Table of Contents

SCOPE AND APPLICATION

This procedure manual describes the techniques that have been approved for use by qualified footwear analysts for the collection, preservation, processing, searching, analysis, comparison, examination, and verification of footwear and other patterned impression evidence on a variety of substrates. The applications of the techniques are described in the subsequent chapters of this manual.

The collection of DNA swabs is sometimes necessary during impression related examinations and is also outlined in the scope of this manual.

TERMINOLOGY AND DEFINITIONS

Please refer to terms and definitions included in ASB Technical Report 097, Terminology Used for Forensic Footwear and Tire Evidence, First Edition 20191.

ADHESIVE LIFTER

Any of a variety of adhesive coated materials or tapes used for lifting impression evidence.

ALTERNATE LIGHT SOURCE

Equipment used to produce light at various wavelengths to enhance or visualize an impression.

CASTING

The filling of a three - dimensional impression with material that takes on and retains the characteristics which were left in that impression.

CATEGORIZED

A word used usually in Footwear Intelligence reports to describe agreement of class and other characteristics in the context that supports a known type of shoe make as capable of having produced those respective features in the questioned impression.

CLASS CHARACTERISTICS

A manufactured feature of design and/or dimension that is shared by a group of two or more shoes or products.

CORRESPOND (CORRESPONDENCE)

A word used usually in Footwear Comparison cases to describe agreement of class and other characteristics in the context that supports a known object (such as an item of footwear) as capable of having produced those respective features (are in agreement) in the questioned impression.

DENTAL STONE

A gypsum product made for the dental industry used throughout the world to cast footwear impressions. Dental stone is similar to plaster of Paris, but stronger.

DISTORTION

An unclear or inaccurate representation of a mark due to interference with the impression making process or the retrieval. Distortion can also be referenced when the quality of the photography angle or lighting is being described.

DOCUMENTARY IMAGES

Images taken to represent visual observations only and the conditions of the acquisition may not meet all the requirements of exam quality images. The resolution and file format of image

capture are at the discretion of the analyst. Documentary images may or may not be retained in ADAMS depending on quality.

DRY ORIGIN IMPRESSION

An impression that contained no moisture, either from the object or the substrate, and which has remained free of moisture. Also known as Dry Deposit.

DYNAMIC TEST IMPRESSION

A known footwear impression that creates an impression that mimics what an impression would look like if a person was taking a step walking. Created with the inkless system consists of a pad saturated with a chemical solution and chemically treated paper. The chemical solution will develop into a dark gray to black color when it contacts the treated paper. This method provides a two-dimensional test impression of a wet deposit material that can be utilized during comparison with the unknown impression.

ELECTROSTATIC DUST PRINT LIFTING (ESLA) DEVICE

A device consisting of a high-voltage supply that is used with a special conductive film to electrostatically transfer a dry impression from the substrate to the film.

ENHANCEMENT

Rendering an impression more clear or more visible through physical, electronic, photographic, or chemical means.

EXAMINATION QUALITY IMAGES

Examination quality images are intended to capture the maximum amount of detail with a minimum amount of distortion. The photographic conditions to produce an exam quality image allow the resulting image to be scaled to natural size and include taking in RAW or uncompressed file format, filling the frame, taking the image with the camera sensor parallel to the impression, a scale located adjacent to the impression and on the same plane as the bottom of the impression, lighting and contrast to maximize visible detail, and sharp focus. Examination quality images may not be possible with curved surfaces or substrates.

EXLUSION

The known footwear exhibits differences in class characteristics or distinguishing characteristics that indicate the footwear did not make the questioned impression and is not part of the pool of potential sources for the questioned impression.

EXCLUSIONARY DIFFERENCE

A difference in a feature or property between compared items that is substantial enough to conclude that they did not originate from the same source.

GENERAL WEAR

The gradual changes to the outsole as a shoe is worn that are due to the erosive effects of friction between it and the substrate that result from both vertical and horizontal forces. General

wear ranges from outsoles that are in new and unworn condition, to those that have extreme wear. Ragged edges of holes or tears that have resulted from extreme wear, as well as abrasion patterns, although products of wearing a shoe involve random events and are considered randomly acquired characteristics and not general wear characteristics.

GELATIN LIFTER

A tacky gelatin material laid on a pliable backing that can be applied to a surface to lift a two-dimensional impression. The lifters can be white, black, or clear.

INCLUSION

The known footwear exhibits similarities in class characteristics and/or distinguishing characteristics that indicate the footwear may have made the questioned impression and is part of the pool of potential sources for the questioned impression.

KNOWN ITEM (STANDARD)

An object of known origin that is compared to a questioned impression. In the context of a comparison examination, a known object is one that may be a potential source of the questioned impression (e.g., shoes worn by a suspect). Sometimes abbreviated “K” in the examination documentation.

LIFT

To transfer an impression from its original surface to a surface typically having better contrast. A lift may also serve to collect an impression from an immovable object.

MOLD CHARACTERISTIC

A general term used to refer to a feature that relates to a specific mold such as texture or how a specific portion of the design interfaces with the perimeter or in relation to other design elements.

MOLD DEFECT

Damage to a mold such as a nick, dent, or scratch. A molded outsole will reflect these characteristics as raised areas on the outsole as the damage area fills with outsole material during molding. Adherence of debris to the mold will be reflected as a depressed area on the outsole as the outsole material fills in around the debris (e.g., incomplete cleaning). The latter type of mold defect may be temporary.

NATURAL SIZE

The same size as the object, thing, or impression represented.

OBLIQUE LIGHT

Light that is positioned at a low angle of incidence relative to the surface being photographed. Also referred to as side lighting.

OUTSOLE DESIGN

The manufactured pattern on the outsole of a piece of footwear.

PATTERNED IMPRESSION

The product of physical contact between an object such as footwear, tire, or other object having a patterned surface that results in the transfer and retention of characteristics of that item.

