

# DAUBERT/KUMHO CRITERIA-FOOTWEAR IMPRESSION EXAMINATION

Prepared by: Cynthia D. Homer MS, D-ABC  
Forensic Scientist  
Maine State Police Crime Laboratory  
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## 1. Have the THEORIES AND TECHNIQUES been TESTED?

### A. Theory:

Definition of terms:

**Class characteristics:** Characteristics that repeat during the manufacturing process and are shared by one or more shoes. These characteristics include: size, design, pattern and mold defects. Class characteristics reduce the number of shoes from every shoe in the world to a group of similar shoes sharing the same size, design, pattern, etc.

**Individual characteristics:** Unique, random damage on the outsole that is a result of its use and wear. New shoes have no wear but as they are used they begin to develop wear as a result of friction between it and the surface on which it comes into contact. The outsole also acquires nicks and scratches as a result of the surfaces and objects to which it comes into contact. These nicks and scratches are in the outsole in a completely random shape, orientation and position.

The theory behind footwear impression evidence examination is:

- The sole (outsole) of an article of footwear experiences damage (wear, accidental damage) as it is worn and used.
- When that sole comes into contact with a receptive surface, it can leave an impression on that surface.
- That impression is a representation of that sole and the characteristics of and on that sole.
- That impression (the unknown or crime scene impression) can be located and collected.
- That unknown impression can be compared to the sole of an article of footwear and an impression of that sole (the known impression).
- Given sufficient quality and size (quantity) of an unknown impression, it can be compared to a known impression and:
  - Differences in size can be observed between the unknown and known.
  - Differences in molds (used to make the sole) can be observed.
  - Differences in wear can be observed
  - Differences in random markings/damage can be observed.
  - Differences can be evaluated and the significance weighed.
  - An identification of the source footwear or an elimination can be made given an evaluation of the above information.

In other words:

An identification can be reached (a conclusion of individuality). It can be said that “this article of footwear is the source of that impression” or “this article of footwear was not the source of that impression.”

### B. Techniques:

Techniques employed in locating and collecting footwear impression evidence have been described in numerous articles and books. The standard techniques in the field include: photography, electrostatic dust lifting, gel lifts, adhesive lifts, casting, etc.

The methodology employed in footwear impression examination and comparison is “ACE-V” (Analysis-Comparison-Evaluation-Verification”). This methodology has been described in numerous articles and books and encompasses several of the comparison sciences (fingerprints, footwear and tiremarks).

### **Examination Methodology: (“ACE-V”)**

1. **Analysis:** The unknown (crime scene) impression is examined to determine if it is of sufficient quality and there is enough of the impression (quantity) to be used in a comparison. In other words, an analysis of the unknown impression is conducted to determine if there is enough information present in the impression to make it of value for a comparison.

The analysis includes consideration of any factors that might interfere with a comparison such as:

- Substrate: the surface on which the impression was left (wood, paper, wall, carpet, etc.) and whether that could contribute to the presence of an excessive background, contamination or distortion in the impression.
- Matrix: the material out of which the impression was made (bloody, greasy, dusty, dirty shoeprint)
- Development media: how the impression was developed and captured (gel lift, photography, etc.)
- Distortion: the presence of any distortion in the impression (ie. smearing) caused by deposition pressure or pressure distortion.

The known footwear is then examined to determine if it is of sufficient quality and quantity to be used in a comparison. The analysis includes consideration of any factors that might interfere with a comparison. During which time the following is considered, not necessarily in this order:

- The presence of any immediately eliminating characteristics such as it having a different pattern than that of the unknown (crime scene) impression.
- The presence of any contamination on the sole
- The presence of wear and accidental damage on the outsole.

If the pattern of the sole of the known footwear appears similar to the unknown impression and the sole is suitable for comparison, a test impression of the known outsole is made.

Something to consider is how much time has passed since the deposition of the unknown impression and the seizure of the known footwear. Additional damage and wear can occur to the known footwear if it is used between the time of unknown impression was made and the time at which the known shoes were collected.

2. **Comparison:** There are generally two forms of comparison:

The first comparison is that of class characteristics. If class characteristics are shared between the unknown impression and the known shoe then the next stage in the comparison is to compare accidental characteristics.

It is standard examination procedure to compare like to like. In other words, compare a two-dimensional impression with a two-dimensional impression and a three-dimensional impression with a three-dimensional impression. However, sometimes the nature of the evidence prevents this.

- **Side-by-Side Comparison:** The examiner is looking at the known, the test impression of the known, and the unknown impression to determine if the characteristics observed on the impressions are characteristics that are also on the known.
- **Superimposition Comparison:** A translucent overlay of the test impression is superimposed over a natural size representation of the unknown. This natural size representation could be a photograph enlarged to natural size, a cast or a lift. The characteristics observed in the unknown impression are compared to those observed in the overlay of the known test impression.

