

Article

Determining the Significance of Outsole Wear Characteristics During the Forensic Examination of Footwear Impression Evidence

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Abstract: This paper will define terms used in the forensic footwear examination and comparison of outsole wear, summarize past research in the area of wear, and discuss the various considerations that should be taken into account when evaluating general wear in casework comparisons. Considerations include factors that limit clarity of the impression, manufactured characteristics, and time intervals between when the impression was deposited and when the shoes were seized. A variety of general wear is encountered in footwear casework and can be used to limit the population of shoes that could have made the impression. However, general wear may appear similar on shoes of the same person and between shoes belonging to different people and therefore general wear alone should not be used to identify a shoe as the particular source of an impression. A survey conducted as part of this project indicates that general wear is not used to individualize footwear impressions by the international community of footwear examiners.

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Introduction

Wear, in the simplest description, is *the gradual erosion of the shoe's outsole material that occurs during contact with the substrate*. This erosion is due to friction, which, over time, results in the elimination and degradation of portions of the outsole material. When that happens, the appearance of the outsole changes (Figure 1).

Wear should be considered in all footwear examinations in the same manner as design, physical size, and individual characteristics. In some cases, general wear may allow for exclusion of the footwear. In other cases, correspondence of general wear between the questioned impression and the shoe will contribute to reducing the population of shoes that could have made an impression. In other instances, the wear features may be too subtle or simply may not be present with sufficient clarity to enable their reliable use in an examination.

Erosion of the shoe's outsole is influenced by many factors, including but not limited to the way a person stands and walks; the amount of time the shoe has been worn; the surfaces over which the shoe passed; the type of soling material; the weight and flexibility of the wearer; and whether the footwear is used for jogging, walking, tennis, or just everyday usage. These and other factors influence the degree and position of wear on the shoe outsole. As the shoe continues to be worn, general wear continues to increase. For the footwear examiner, it is not important, nor is it possible, to determine the combination of factors that contributed to the wear on a well-worn shoe, but rather it is the goal of the examination to determine the level of correspondence of the position and degree of wear to the crime scene impression.

Although the precise location and degree of wear varies considerably among the population, even in those cases of extensive general wear, sufficient uniqueness does not exist to allow for individualization based on general wear alone (Figure 1). Important factors for the proper evaluation of general wear in a forensic comparison include the proper use of terms; an understanding of the significance of wear including background information and research, manufacturing issues, time intervals between the crime and seizure of the shoes; and any other limitations or considerations of distortion or degradation as a consequence of both the impression making and the recovery process.

Terminology

To aid in defining and discussing the topic of wear and to assist in expressing observations and conclusions, a standard set of terminology recommended by the Scientific Working Group for Footwear and Tire Track Evidence (SWGTTREAD) [1] is included:

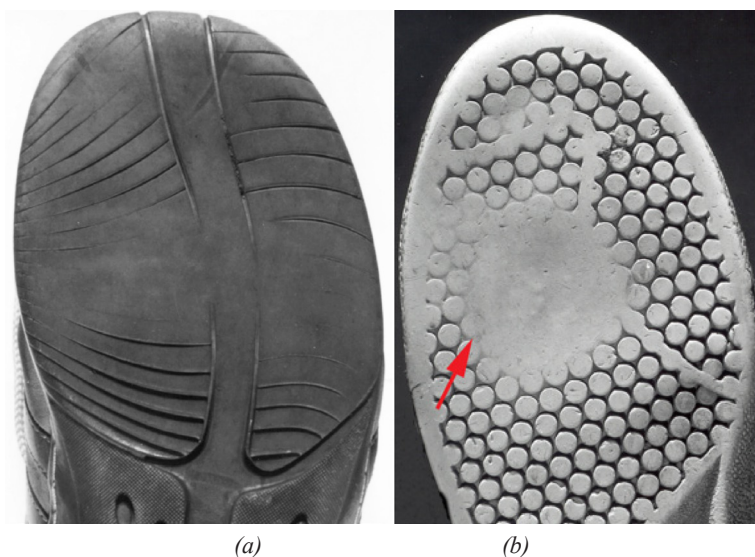
Class Characteristics: A feature that is shared by two or more shoes or tires. The shoe outsole or tire tread design and the physical size features of a shoe outsole or tire tread are two common manufactured class characteristics. General wear of the outsole or tire tread is also a class characteristic. Agreement of class characteristics alone does not provide a basis for identification however they reduce the possible number of shoes or tires that could have made an impression.