PHYSICAL SIZE

The specific dimensions of a design or design elements, noting these are distinguishable in various ways as they are graded throughout the size range. Physical size includes the size of spacing, gaps, and spatial relationships between design elements. The term physical size does not refer to the manufacturer's shoe size such as size 9 or 10.

QUESTIONED OBJECT OR IMPRESSION

The impression of interest or unknown origin at a scene is referred to as the questioned object or impression. The questioned impression evidence may consist of photographic or digital images, casts, lifts, or the actual object that has the questioned impression on it. Sometimes abbreviated "Q" in the examination documentation.

RANDOMLY ACQUIRED CHARACTERISTICS (RACs)

Features that have occurred unsystematically and unintentionally on a footwear outsole during its use. Examples include cuts, scratches, tears, stone holds, abrasions, and the acquisition of debris stuck to or in the outsole. The position, orientation, size and shape of RACs contribute to the uniqueness of a shoe outsole. RACs that correspond between the questioned impression and known outsole are essential to support an Identification or High Degree of Association conclusion. Previously referred to as Accidental, Acquired, or Individual Characteristics.

SCHALLAMACH PATTERN

A microscopic abrasion pattern that develops as ridges on rubber outsoles because of repeated frictional forces. These patterns are very similar in their size and appearance to skin friction ridges and are highly individual. The pattern continues to change as it's affected by additional abrasion to the outsole. Schallamach patterns are randomly acquired characteristics. The name originates from the researcher of the same name. Also known as Feathering.

SIDE-BY-SIDE

A comparison method is performed by placing two or more objects next to one another, sometimes assisted with measuring devices, low power magnification, tracings, or other tools.

SIMILAR

An observation that an impression or feature shares a general likeness with a known object. Similar should not be equated with correspondence and does not infer the feature is the same as a particular known object.

SPECIFIC WEAR

A defined area of erosion on a shoe outsole. An example of this would be a small area where texture on a shoe outsole was worn away. Specific locations of wear may allow for a greater level of discrimination or association between questioned impressions and known shoes.

STATIC TEST IMPRESSION

This method of test impression collection allows for a two-dimensional recording of the recessed areas of a footwear outsole to be recorded. Fingerprint powder is applied to the bottom of the known outsole and then adhesive paper pressed onto the outsole to collect the outsole impression. The test impression can then be used in comparing the unknown impression.

SUPERIMPOSITION

A comparison method performed by placing one object over the other. In impressions this normally involves the use of a transparent version of a test impression placed over the questioned impression, or vice versa. Superimposition can occur either using printed paper and transparency copies, or digitally.

TEST IMPRESSION

An impression made utilizing a known object for the purpose of comparing it to a questioned impression. Also known as an Exemplar.

TEXTURE

A rough surface or shallow design added to surfaces of a mold through the process of acid etching or hand-struck stippling. This texture will be transferred to each outsole during the molding process. Texture is unique to a specific mold to which it is applied.

THREE-DIMENSIONAL (3-D) IMPRESSION

An impression having significant depth.

TWO-DIMENSIONAL (2-D) IMPRESSION

An impression which for all practical purposes has no significant depth.

WET ORIGIN IMPRESSION

An impression containing moisture, contributed by either the object and/or surface. Although a wet impression will dry, it is still an impression of wet origin. Also known as a Wet Deposit.

SCOPE OF WORK FOR A FOOTWEAR EXAMINER

Summary of Footwear or Tire Examination Practice:

Forensic footwear examiners undertake the following tasks: documenting, collecting and preserving footwear and tire evidence, and analyzing and comparing footwear or tire impressions.

Examiners' responsibilities include:

– determining the manufacturer, make, or model of the source of a questioned impression;

– comparing questioned impressions;

– determining the manufacturer, make, or model of an item of footwear from an image or video;

– providing expert opinions regarding source conclusions;

– writing reports and providing testimony.

General duties in this field include:

– detecting footwear impressions;

– preserving footwear impressions;

– collecting and recovering footwear evidence;

– documenting footwear evidence;

– preparing test impressions, including elimination prints from footwear;

– performing physical, chemical, photographic, and digital enhancement of footwear impressions;

– recognizing and preserving other relevant physical evidence;

– analyzing, comparing and evaluating footwear evidence;

– documenting examinations;

– preparing court exhibits;

– utilizing reference materials and databases;

– providing training and mentoring;

– utilizing technical equipment;

– performing technical review;

– providing verification of findings;

– performing quality assurance activities;

– performing research;

– staying current with relevant information, literature, and journals.

SOFTWARE AND DIGITAL IMAGING

DIGITAL IMAGES

Digital imaging is used for visualizing, examining, recording, enhancing, and preserving evidence. Any visible impressions should first be documented through imaging prior to any lifting, casting, or chemical enhancement.

Digital imaging used for impressions casework can be generated by qualified laboratory personnel or submitted by an outside agency. Images generated in the laboratory or submitted for current testing or preserved for future testing will be treated as evidence.

APPARATUS AND EQUIPMENT

- Scanner
- Epson Perfection V750 Pro
- Mustek Flatbed Scanner
- Digital Cameras
- Canon EOS-5D Mark II/III/IV
- Scale: Ruler should be L-shaped, flat, thin, and rigid. Recommended colors are black, grey, and white depending on the substrate color.

Authenticated Digital Asset Management System (ADAMS)

ADAMS is a digital asset software program from FORAY Technologies. ADAMS serves as the repository for digital images taken during casework for the Physical Discipline (including Latent Prints, Crime Scene, Firearms and Footwear). Access to ADAMS and the Digital Assets are limited to staff members who work in the Physical Discipline.

ADAMS Web can be accessed here: https://adams.dps.alaska.gov/AdamsWeb/

ADAMS provides a calibration utility tool which allows images to be sized at a 1:1 ratio.

All digital images received as evidence items (CD/DVD, thumb drive, etc.) must be acquired to ADAMS to maintain the audit trail prior to examination.

