actual Sneaker Size.* Monroe County Public Safety Laboratory. 1-12.

Von Bremen, A. "The Comparison of Brake and Accelerator Pedals with Marks on Shoe Soles." *Journal of Forensic Sciences.* Vol. 35, 1: 14-24 (1990).

Walker, S.A. *Sneakers.* Scholastic Book Services/Workman Publishing Company, New York (1978).

Wolner, M.F. *Black Powder – Cotton Development of Latent Footwear Impressions.* Michigan State Police Laboratory.

Wyatt, J.M., K. Duncan and M.A. Trimpe. "Aging of Shoes and its Effect on Shoeprint Impressions." *Journal of Forensic Identification*. Vol. 55, 2: 181 – 188 (2005).

9.0 Records - N/A

10.0 Attachments - N/A

Revision History		
Effective Date	Version Number	Reason
09/17/2012	1	Original Document