Degree of Wear: The extent to which a shoe outsole or tire tread has been eroded. Examples of degree of wear range from a shoe outsole or tire tread that is in a new and unworn condition to those that have considerable wear. The degree of wear continues to change as a shoe outsole or tire tread is worn.

General Wear: The overall condition of a shoe outsole or tire tread related to its degree of use. General wear is a class characteristic that may be used to include or exclude shoe outsides and tire treads based on similar or different degrees and positions of wear.

Holes: The result of erosion of a shoe outsole or tire tread that is so extreme that it results in removal of the outer layers of sole or tread materials, often resulting in irregular edges. These irregular edges are individual characteristics. Random holes due to punctures are also individual characteristics.

Individual Characteristics: Features that have occurred randomly on a footwear outsole or tire tread. Examples of individual characteristics include cuts, scratches, tears, holes, stone holds, abrasions and the acquisition of debris from random events. The position, orientation, size and shape of individual characteristics contribute to the uniqueness of a shoe outsole or tire tread. Individual characteristics are essential for an identification of a particular shoe or tire as the source of an impression. (Note: Schallamach pattern may result from abrasion and is used as an individualizing feature.)



(a) *Example of general wear on an outsole material.*
(b) *Example of extensive general wear.*

Position and Orientation of Wear: The location and direction of an area of erosion on a shoe outsole or tire tread. Examples of location of wear include wear along the medial edge of the shoe outsole and wear along the outer edge of a tire tread. The position and orientation of wear can change as a shoe outsole or tire tread is worn.

Specific Location of Wear: A defined area of erosion on a shoe outsole or tire tread. Examples of a specific location of wear are a worn tire sipe or a small area of worn stippling on a shoe outsole. Specific locations of wear may allow for a greater level of discrimination or association between questioned impressions and known shoes or tires.

Tears: Fractures that have occurred in shoe outsoles or tire treads that reflect irregular edges. Tears are individual characteristics.

Wear: Erosion of the surfaces of a footwear outsole or tire tread during use.

Appearance of General Wear

Most footwear impressions from crime scenes reflect at least some evidence of general wear. Because some shoes are new whereas others have a more advanced condition of wear, and because not all persons wear their shoes the same, a large variety of both the degree and position of wear is encountered in forensic footwear evidence. Because heels typically strike the ground first with each step, the heel area will usually reflect the first signs of wear. Depending on the outsole design, wear on other areas of outsoles may not be as easily noticeable until it has become more advanced. For outsoles that have been worn extensively, the total erosion of the original design may occur in localized areas on the shoes of some whereas the wear on the outsoles of others will occur across the entire outsole.

In case applications, wear is examined along with the design, physical dimensions, and individual characteristics. In instances where general wear features present in a crime scene impression correspond with a suspect's shoe, the hypothetical question may be asked, Could another shoe contain general wear that is indistinguishable? But for many reasons, this question can never be definitively answered. Examples of these reasons include the variables in the quality of reproduction from one impression to the next, that wear is constantly changing on shoes that continue to be worn, and that most wear on footwear is minimal to moderate and is not particularly distinctive. Although there is considerable empirical evidence and overall acceptance that frequency, features, and combined strength of random individual characteristics (damage such as holes and scratches) provide a basis for individualization of a single shoe sole, the same cannot be said for the general wear on a shoe.

Shoes in the closet of an individual, assuming they have many varied types of footwear and wear them for a range of purposes, will have general wear that appears similar when compared to some shoes and different from other shoes. For example, wear may appear similar on shoes of the same design belonging to the same person if the shoes have been used for a similar purpose (Figure 2). Wear may also appear visually similar on shoes of the same design worn by different people for a similar activity range (Figure 3). General wear may also appear different on shoes belonging to the same person, even if they use them for the same purpose, often because of the degree of wear. Wear may also appear different on shoes belonging to the same person, if used for different purposes.