IMAGE SUBMISSION POLICY

The preferred method of submitting Impression evidence is by physical media (e.g., CD, DVD, flash drive). Images may also be submitted by a law enforcement officer (LEO) via ZendTo, Anchorage Police Department AXION Digital Imaging Server, or by e-mail. E-mail submissions will only be accepted for Intelligence/database searches. There are no image resolution or file format requirements for submitted images.

For comparison requests, all images that depict the impressions should be submitted. Images of the crime scene and/or vehicle process images, do not need to be submitted. The analyst can request additional images of the crime scene if necessary. For Footwear Intelligence search requests, only the impression images requiring searching should be submitted. The extent to which the requested examination can be completed is at the discretion of the examiner based upon the quality and content of the images submitted.

The number of digital images received by the Analyst for processing will be documented in the analysts notes and LIMS for all items containing digital evidence (examples: CD/DVD, USB drive, ZendTo, AXON). All images received will be uploaded into Foray ADAMS, and a chain of custody will be initiated. The image file names will be added to the analyst's processing notes and follow the image through the entire comparison process.

LABORATORY GENERATED IMAGES

Detailed metadata is set to record electronically from the start of image capture, whenever possible, and continue through any image processing. Intentional removal of metadata in Photoshop is prohibited.

Documentary Images

Documentary images are taken to record the overall packaging, contents, and condition of the evidence as it was received and support the description of the evidence. Documentary images should contain the analyst identifiers Documentary images can also be used for some comparison purposes (e.g., documenting outsole design differences). The resolution and file format of the camera are at the discretion of the analyst. Documentary images should be taken in JPEG and acquired to Foray ADAMS.

Examination Quality Images

Examination quality images are taken to preserve questioned impressions, document the test impressions, and preserve detail for comparison purposes. Exam quality images allow the resulting image to be scaled to natural size with minimum distortion and maximum resolution. Cameras used to capture examination quality images will be set to capture in RAW file format in full color or in the TIFF file format (scanning). When acquiring scanned images of an evidentiary nature, analysts should utilize the maximum resolution of the scanning device (recommended nothing below 500ppi). The unknown evidence item will have an ID tag visible in exam quality photos, (usually the last two numbers of the item number), with the item number present somewhere in the file name of retained photo. The whole evidence item number can also be used. All known footwear evidence items will have an ID tag visible in exam quality photos that include the entire item number. All examination quality photos shall be acquired to Foray ADAMS as the permanent record and are referred to as Assets. The Assets once acquired contain an electronic audit-trail. The image(s) should additionally have the following attributes.

Note: Multiple images with varied lighting angles may have to be taken to achieve these goals. a flat scale (preferably an L-shaped scale) on the same plane as the impression

- the impression should fill the frame
- the camera sensor should be as parallel to the impression as possible

- lighting sufficient to maximize the detail of the impression.
- focused and properly exposed

Laboratory captured images not suitable for examination or comparison due to duplication or poor quality may be deleted at the discretion of the analyst. However, images that are accepted as suitable for examination or comparison may not be deleted (e.g., images uploaded into ADAMS Foray). A minimum of at least one photo per footwear impression per processing step where impression detail is of value for preservation will be retained.

DOCUMENTATION AND DIGITAL IMAGE HANDLING

Images submitted to the laboratory on physical media are evidence. They will be tracked in LIMS and returned to the submitting agency.

Enhanced versions of images used in analysis/comparison will be stored in such a way that the image and metadata are maintained in an unalterable fashion. These are not considered evidence and can be used in notes documentation.

Images submitted electronically will have a virtual item of evidence created in LIMS named “FW Images” containing the image file numbers. The chain of custody will include the submitting officer, how it was received (e.g., via email), the analyst creating the virtual item, and the Digital Imaging Server as the final location. All images will then be acquired to Foray ADAMS.

Footwear Examiners may triage evidentiary images if multiple photos have been taken of footwear impressions resembling the same class characteristics/outsole design, or if photos have been taken of the same footwear impression from various lighting angles. If the original photo selected for examination does not reflect the same size as the known shoe during examination, the analyst can select additional photos for additional examination if necessary.

REPORTING

The report will include the number of submitted images. The examination documentation will identify the number, file names, and format of all images submitted on physical media. The digital image file name will follow the image through the entirety of the examination process. It is recommended that the image file names also be included in the report, if doing so doesn’t interfere with report clarity. A description of each footwear impression submitted will be included along with the substrate and recovery medium used. See the comparison section of the manual for further report requirements.

ADOBE PHOTOSHOP

Adobe Photoshop is used for digital image enhancement. From ADAMS, an original image can be sent to Photoshop for digital processing. Once in Photoshop, the footwear images can be enhanced to improve the contrast and remove unnecessary color or substrate patterns from the image. Photoshop is also used during comparison by creating layers and contrast to the photos that allow the analyst to overlay the known test impression over the questioned impression for comparison of size, wear, and randomly acquired characteristics. All Photoshop installations used for digital processing must have the History function enabled within the application. This feature records all enhancements made to the image. ADAMS, when used with Adobe

Photoshop, provides a secure and traceable means of digital image storage and processing. See Appendix A in the Latent Print Procedure Manual for ADAMS and Adobe Photoshop Working Instructions for image acquisition, calibration, processing, and exporting.

CORVUS/ALASKA REFERENCE COLLECTION (ARC)

The ARC is a searchable National Footwear Reference Collection catalog of shoe impressions that includes both the UK national footwear reference collection and the Alaska subset of the ARC database. Manufacturing (make/model), production, distribution, and occasionally sizing information may also be determined with assistance from the specific manufacturers and/or research. The ARC database can be accessed here: CORVUS/ARC

PRESERVATION AND LIFTING

All visible impression should first be documented through examination quality imaging prior to any lifting attempt. Ambient lighting can be used, but some impressions may need additional lighting to be made visible. Oblique lighting from various angles should be utilized for a complete search of footwear impressions. Successful lifts should be examination quality imaged after collection and prior to packaging.