Typically both procedures are used during a comparison. For each characteristic observed during the superimposition comparison, the examiner goes back to the known and verifies that there is something on/in the known that would/could be responsible for the characteristic observed on the impression(s). For example: is there a rock, scratch, or damaged area on the known that could cause the defect seen on the impression?

3. **Evaluation:** All the information gathered during the analysis and comparison phases of the examination is taken into account and a conclusion as to association between the unknown and the known is drawn.

The Analysis-Comparison-Evaluation phases are a dynamic investigation process. Meaning, there is constant evaluation as to the significance of each characteristic observed in the analysis and comparison phases. Knowledge of the significance of what is observed comes from experience and training.

The significance of a characteristic depends on the characteristic. What could appear to be an accidental, random characteristic on the outsole could actually be a defect from manufacturing so multiple outsoles might share the same characteristic (class characteristics). It is therefore important for the examiner to have knowledge of the different manufacturing processes and how they might effect the outsole characteristics.

Individualization is established by finding agreement of corresponding individual (accidental and random) characteristics of such number and significance as to preclude the possibility of their having occurred by mere coincidence and establishing that there are no differences that cannot be accounted for.

4. **Verification-** As established and accepted within the latent print field, 100% of all identifications in the Latent Print Section of the Maine State Police Crime Laboratory are verified by another qualified examiner. This ensures quality control of the examination process and maintains and enforces the scientific standards accepted in the latent print field.

## **TESTING:**

The theory that a footwear impression can be identified to an article of footwear given sufficient quality and quantity has been tested and affirmed in many ways. In class or training exercises, it is tested when everyone sees the same things and comes to the same conclusions. It is tested and affirmed in every case examined. It is tested every time an examination is performed and the results are verified. The verification process tests the techniques and methodology and ensures that they work. Another form of testing occurs through experimentation and research in attempts to replicate the scene impression to explain why something may have occurred or why the impression appears as it does.

## **2. Do the techniques employed have a known ERROR RATE?**

The ACE-V methodology has an error rate of zero. The shoe either made the impression or it did not (there are situations in which the clarity or the quantity of the crime scene impression precludes a positive identification or elimination. At times, depending on the crime scene impression, only a class association can be established between the crime scene impression and the known shoe). The reliability of the method used in footwear impression examination (or any scientific examination) is evidenced by the fact that the results are repeatable from one examiner to the next. Repeatability is witnessed in technical review of case work, verification of results in case work, training exercises, internal competency tests and external proficiency tests.

Any “error” that does occur is because an individual examiner failed to appropriately apply the techniques and methodology and therefore came to an erroneous conclusion. Adequate and appropriate training, training exercises, internal competency tests and external proficiency tests teach the examiner the examination methodology and ensures the appropriate use of the methodology. Again, the reliability in the methodology is evidenced by its repeatability, therefore any examiner error is detected in the “Verification” stage of the overall methodology. In addition, evidence is always available to be examined by another qualified footwear examiner.

The Maine State Police Crime Laboratory is accredited by the American Society of Crime Laboratory Directors-Laboratory Accreditation Board (ASCLD-LAB). Accreditation means agreeing to prescribe to standards established by an outside governing board and opening the laboratory for full examination by that Board. ASCLD-LAB requires yearly proficiency testing in the different laboratory disciplines. All members of the Latent Print Section of the laboratory undergo yearly proficiency testing in the disciplines in which they are trained.

## **3. Are there universally accepted STANDARDS governing their application?**

In footwear impression examinations, the standard used during the examination is the known shoe and the known test impression. A representation of the outsole pattern is made from a known piece of footwear and this is the standard by which the other impressions are compared. Typically multiple test impressions are made in order to fully represent the accidental characteristics on the outsole as well as to attempt to recreate the appearance of the crime scene impression to better understand why it appears as it does. Proper test impressions record all of the features of the outsole including size, design, shape, wear and random or individual characteristics. The comparison looks for associations between the questioned (or crime scene) impression and the known impression and shoe.

It is standard examination procedure to compare like to like. In other words, compare a two-dimensional impression with a two-dimensional impression and a three-dimensional impression with a three-dimensional impression. However, sometimes the nature of the evidence prevents this.

The standard methodology in use in the impression sciences is the “ACE-V” methodology. The ACE methodology of Analysis-Comparison-Evaluation is a scientific and systematic way of examining an impression and gathering information. It takes into account all the information present in the unknown impression and the known impression. ACE takes into consideration not only the presence of a characteristic but it’s shape, size, orientation and position in relation to other characteristics observed on the unknown impression and in relation to characteristics observed in the known footwear impression (the test impression) and the known article of footwear.

Footwear impression examination is done the same way in over 35 foreign countries.