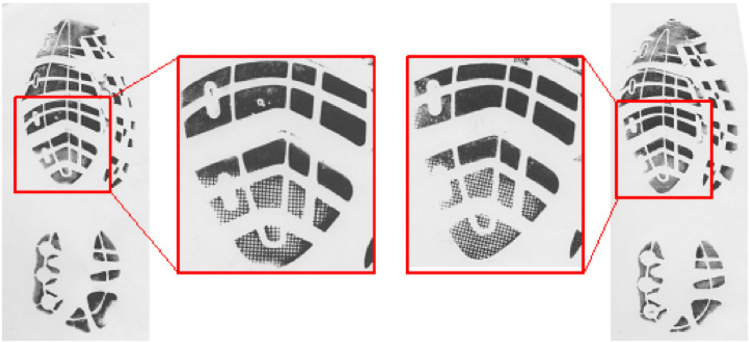


Figure 2

Test impressions depicting similar wear on the forefoot area of different shoes of the same design worn by the same person for a similar range of activity (running).

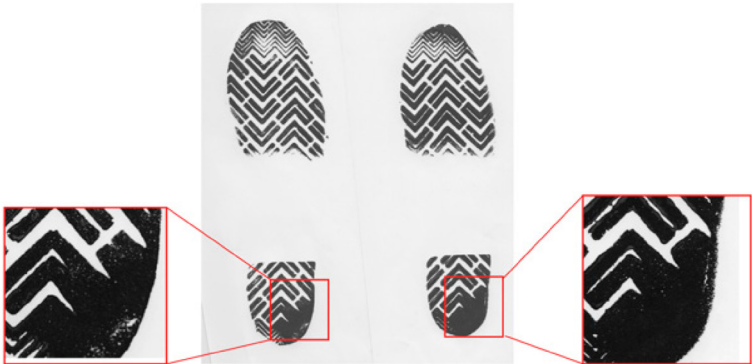


Figure 3

Test impressions depicting similar wear on the heel area of different shoes of the same design worn by different people for a similar range of activity (work).

Literature and Studies Regarding Wear

The main texts in the area of footwear examination discuss wear in an interesting progression that reflects growth in research, information, and consideration of this characteristic throughout the years. Abbott's book *Footwear Evidence*, published in 1964, mentions wear as a characteristic to be considered during examination but does not discuss the significance [2]. Cassidy's *Footwear Identification*, published in 1980, evaluates wear as a result of his research and concludes that identifications should not be made using wear alone [3]. Bodziak's second edition of *Footwear Impression Evidence*, published in 2000, includes an entire chapter on wear that covers terminology, discusses factors that cause wear, and the use and value of wear in forensic examinations. Bodziak, as did Cassidy, notes that general wear alone is not sufficient evidence for individualization [4].

A 1977 survey of men's footwear examined both the trace evidence encountered on a population of shoes and the evidence of wear on the outsole. The survey found that some areas of the shoe, for instance the bottom of heels, tend to be very commonly worn. A protractor was utilized to measure the common areas of wear and defined the area of most occurring wear as toward the bottom insides of most shoes [5].

Another study utilized a method of precise measurements to determine the discriminating power of general wear between a population of military boot impressions. These boots were of the same size and had been exposed to wear under the same conditions for the same length of time. The results of this study indicate that there are measureable differences in general wear between similarly worn shoes [6]¹.

A recent test was conducted by the Expert Working Group Marks (EWGM)² to determine the range of answers on a sample test involving wear differences. The test involved a known shoe and two crime scene impressions that had been made by a shoe with a greater degree of wear than was present on the shoe

¹ Note: Care should be taken when the results of the Blackledge study are extrapolated to a casework application. It is significant that the impressions compared were all inked impressions taken under controlled conditions. Additionally, the measurements were precise and the differences found, discussed, and used to discriminate are in tenths and hundredths of a centimeter. These minute differences, when considered in practical crime scene conditions, would be of limited value for discrimination because they may not be able to be attributed specifically to differences in general wear.

² The Expert Working Group Marks (EWGM) is one of the forensic science working groups of the European Network of Forensic Science Institutes (ENFSI).

provided for comparison. The large majority of the responding examiners properly eliminated or concluded that it was not the shoe or not likely the shoe [7].

Literature and research in the area of the significance of outsole wear indicate that although there may be detectable differences in general wear between shoes, there are also significant similarities in the appearance of wear between impressions. Large differences may allow for a clear elimination of a shoe from making a particular crime scene impression, but similarities may be common and limited in discriminating value. None of the studies provide support for the identification of shoe impressions based on general wear alone.