CASTING

Footwear analysts typically do not cast footwear impressions. The collection of footwear impressions by casting is performed by Crime Scene technicians. The methods for accurately capturing a footwear impression by casting can be found in the Crime Scene Procedure Manual. Any evidentiary casts that are received by the lab, should be photographed as received and then gently cleaned. After cleaning, examination photos should be taken of the cast with various lighting angles and retained in ADAMS for comparison purposes.

LIFTING

Footwear impression recovery can be achieved through the physical transfer of a two-dimensional impression from one surface to a surface that will provide better contrast, allow easier transportation, and perhaps aid in preservation. Methods that can be utilized include electrostatic lifting, gelatin lifting, and adhesive lifting. The analyst should consider the substrate (porous, nonporous), deposit condition (wet, dry), deposit color, and the presence of interfering material (dirt, grease) when selecting a lifting device.

Recovery may be achieved through the physical transfer of the impression from one surface to another, such as electrostatic lifting, gelatin lifting, and adhesive lifting. An impression is transferred from its original surface to a surface that will provide better contrast. A lift is a reverse image of the impression that it represents. A lift can be compared directly with the sole of the footwear, or the photo may be reversed to compare with test impressions.

Lifted impressions should be labeled and packaged with pertinent case-related information (e.g. case number, substrate, direction of travel). Multiple attempts should be considered if the first impression is of poor quality, or if the original lift contains too much dust interference or background debris.

Lifts created and used for testing are considered evidence and will be retained and have their chain of custody (COC) tracked in LIMS with the parent item. Lifts will be retained in the package with the parent item unless otherwise stated in the examination documentation. If lifts are retained in a location other than with the parent item, they must be assigned a subitem number and tracked in LIMS, and the location must comply with all requirements for evidence storage.

Footwear impressions may have inherent limitations that can interfere with the lifting process. Limitations can be due to substrate features, the quality of the original impression, environmental factors, and collection and visualization/detection. Limitations should be noted and recorded in the processing portion of the bench notes.

ELECTROSTATIC LIFTING DEVISE

The electrostatic lifting device (ESLA) uses a high-voltage source to create a static charge on the lifting film, causing the dust or residue particles composing the footwear impression to transfer to the underside or black layer of the lifting film. This technique works best on dry dust or dry residue footwear impressions that are either latent or barely visible, either where the footwear has left a dust residue on a cleaner surface (positive impression) or where the footwear has come into contact with a dusty surface and during contact has removed some of the dust (negative impression).

APPARATUS AND EQUIPMENT

Electrostatic lifting device: main unit housing and ground plate that connects to the housing unit.

Lifting film: most commonly a black vinyl or polyester film coated on one side with a conductive metal laminate.

METHOD

- Any visible impression should first be documented through examination quality imaging prior to lifting.
- Identify the area of the impression, cut a portion of the lifting film to fit the area and annotate the back of the sheet (silver side) with identifying information (the location (if applicable), case and exhibit number, date, and analyst's initials. Place the film (black side down) on the impression. Careful placement of the film is necessary to prevent the impression from being disturbed. Never attempt to re-use film.
- Place the small grounding plate next to but not touching the film. Place the electrostatic lifting apparatus (ESLA) with two points on the grounding plate and one point on the film.
- Switch the ESLA device on and slowly increase the voltage up to the maximum if necessary. The film should start to flatten out over the impression and may crackle with the build-up of electrical charge.
- Use a plastic/wood/rubber roller to gently roll out any air bubbles. Make sure not to touch any part of the film with your hand or arm.
- Turn the ESLA off and gently peel back the film from one corner.
- If a lift was successful, then exam quality image the lift with oblique lighting as soon as possible for preservation purposes.
- The lifted impression should be stored in a shallow box or secured in a paper folder. It may also be rolled up, impression side in, and secured with a small piece of tape.
- Failed lifts that are collected and examined/evaluated in the laboratory do not need to be retained. A failed lift is one where little to no detail of the impression transferred onto the lift and the impression is still visible in its original or near-original state on the object.

This technique can also be used to “clean” an excessively dusty/dirty impression prior to gel lifting. Electrostatic lifting can be the first lifting technique used as this method is noninvasive and even if unsuccessful, it does not preclude subsequent use of additional methods of detection.

Electrostatic lifts are fragile, and impressions can be destroyed by any wiping action across the surface of the lift. Electrostatic lifts retain a charge, and care should be taken in packaging. Electrostatic lifts should be examined in a timely manner due to their fragile nature.

INTERPRETATION

The lift transfer will be a mirror image of the impression on the evidence. This needs to be considered when comparing the lifted impression to the known evidence.

ELECTROSTATIC DETECTION APPARATUS (ESDA)

The electrostatic detection apparatus (ESDA) can be used to recover slightly indented impressions (barely visible or latent) on paper or cardboard in a non-destructive manner and operates on the principle of electrostatic attraction.

APPARATUS AND EQUIPMENT

Electrostatic detection device: Main unit that has the central control system and is composed of other components:

Platen: conductive surface where the indented item (paper, cardboard) is placed

Reel Holder: holds thin, transparent plastic imaging film (Mylar) used to develop the electrostatic charge

Corona wand: handheld unit that applies the electrostatic charge to the intended item

Toner tray: holds and dispenses the toner, which is attracted to the charged areas on the item

Aerosol development hood: to capture and filter out excess toner and prevent the airborne spread of toner particles

Vacuum pump: ensures the document and the imaging film are held tightly together on the platen without any air bubble

METHOD

- Place the paper or cardboard containing the impression face up on the platen bed.
- Turn on the vacuum to secure the document firmly to the platen bed and remove bubbles.
- Extend the clear film across the paper avoiding any folds or wrinkles in the film.

- A high voltage static charge is then applied to the impression using the corona bar at a distance ~1cm waved back and forth over the item repeatedly. Wait one minute.
- Holding a camel hairbrush parallel to the surface brush the toner powder lightly over the film. The powder will be attracted to the positively charged area of the impression.
- Immediately photograph the film in a dark room with oblique lighting and then place an adhesive cover sheet over the film for preservation.