#### 4. Do the theories and techniques employed enjoy WIDESPREAD ACCEPTANCE?

- Footwear identification was first accepted in court in the Richardson case in Scotland in 1786.
- Footwear impression evidence and testimony have been accepted in US courts since the 1930's.
- The techniques and methods used in footwear impression examination are widely accepted in the forensic science community and the ACE-V methodology is described in numerous forensic journals and at numerous seminars throughout the world.
- Footwear impression evidence is routinely accepted in courts in the US, Canada and Europe.

As of 2004, the International Association for Identification has active members in over 40 countries including: Argentina, Australia, Azerbaijan, Bahamas, Bahrain, Bangladesh, Barbados, Belgium, Bermuda, Bosnia/Herzegovina, Brazil, Bulgaria, Canada, Cayman Islands, China, Croatia, Denmark, El Salvador, Finland, France, Germany, Great Britain, Greece, Hong Kong, Hungary, Iceland, India, Ireland, Israel, Italy, Jamaica, Japan, Jordan, Korea, Kosovo, Lithuania, Macau, Mauritius, Mexico, Netherlands, Netherlands Antilles, New Zealand, Nicaragua, Northern Ireland, Norway, Oman, Pakistan, Panama, Philippines, Portugal, Puerto Rico, Qatar, Russia, Saudi Arabia, Seychelles, Singapore, Slovenia, South Africa, Spain, Sri Lanka, Sultanate of Oman, Sweden, Switzerland, Taiwan, Thailand, Trinidad and Tobago, Turks and Caicos Islands, United States of America, Uruguay, Yugoslavia.

#### 5. Have the theories and techniques been subjected to PEER REVIEW AND PUBLICATION?

- A. Five books have been written dealing exclusively with the examination of footwear evidence:
- Abbott, John "Footwear Evidence" Charles C. Thomas Publishing, 1964
  - Cassidy, Michael "Footwear Identification" Canadian Government Publishing, 1980
  - Bodziak, William "Footwear Impression Evidence: Detection, Recovery and Examination" 1<sup>st</sup> ed. Elsevier Science Publishing Co., 1990
  - Hilderbrand, Dwane "Footwear, The Missed Evidence" Staggs Publishing Co., 1999
  - Bodziak, William "Footwear Impression Evidence: Detection, Recovery and Examination" 2<sup>nd</sup> ed. CRC Press, 2000
- B. Books that cover the examination of footwear evidence include:
- Fisher, Barry "Techniques in Crime Scene Investigation" 6<sup>th</sup> ed. CRC Press, 2002
  - Deforest, Peter; Gaensslen, Robert; Lee, Henry "Forensic Science-An Introduction to Criminalistics" McGraw-Hill, 1983
  - Kiely, Terrence "Forensic Evidence: Science and the Criminal Law" CRC Press, 2001
- C. Articles on footwear impression examination have been published in numerous peer-reviewed journals including:
- "*Journal of Forensic Identification*"
  - "*Identification Canada*"
  - "*Journal of Forensic Science*"
  - "*Journal of Canadian Society of Forensic Science*"
  - "*Information Bulletin for Shoeprint/Toolmark Examiners*" (European)
  - "*FBI Law Enforcement Bulletin*"
  - "*Forensic Science Communications*"
  - "*Science and Justice*" (UK)
  - "*Association of Firearms and Tool Marks Examiners Journal*"
  - "*Journal of the Indian Academy of Forensic Sciences*" (India)
  - "*Journal of Legal Medicine*"
  - "*International Criminal Police Review*"

*“The Police Journal”* (Great Britain)  
*“Journal of the Forensic Science Society”* (Great Britain)  
*“R.C.M.P. Gazette”* (Canada)  
*“Report of National Institute of Police Science”* (Japan)  
*“Forensic Science International”*  
*“La Police Scientifique”* (France)  
*“Journal of Criminal Law and Criminology”*  
*“Kriminalistik”* (Germany)  
*“Annals of Physical Medicine”*  
*“Fingerprint Whorld”* (Great Britain)  
*“Fingerprint and Identification Magazine”*

D. There are numerous presentations on footwear impression examination given at numerous Forensic Science meetings such as:

International Association For Identification  
Regional Divisions of International Association For Identification  
American Academy of Forensic Science  
FBI International Symposium on Footwear and Tiretread Evidence (1994)  
Canadian Identification Society  
International Association of Forensic Science  
European Shoeprint/Toolmark Association  
European Network of Forensic Science Institutes  
European Meeting of Shoeprint/Toolmark Examiners  
European Meeting of Forensic Science

E. A Footwear Certification program is available through the International Association For Identification.

F. Laboratory accreditation is available through the American Society of Crime Laboratory Directors-Laboratory Accreditation Board. All or many of the conclusions of footwear examiners in accredited labs are subject to peer review. The Maine State Police Crime Laboratory is an accredited laboratory and according to the Latent Print Section Protocol on Impression Evidence Examination, all footwear cases examined are peer reviewed.