The Scientific Working Group on Shoe Print and Tire Tread Evidence (SWGTHREAD) has published 15 guidelines for footwear examination³. Two of these guidelines address the use of general wear in the examination of footwear evidence. They are the *Guide for the Examination of Footwear and Tire Impression Evidence* and the *Standard Terminology for Expressing Conclusions of Forensic Footwear and Tire Impression Examinations*. Both of these guides include general wear as significant for elimination and inclusion conclusions. Neither guide indicates that general wear alone may be used to determine an identification conclusion.

Proper Evaluation of Wear in Forensic Footwear Examinations

The proper evaluation of wear is an integral step in the comparison process. Throughout the examination, footwear examiners will encounter similarities or dissimilarities in the characteristics available. Each characteristic will have a certain value, assisting an examiner to reach a conclusion. The primary focus of the evaluation process is to determine the significance of the characteristics available in a given impression.

The two questions that must typically be answered to aid in the formation of a conclusion regarding two impressions are:

- Is there an agreement between the position and degree of general wear, or lack thereof, in both the questioned and known impressions?
- What is the relative value of the wear present?

³ SWGTREAD website: www.swgtread.org.

Factors to Take into Consideration During the Evaluation of Wear

The evaluation stage in the footwear comparison process needs to take into account any and all available information that could affect the outcome of a conclusion. It is at this stage in the comparison process that an examiner should be aware of and consider all factors that might relate to how or when a shoe left its impression. These factors can include case-related information, factors in the impression-making process (deposition), and some relate to the manufacturing or construction of the shoe. Examples follow.

Changes Between Date of Crime and Date Shoes are Obtained

An important consideration in the comparison of footwear impression evidence is the change in the degree of wear over time. Information about the time between the crime and seizure of the footwear is necessary to evaluate any differences in wear. Typically in casework, the shoes of a suspect are seized as evidence within hours or days after a crime, allowing for a comparative analysis of the general wear represented in the crime scene impression. However, in some cases, the shoes of a suspect may not be seized until many weeks or months after the date of the crime, allowing for the possibility that additional wearing of those shoes occurred. In these cases, the possibility that the general condition of wear may have changed since the date of the crime due to additional wearing of the shoes is a factor in the examination.

The image in Figure 4 depicts the change in degree of general wear in one particular shoe over a five-month period. The photo on the left depicts an outsole bearing general wear on the lateral side of the toe area. The image of the outsole on the right is the same outsole photographed five months later. A significant change in the degree of wear is depicted in corresponding areas A, B, and C of Figure 4. A similar noticeable change could result in an erroneous exclusion without information regarding relevant time intervals available for consideration during an examination.

Substrate and Impression-Making (Deposition) Factors

Another consideration is the accuracy and clarity of the wear as it was reproduced in the crime scene impression as well as any limitations or considerations of distortion or degradation as a consequence of both the impression-making and the recovery processes. Some examples of substrate and matrix conditions that may limit an examiner's ability to evaluate wear characteristics are depicted in Figure 5. For example, mud or snow may collect in design elements and prevent the formation of an accurate impression (Figure 5a). Also, excess material, such as blood, may prevent a clear recording of outsole detail and condition of wear (Figure 5b). Any other factors such as photo distortion, problems with casting or lifting, and distortion from movement during the impression deposition should all be considered in terms of clarity. Only impressions with sufficient quality and quantity of detail to determine the condition of wear should be used in an evaluation of wear characteristics.

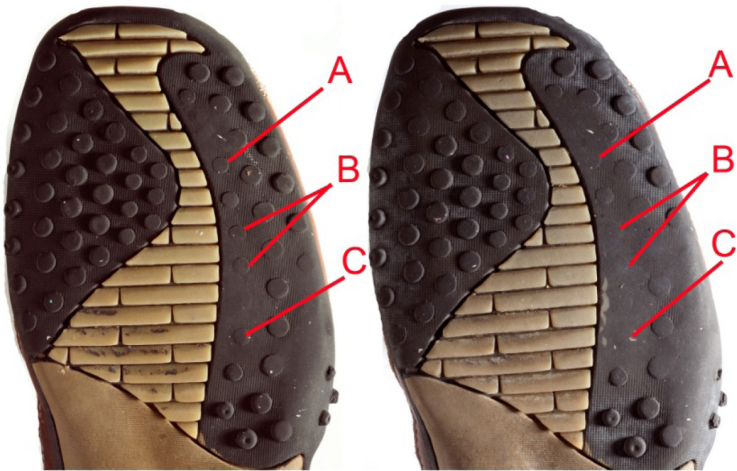


Figure 4

Example of increased general wear on an outsole over time.