GEL LIFTING

A gelatin lifter can be used on porous and nonporous surfaces for lifting residue deposits such as light dust, dry residue, wet origin impressions after black powdering, and chemically enhanced blood impressions.

APPARATUS AND EQUIPMENT

Gelatin lifters are commercially available in three colors: black, white, and clear.

Rubber roller

METHOD

- Any visible impressions should first be documented with examination quality imaging prior to lifting.
- Choose the color of gel lift that will result in the best contrast with the impression matrix. Black lifters usually offer the best contrast for soil and dust impressions, and white lifters work best for impressions that have been developed with black fingerprint powder. If clear lifters are used, a backing that provides adequate contrast needs to be used (usually white).
- Ensure the gel lifter is at room temperature, performance and adhesion is affected by excessive cold and excessive heat can destroy the gel lifter. Gel lifters can be cut to smaller size if desired.
- Slowly peel back clear acetate cover sheet and set it aside. In very dusty conditions protect the uncovered gel lift during the resting period. Once the cover is removed handle the gel lift minimally. Gelatin lifters may stretch when the clear cover is removed. Care should be taken when removing the cover to limit the stretch. The lift should be allowed to rest until it returns to the original size, before applied to the impression.
- Apply the gel lift to the edge of the impression and lie the gel lift over the entire impression. Make sure there is full contact of the gel lift to the impression by gently rolling the back of the gel lift gently with a rubber roller to roll out air bubbles. Leave the gel lift on the impression for at least 10 minutes then slowly peel back from one end.

- Place the gel lift on a flat, horizontal surface with the gelatin layer up to view the results. Black gel lifts will need to be evaluated in a dark room with oblique lighting to determine the quality of the lift.
- If the lift is suitable, take multiple exam quality photos immediately after lifting with oblique lighting from various angles with the acetate cover off.
- Package the gel lift by replacing the acetate cover trying to avoid air bubbles (can use a rubber roller) and package in an envelope or bag. Gelatin lifts can be stored in individual clean dust free containers. These containers should never be reused.

DOCUMENTATION

Label the back of the lift with the case identifiers, location (if available), and the analyst initials and date of the lift.

If excessive background debris is present on the gel lift on the first attempt, a second lift may be attempted to obtain a better-quality lift.

If the acetate cover needs to be removed for additional photos (those received from other agencies), place the clean side of the cover back on the gel or use a new acetate cover. The side previously in contact with the gel lift should not be replaced as it can result in re-deposition of the residue.

Failed lifts that are collected and examined/evaluated in the laboratory do not need to be retained. A failed lift is one where little to no detail of the impression transferred onto the lift and the impression is still visible in its original or near-original state on the object.

INTERPRETATION

The lift will be a mirror image of the impression on the evidence. This needs to be considered when comparing the lifted impression to the known evidence as photos will need to be flipped upon examination.

CAUTIONS

- Avoid sliding the lifter across the impression, especially when flattening with hand or rubber roller.
- The retention of impressions on gel lifts will vary and is not permanent.
- Powdered impressions will lose sharp detail but persist for many months, however, chemically processed impressions will degrade to the point of not being visible in a short amount of time.

ADHESIVE LIFTING

Adhesive lifting works best on non-porous, white background surfaces that have been developed with dark colored powders and are not best practice to be used on lifting dust or residue impressions. Adhesive lifters are available in white and clear.

APPARATUS AND EQUIPMENT

Clear adhesive lifting sheets

Latent lifting tape, such as 3M Clear Poly tape, Remco tape, or equivalent (wider 5-inch widths preferred).

Latent lifting cards in various colors and sizes (e.g., black, white, etc.)

Rubber roller

METHOD

- Any visible impressions should first be documented with examination quality imaging prior to lifting.
- Choose either the white or clear adhesive lifter and lift cards based on what will give the expected result the best contrast.
- Unpeel or unroll the adhesive lift or tape in a smooth and continuous motion. Quick and non-continuous motions will cause creasing on the adhesive.
- Slowly apply the adhesive to the impression surface, using the side of your hand or fingers to press the adhesive down to ensure good contact. Avoid air bubbles if possible. Air bubbles can be eliminated with hand or fingers to force the air bubble out of the side of the adhesive. The rubber roller can also be gently rolled across the surface. Large creases or tears should be left alone.
- Using a smooth and continuous motion, remove the lift from the surface and place on a lift card.
- Take examination quality image of the lift.

Lifts that result in little to no detail transfer do not need to be retained.

INTERPRETATION

The lift is a mirror image of the impression if white backed adhesive lift sheets are used. This needs to be considered when comparing the lifted impression to the known evidence as photos will need to be flipped upon examination.

DOCUMENTATION

Label the back of the lift with the case identifiers, location (if available), and the analyst initials and date.

CHEMICAL AND PHYSICAL ENHANCEMENTS

Chemical and physical enhancement techniques are used to increase detail and contrast between the footwear impression and substrate by way of chemical reactions with specific components of the impression residue or enhancing non-visible impressions.

The substrate composition (e.g., porous or non-porous), substrate color, impression composition (e.g., blood, soil), method of impression deposition (e.g., wet or dry), and color produced by the enhancement need to be taken into consideration.

It is recommended that a non-evidential area of the substrate be tested with each reagent to evaluate potential processing limitations such as poor de-staining, degradation of the substrate, or substrate reaction with the reagent. This is particularly important if a sequence of more than one processing technique will be applied.

To help determine an appropriate processing method refer to ANSI/ASB Best Practice Recommendation 052, First Edition 2022 – Best Practice Recommendation for the Detection and Collection of Footwear and Tire Impression Evidence page 5.

Most chemical enhancement reagents interfere with or reduce the yield of DNA during DNA analysis. DNA evidence should be collected if requested before enhancing impressions evidence.

DOCUMENTATION

Visible impressions should first be documented through examination quality imaging prior to any chemical enhancement.