Manufacturing Characteristics that Occur for Reasons Unrelated to Wearing of the Shoe but that may be Mistaken for Causes Relating to Wear

Mold Warp

Another important aspect to take into consideration during the evaluation process is the issue of mold warp. Mold warp is not uncommon with many compression-molded, flat-bottomed outsoles that are in new or relatively new condition. This occurs in the compression molding of outsoles when they are stacked upon one another after removal from the molds, but prior to cooling. This can result in outsoles that do not print perfectly on a flat surface during their initial weeks of wear. This may not be apparent in three-dimensional impressions but is usually apparent when the shoe leaves its impression on a smooth, two-dimensional surface and void areas occur where small portions of the shoe sole did not make contact (Figure 6).

Foxing Strips, Toe and Heel Guards

Foxing strips, along with toe and heel guards, are wrapped around soles after the sole is attached and vary in their position. If wrapped low, they will contact the ground prior to the sole and keep a portion of the sole of newer shoes from making contact with the ground, producing a void or “nonprinting” area as seen in Figure 7.

Sole Designs that Imitate Worn Shoes

Some shoe designs are made to imitate areas of wear. An example is featured in Figure 8. Although this feature may be obvious on a new shoe, once the sole is worn for a while, it may be difficult to distinguish this manufactured characteristic as part of the design versus having occurred from wearing the shoe.

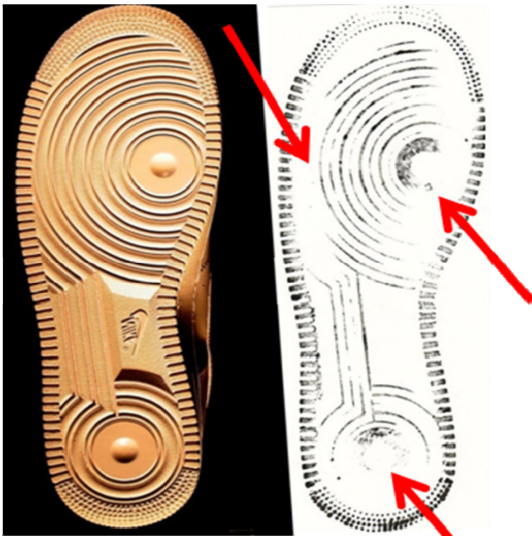


(a)

(b)

Figure 5

Impression detail may be limited by (a) substrate (e.g., mud); (b) excess matrix (e.g., blood).



(a)

(b)

Figure 6

Mold warp on an outsole (a) and the appearance of mold warp in a test impression (b). Void areas are indicated by red arrows.



(a)



(b)

Figure 7

Low foxing strip on outsole (a) and effect on the appearance of the test impression (b).



(a)



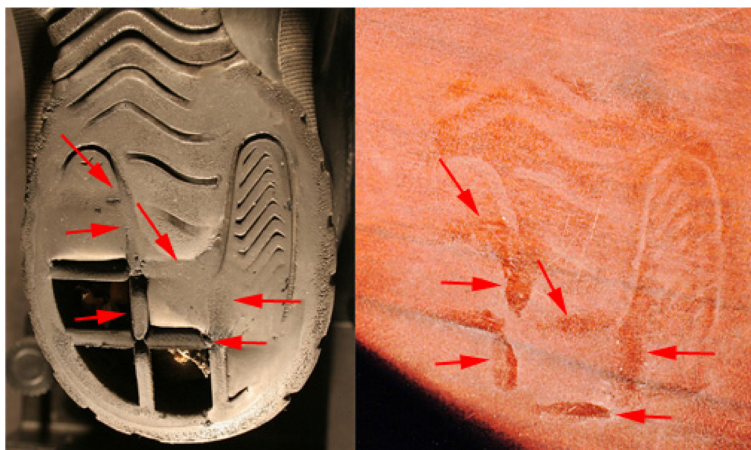
(b)

Figure 8

Outsole with manufactured simulated worn areas (a) and appearance of this characteristic in test impression (b).