Documentation of the impression's location relative to its substrate and/or immediate surroundings must also be included in the examination documentation.

The results of the positive and negative controls (if applicable) will be documented in the analyst bench notes.

After enhancement, examination quality images should be taken of the impression if the enhancement resulted in greater detail, greater contrast, or visualization of additional impressions.

The examination documentation must include documentation of:

- the impression(s) selected for enhancement
- the enhancement technique used
- lot numbers of reagents and chemicals used (recorded in analyst notes)
- the controls tested and test results
- the results of the enhancement of the impression(s)

All reagents are prepared using the procedures listed below. Any deviation from the standard procedure will be documented in the notes and a deviation form will be filled out stating why the deviation was needed.

POWDERING

Powder is used for developing impression detail on various surfaces. Standard and magnetic powders come in multiple colors (black, red, white, fluorescent) and the analyst must use discretion as to which color powder will provide the highest contrast with the substrate.

Brushes are selected based on the type of powder used and the type of substate (fiberglass, nylon, feather or short bristle brush for standard powders, magnetic wand for magnetic powder). Substrates such as metal may not be suitable for magnetic powder.

All powders are purchased and not prepared in the laboratory.

APPLICATION

1. Suitable protective clothing (lab coat, mask, and gloves) should always be worn. Powder may be applied in a ventilation hood.
2. Choose the appropriate powder and brush for application
3. Apply the powder to the surface by using a smooth and light motion to brush the item. Just the tips of the brush should come in contact with the surface.
4. Additional passes of the brush can be made to increase enhancement, but care should be taken to not apply excess powder which can destroy the impression detail.
5. Use oblique or intense lighting to better visualize the impression.
6. Take examination quality photos of the dusted impression.

DEVELOPMENT

A positive result is when there is adhesive of the powder to the impression making the impression more visible.

CONTROLS

Controls are not required for powdering.

REFERENCE

Bodziak, W. J., *Footwear Impression Evidence: Detection, Recovery, and Examination,* 2nd edition, CRC Press, Boca Raton, 2000, p. 126, 144

Processing Guide for Developing Latent Prints, U.S. Department of Justice, Federal Bureau of Investigation, 2001, pp. 41-43. (Equivalent information is also available in the 2000 revision of this document available at http://onin.com/fp/fbi_2000_lp_guide.pdf.)

POTASSIUM THIOCYANATE

This technique utilizes a color reaction that takes place when potassium thiocyanate comes into contact with iron from soil/mud/residue impressions. If iron is present it reacts with the thiocyanate ions in the acid solution to produce reddish-brown color. This process works for wet residue and muddy impressions on all surfaces.

Potassium Thiocyanate is typically utilized instead of other processes and is prepared in house and not purchased as a working solution.

FORMULA

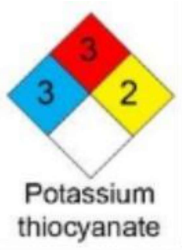
120 mL Acetone

15 mL Water

15g Potassium thiocyanate

8.5 mL Sulfuric acid (dilute <10%)

Makes 150ml



PREPARATION

Prepare dilute sulfuric acid by adding 2.5 mL of concentrated sulfuric acid to 6 mL water. Dissolve 15g of potassium thiocyanate to 120ml of acetone and 15ml of water. Mix thoroughly. Crystal may take some minutes to dissolve. Then slowly add 8.5ml of dilute (<10%) sulfuric acid. When mixing always add the sulfuric acid to the acetone/water mix, never the other way around or it may explode. A milky mixture results which, if left standing for a few minutes, will separate into two layers. When the layers have separated, pour the top layer, which is clear into a dark bottle.

CONTROLS

Reactionary substance: faint soil impression (soil collected from east side of laboratory) on light colored substrate

Positive results – reddish/brown enhanced impression

Negative results – no enhancement

STORAGE

The solution should be stored in an amber glass bottle at room temperature or refrigerated. Expiration is 3 months after mixing.

APPLICATION

1. The application of Potassium Thiocyanate will be performed in a ventilation hood whenever possible.

2. Preserve any suitable visible impressions present on evidence with examination quality photos prior to applying thiocyanate solution.
3. Lightly spray a fine mist of the working solution over the impression. Control the amount to get the maximum reaction without causing the impression to run or bleed.
4. Let dry.
5. Photograph either as is or using a green filter.

Application of too much potassium thiocyanate solution can cause running or obliteration of fine detail. This is more likely with repeat or heavy spraying.

REACTIONS

A positive result if a brick red, rust, or red-brown color upon application. Developed impressions on some dark-colored surfaces may be viewed with a light source for increased contrast.

SAFETY

Mixing and application must be performed in a vent hood wearing lab coat, gloves, and eye protection.

REFERENCE

Footwear Impression Evidence, CRC Press, 2000, Bodziak, W., J.

AMIDO BLACK- METHANOL BASED

Amido Black is commonly used on bloody impressions and stains the proteins in the blood turning the impression a dark blue or black color. This process works on both porous and non-porous surfaces but is especially useful for bloody or protein-based impressions deposited on lighter colored, non-porous surfaces such as glass, plastic, vinyl, etc. but may work on concrete or some papers. Results may be best on faint impressions.

Amido Black may destroy blood for biological screening/DNA testing. Have evidentiary blood samples chemically tested and preserved by appropriate personnel prior to processing. The background of a porous item may also stain, causing weak bloody impressions to not be detected on these surfaces. The background reagent is rinsed away which may increase the contrast of the impression on the substrate.

Amido Black is typically utilized instead of other processes. The fixative (5-sulfosalicyclic acid) is usually incorporated into the working solution. Amido Black is purchased, and the developer and rinse are prepared in the laboratory.

FORMULA

Amido black developer

0.2g amido black powder

10mL glacial acetic acid

90mL methanol

Makes 100mL

Amido black rinse

90mL methanol

10mL glacial acetic acid

Makes 100mL

PREPARATION

Mix only in a vent hood. Wear lab coat, gloves, and eye protection. Amido Black mixed with methanol which is highly flammable. Extreme caution should be taken.