Honeycomb or Pattern in the Shoe Sole Construction

The top of the mold in both compression molds and unit sole injection molds will often have a honeycomb or grid pattern. Although more common in the heel area, it can also cover the majority of the shoe outsole area. This honeycomb pattern reduces the amount of soling material needed to fill the mold, reduces the weight of the sole, and provides some cushioning effect. When the shoe outsole is worn excessively and the outer layers of soling materials are worn thin, the areas directly beneath the walls of the honeycomb or grid pattern will bear most of the weight and will erode faster. In these cases, the wear becomes apparent and in more extreme cases, portions of the honeycomb or grid area might be exposed and visible in an impression (Figure 9).



(a)

(b)

Figure 9

Extreme wear of an outsole with grid pattern construction inside sole (a) and appearance in an impression (b).

International Survey Regarding the Use of Wear in Casework

In a small assessment conducted in conjunction with this paper, thirteen forensic footwear examiners in ten countries were surveyed regarding their use and evaluation of general wear (Appendix). The examiners were selected based on their experience level and involvement in European footwear meetings.

Survey Results

Question #1 asked whether they agreed that general wear is considered a class characteristic. Only two answered “no”. However, they did not disagree that general wear is a class characteristic by definition, as much as they prefer to call it either a wear or manufacturing characteristic. Questions #2 through #5 provided some hypothetical casework examples. Question #2 involved the impression of a nearly new heel area. All but three answered they would consider this as having some relevance. Question #3 involved the outer area of a heel showing some wear. Eleven found this had some significance whereas the other two took a more conservative approach and did not feel this was worthy to comment on. Question #4 involved an outsole worn in a more specific area. All believed this degree of wear in this same area had significance in the examination, although their answers implied that they weighed this to different degrees ranging from simply agreeing it reduced the amount of shoes of this size and design that would be similarly worn (answer A) to an answer that it was highly probable (very strong support) that the shoe made the impression. Most significant was the fact that no one believed this specific area of wear could justify identification. One other reason that the answers were more scattered in this example is because the examiners were only provided with one test impression. Figure 10 depicts three impressions made of the same shoe used in the survey example in question #4 and illustrates how the area of wear recorded in the test impression varies as the pressure varies. Had the examiners in the survey had the shoe and the ability to make their own impressions, a more universal answer would have been likely. Finally, regarding question #5, they were asked, If a tear or hole occurs in the outsole, would the irregularities of the torn edges of that hole now become individual characteristics? All thirteen respondents answered, “Yes.”

The results of this survey are shown in Table 1 and were consistent with current practices in this forensic discipline in that clear distinctions were made between general wear features and their insufficient degree of uniqueness, as opposed to a significantly worn and degraded outsole that had acquired holes, tears, or other abrasions that are considered to fit under the category of individual characteristics.

Respondent	Question #1	#2	#3	#4	#5
England #1	No	A	B	A	Yes
England #2	Yes	A	B	B	Yes
Canada #1	Yes	A	B	A	Yes
Canada #2	Yes	B	B	B	Yes
Scotland	Yes	B	A	C	Yes
Netherlands	Yes	A	B	B	Yes
Switzerland	No	B	B	A	Yes
Denmark	Yes	A	B	C	Yes
Austria	Yes	A	A	A	Yes
Sweden #1	Yes	A	B	B	Yes
Sweden #2	Yes	A	B	B	Yes
Poland	Yes	A	B	B	Yes
Israel	Yes	A	B	B	Yes

Table 1

Responses from the international survey on forensic use of wear.

Conclusion

General wear is an important and necessary aspect that must be evaluated during the examination of footwear evidence. Although thousands of shoe soles of the same design and size may be manufactured and in circulation, they are not all worn in the same precise areas or to the same degree. The evaluation of general wear requires careful consideration of the possible variables and interferences in the impression-making process, the time that has elapsed since the date of the crime, manufacturing information, and any other factors that might affect the accurate representation of the general wear in the crime scene impression. If correspondence of general wear can be established, it contributes to reducing the overall number of footwear that potentially could have produced an impression at the scene of the crime; however, general wear alone is insufficient to establish an identification. The survey conducted and discussed in this paper supports that this is generally the practice among the international community of footwear impression experts. General wear characteristics utilized in support of a conclusion must be clearly observable, confirmable, and noted in terms that relate to their value.