For the reagent, dissolve 0.2g amido black in a solution of 10mL glacial acetic acid and 90mL methanol. For the rinse, combine the methanol and glacial acetic acid.

CONTROLS

Reactionary substance: synthetic blood impression (Sirchie catalog No. SYNB8) on light colored non-porous substrate.

Positive results – purple, blue, black color change

Negative results – no color change

STORAGE

The reagent and rinse solutions are stored in bottles at room temperature or refrigeration. Shelf life is indefinite.

APPLICATION

Application of enhancement reagents will be performed in a ventilation hood whenever possible. Eye protection, lab coat, gloves, and mask are to be worn. Stain and rinse a small area of the substrate that is not part of the impression, if possible, to check for background staining. Do not use this reagent if the background staining is significant.

1. Preserve any suitable visible impressions present on evidence with examination quality photos prior to applying Amido Black solutions.

2. Apply the Amido Black base solution by dipping, spraying, or using a squirt bottle to dried impressions in apparent blood. Apply until the entire impression has turned from a reddish-brown color to a blue-black color (~1 minute). Background staining may occur.

3. If necessary, the base solution can be re-applied before the final rinse to achieve sufficient clarity.

4. Rinse off excess base solution with the rinse solution (use additional rinses as necessary to achieve sufficient clarity). A final rinse with distilled water can be used if needed.

5. Let dry.

6. Examine the item for footwear impressions and indicate the impression with suitable markings as appropriate to be preserved by examination quality photography.

REACTION

Successful staining will result in a blue-black colored impression within 1-2 minutes.

REFERENCES

Bodziak, W. J., *Forensic Footwear Evidence*, CRC Press, Boca Raton, 2017, pp. 61-162. (Formula)

Processing Guide for Developing Latent Prints, U.S. Department of Justice, Federal Bureau of Investigation, 2001, pp. 23-25. (Formula)

LEUCO CRYSTAL VIOLET (LCV)

LCV is used on bloody impressions by staining the proteins (hemoglobin) in the blood and turning the impression a dark violet color. LCV is useful for bloody impressions deposited on lighter colored surfaces and porous and non-porous substrates such as carpet, fabric, vinyl flooring, etc. LCV works with extremely faint traces of blood. LCV can have false positive results which include but are not limited to plant materials, and some metals.

LCV is typically utilized instead of other processes although faint impressions can be further enhanced with Amido Black after treatment with LCV to increase contrast.

LCV may destroy or degrade DNA. Collect biological samples before treating the substrate with LCV.

FORMULA

LCV components are purchased from a vendor but prepared on scene.

LCV

Prepare the following four containers:

· Bottle A – 473 mL bottle of 3% Hydrogen Peroxide

· Bottle B – a bottle containing 10 g of Sulfosalicylic Acid

· Bottle C – a dark colored bottle (at least 40 mL capacity) containing 1.1 g of Leuco Crystal Violet

· Bottle D – a bottle (at least 40 mL capacity) containing 4.4 g of Sodium Acetate

Mix Instructions:

1. Add bottle B to bottle A, shake well.

2. Add approximately 30 mL of bottle A to bottle C, shake well. Add back to bottle A.

3. Add approximately 30 mL of bottle A to bottle D, shake well. Add back to bottle A.

4. Place solution in a spray bottle or attach a spray top to the hydrogen peroxide for application.

CONTROLS

The control will consist of dried synthetic blood on a swab or non-porous surface. The result will be documented in the analyst's bench notes.

Positive control- color change to violet
Negative control- no color change

STORAGE

The solution should be stored in a dark bottle and refrigerated. It expires 30 days after mixing.

APPLICATION

1. Take examination quality photos of impression evidence prior to application.

2. Adjust the spray nozzle to obtain the finest mist possible.
3. Spray over the tip of the control swab containing synthetic blood.
4. Note the color change (within 60 seconds).
5. Apply to the area of interest. If a positive reaction occurs, stop spraying, label and photograph.
6. If needed, cut out and collect the area.

REACTION

Successful staining will result in a violet-colored impression within 1 minute.

SAFETY

Avoid contact with skin and eyes. Lab coat, mask, eye protection, and gloves should be worn.

REFERENCE

State of Alaska Crime Scene Procedure Manual (Version 7.0)

Processing Guide for Developing Latent Prints, U.S. Department of Justice, Federal Bureau of Investigation, 2001, pp. 49-50. (Formula)

Bodziak, W. J., *Footwear Impression Evidence: Detection, Recovery, and Examination,* 2nd edition, CRC Press, Boca Raton, 2000, pp. 161-163.

ACID YELLOW 7

Acid Yellow 7 is a dye solution used for staining bloody impressions. The impressions will turn yellow after treatment. This enhancement only works on non-porous surfaces.

Acid Yellow 7 may destroy or degrade DNA. Collect requested DNA evidence before processing the item.

Acid Yellow 7 is prepared in the laboratory and not purchased as a working solution.

FORMULA

Fixative

20g 5-Sulfosalicylic acid

1000mL Distilled water

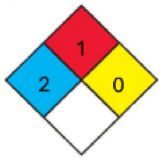
Acid Yellow 7

1g Acid Yellow 7

700mL Distilled water

50mL Acetic acid (glacial, 99%)

250mL Ethanol (98% or higher)



Acid Yellow 7

PREPARATION

Fixative: Add all components to a beaker/flask and mix until completely dissolved.

Acid Yellow 7: Add water first and then Acid Yellow 7 powder to an Erlenmeyer flask. Mix by swirling the flask or using a magnetic stirrer and a PTFE- covered stir bar. The powder will dissolve quickly. Add ethanol and acetic acid.

CONTROLS

Synthetic blood impression (Sirchie catalog No. SYNB8) on any substrate, lifted with black gelatin lifter and visualized using a blue green light. The results will be documented on analyst bench notes.