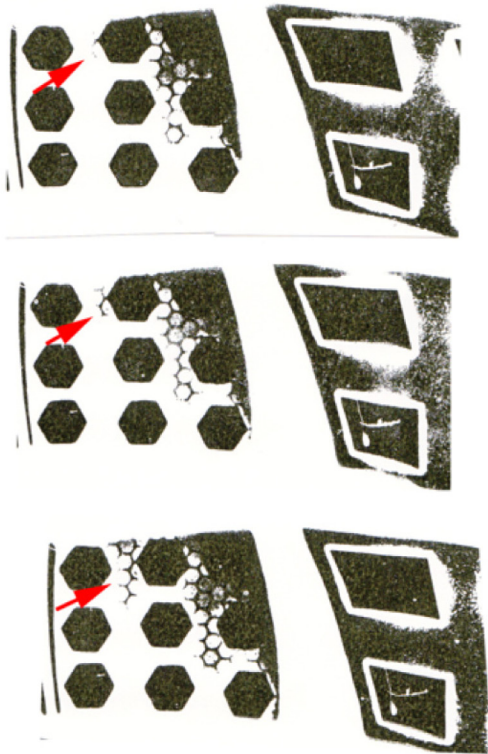


Figure 10

Three impressions of the same shoe that was used for survey sample #4. The pressure used to make each impression above was varied.

Acknowledgment

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Appendix

Survey Content and Directions

Dear Fellow Footwear Examiner

I along with several other associates currently are preparing a comprehensive presentation on The Significance of Wear Characteristics of Footwear in the Forensic Examination of Footwear Impression Evidence. This will be presented at the International Association for Identification (IAI) meeting in Tampa, Florida next year.

In connection with this presentation, it is important for us to know how others evaluate Wear during footwear examinations and to also see how Wear is treated in forensic footwear examinations around the world. We are interested in how you treat Wear in a physical comparison.

Terminology (the following terminology is provided for these questions)

WEAR

Erosion of the surfaces of a footwear outsole or tire tread during use.

GENERAL WEAR

The overall condition of a shoe outsole or tire tread related to its degree of use. General wear may be used to include or exclude shoe outsoles and tire treads based on similar or different degrees and positions of wear.

POSITION AND ORIENTATION OF WEAR

The location and direction of an area of erosion on a shoe outsole or tire tread. Examples of location of wear include wear along the medial edge of the shoe outsole and wear along the outer edge of a tire tread. The position and orientation of wear can change as a shoe outsole or tire tread is worn.

SPECIFIC LOCATION OF WEAR

A defined area of erosion on a shoe outsole or tire tread. Examples of a specific location of wear are a worn tire sipe or a small area of worn stippling on a shoe outsole. Specific locations of wear may allow for a greater level of discrimination or association between shoe outsoles or tire treads.

DEGREE OF WEAR

The extent to which a shoe outsole or tire tread is eroded. Examples of degree of wear range from a shoe outsole or tire tread that is in a new and unworn condition to those that have considerable wear. The degree of wear continues to change as a shoe outsole or tire tread is worn.

INDIVIDUAL CHARACTERISTICS

Features that have occurred randomly on a footwear outsole or tire tread. Examples of individual characteristics include cuts, scratches, tears, holes, stone holds, and abrasions. The position, orientation, size, and shape of individual characteristics contribute to the uniqueness of a shoe outsole or tire tread. Individual characteristics may be used to identify a particular shoe or tire as the source of an impression.

HOLES

The result of erosion of a shoe outsole or tire tread that is so extreme that it results in removal of the outer layers of sole or tread materials, often resulting in irregular edges. These irregular edges are individual characteristics. Random holes due to punctures are also individual characteristics.

TEARS

Fractures that have occurred in shoe outsoles or tire treads that reflect irregular edges. Tears are individual characteristics.

SCHALLAMACH PATTERN / FEATHERING

Very fine patterns or micro ridges that develop on rubber material as a result of repeated abrasive forces. These patterns are highly individual and continue to change as affected by continued abrasion. Schallamach patterns are individual characteristics.

Questions:

1. A Class Characteristic is a feature that is shared by two or more shoes. The shoe outsole design and the physical size features of a shoe outsole are both class characteristics which are acquired in the manufacturing process. General Wear of the outsole is also a class characteristic. Agreement of class characteristics alone does not provide a basis for Identification however they reduce the possible number of shoes that could have made an impression.

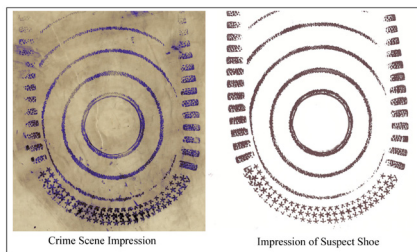
Do you agree with the above definition of Class Characteristics?

(check one) YES _____ NO _____

If you do not agree, please explain _____

NOTE: With regard to the following Questions 2, 3 and 4, the hypothetical examination has already determined that the (1) Design and (2) Physical Size of the design of both the crime scene impression and the known shoe correspond. The questions below pertain only to the Wear and your evaluation of that.

2. If you were to make a physical comparison between an impression and a shoe sole in the below illustrated case where the shoe is in new or nearly new condition (thus there is virtually no wear evident), please indicate which of the following would be closest to your evaluation regarding Wear? The following pictures depict the crime scene impression and the known impression of the suspect's shoe.

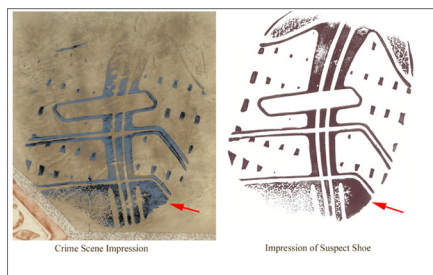


Which statement below most closely reflects your evaluation of Question #2, choice "A" or choice "B"? Please circle or indicate your answer.

- A. The General Wear corresponds, i.e. the shoe is virtually new and this is reflected in the crime scene impression
- B. No comment on Wear would be included as part of your opinion because the shoe sole is essentially new and does not reflect any wear and/or there is no wear evident in the crime scene impression.

Other comments _____

3. You are making a physical comparison between an impression and a shoe sole in the below illustrated case in which the shoe contains some general wear on the outer edge of the heel and wear also appears in the same area in the crime scene impression (see arrows). Please indicate below which of the following would be closest to your evaluation regarding Wear. The following pictures depict the crime scene impression and the known impression of the suspect's shoe.

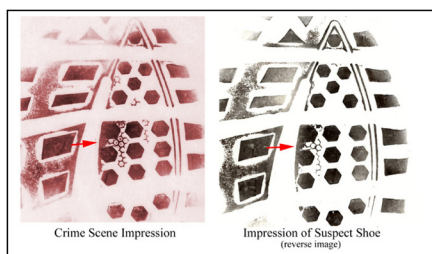


Which statement below most closely reflects your evaluation, choice “A” or choice “B” or choice “C”?
Please circle or indicate your answer.

- A. The General Wear corresponds but is not significant enough to comment on.
- B. The General Wear corresponds and helps to reduce the remaining population of shoes that could have made that impression and is worthy of some comment in your opinion but is not highly significant.
- C. The General Wear is significant to say it is probable (there is strong support) this shoe made the impression

Other comments _____

4. You have made a physical comparison between an impression and a shoe sole in the below illustrated case where the shoe contains general wear across the outside of the heel and also in a specific area of the sole where the texture pattern is beginning to show as the tread is worn away (as pictured below with arrows). Please indicate which of the following would be closest to your opinion regarding that wear? The following pictures depict the crime scene impression and the known impression of the suspect's shoe.



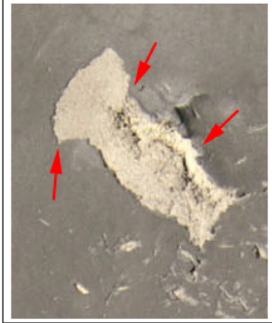
Which one statement below most closely reflects your evaluation, choice A, B, C or D?
Please circle your answer.

- A. The General Wear of the crime scene impression and shoe correspond and reduces the remaining population of shoes that could have made this impression.
- B. Same as answer "A" plus the General Wear is sufficient to say it is probable (strong support) that this shoe made the impression.
- C. The General Wear is so specific (Specific Location and Degree of Wear) that it is sufficient to justify saying it is highly probable (very strong support) that this shoe made the impression.
- D. The General Wear is so specific (Specific Location and Degree of Wear) that it is sufficient to justify Identifying this shoe as the only shoe that could have made this impression, based on those wear characteristics.

Other comments _____

5. Do you agree with the following statement? “When a shoe is worn to the extent that a tear or hole occurs in the sole (see below photos), the irregularities (see arrows) of the size and shape features of that tear or hole now become Individual Characteristics.”

YES _____ NO _____



Other comments _____