Positive results – yellow color change

Negative results – no color change

STORAGE

Store in dark container for up to 1 day.

APPLICATION

Acid Yellow 7 is typically utilized instead of other processes although the resultant impression can be gel lifted and photographed in the blue/blue-green light range. The fixative (5-sulfosalicyclic acid) is usually applied to the impression before staining with Acid Yellow 7.

1. Preserve impression with examination quality photos
2. Immerse impression in fixative for 3-5 minutes
3. Remove and rinse with distilled water
4. Immerse or spray mist the impression with working solution of Acid Yellow 7 for 1-3 minutes or until the impression is fully developed.
5. Remove and rinse with the distilled water.
6. Allow to dry completely.
7. Stained impression can be lifted with a black gel lifter. leave gel on impression for around 1 minute. Remove and visualize under blue/blue-green light (400-490nm) using orange/yellow eye protection. Photograph using orange/yellow filter as soon as possible as dye will begin to diffuse into the gel.

REACTION

Successful staining will result in a yellow-colored impression within 1-3 minutes.

SAFETY

Avoid breathing aerosols of the fixative and dye solution by using a fume cabinet. Avoid contact with skin and eyes. Lab coat, mask, eye protection, and gloves should be worn. Wear amber protective eye wear when viewing results under laser light.

REFERENCES

Bodziak, W.J., Forensic Footwear Evidence. CRC Press: Boca Raton, FL: CRC Press; 2017.

TEST IMPRESSIONS

Test impressions record the fine details of a known footwear outsole. Multiple attempts should be made to record as much fine detail as possible with appropriate contrast and/or three-dimensional features of accurate size, shape, and clarity. Footwear test impressions will be retained in the package with the submitted shoes and share the parent item chain of custody unless otherwise stated in the bench notes. All suitable test impressions made will be scanned and retained in ADAMS. Test impressions that fail or are of poor quality do not need to be retained.

Footwear examiners should make test impressions using one of the methods listed below. The following methods are suggested but are not the only possible methods (other methods meeting the criteria of 4.2.1 may be used). The two main test impression methods used at the Alaska Scientific Crime Detection Laboratory that are normally used for examination are static test impression (fingerprint powder and adhesive lift, and dynamic test impression (inkless pad and paper). Three-dimensional test impressions may be helpful and should be used on 3D impressions. Usually, each method of test impression collected can be accomplished by wearing the footwear item or/and stepping or by rolling/pressing the outsole by hand.

Step-by-step procedures are listed only as a guide to assist the analyst and are not intended to be absolute. Slight modifications or additions to the steps may be made at the analyst's discretion provided that the quality of the resulting test impression is maintained.

Variations may occur from one test impression to another depending on how the test impression is created. These variations are normal and expected. Test impressions do not always fully reproduce characteristics due to variability in the impression making process. The analyst can make as many test impressions as they deem appropriate to capture all the details possible.

Many methods of creating test impressions require wearing the known footwear. For personal protection and safety of the wearer, the wearer must wear a plastic bag or other protective foot cover and gloves whenever putting on the item(s) of footwear.

Requested biological evidence should be collected prior to any test impressions being made.

DOCUMENTATION

The method of test impression (static, dynamic, Biofoam) collection from the outsoles and the final storage location of the test impressions if not returned with the original item will be documented in the bench notes. The type of test impressions takes, the date they were taken, and which test impression was used in comparison will be documented in the bench notes.

Each impression should have the following information documented on the test impression:

Make, model, size, date test impression was made, country of manufacturing, left or right shoe, dynamic or static, and the analyst initials will be recorded on each test impression.

A scale will be included on any imaged/scanned test impressions, even when scanning at 100% natural size.

Limitations, when known, should be noted and recorded in the bench notes. Limitations can be due to the substrate features, the method of collection, and the inability to accurately reproduce conditions under which the question impression was made.

INKLESS TEST IMPRESSIONS (DYNAMIC TEST IMPRESSION)

The Soleprint system or equivalent inkless system may be used. The inkless system consists of a pad saturated with a chemical solution and chemically treated paper. The chemical solution will develop into a dark gray to black color when it contacts the treated paper. This method provides a two-dimensional test impression of a wet deposit material. When the pad is newer and more saturated, a "blotting" step prior to stepping onto the treated paper might be desired.

1. Place the inkless pad on the floor with the saturated chemical pad.
2. Place a piece of treated paper next to it, treated side up.
3. Wearing the item(s) of footwear (analyst wears plastic bag over foot for protection), step on the pad to evenly distribute the solution over the outsole.
4. Step onto the piece of the treated paper like a normal step is being taken.
5. Label the impression with pertinent case information.
6. Scan with a scale sticker and upload to ADAMS

FINGERPRINT POWDER AND ADHESIVE LIFT (STATIC TEST IMPRESSION)

This method of test impression collection allows for a two-dimensional recording of the recessed areas of a footwear outsole to be recorded. However, when the adhesive is pressed into the recessed areas of the outsole, the size representation will normally appear longer. A mask should be worn when working with fingerprint powders or the fingerprint powder applied in a ventilation hood.

1. Lightly dust a thoroughly dry outsole with fine, black or red fingerprint powder. Tap the item of footwear firmly on its side to dislodge loose fingerprint powder.
2. Obtain an adhesive sheet that has a cover sheet.
3. Prop the item of footwear up to expose its outsole.
4. Using a roller or hand, press the adhesive sheet onto all areas of the sole to obtain a full impression. If information from the recessed areas is desired, press the adhesive sheet onto the footwear beginning at one end and press the sheet into the recessed areas as they are encountered.
5. Carefully peel away the adhesive and cover with the cover sheet, avoiding air bubbles. Use of a fingerprint roller may help.
6. Label the impression with pertinent case information.
7. Scan with a scale sticker and upload to ADAMS

BIOFOAM

Biofoam is a deformable fragile foam product used to create three-dimensional test impressions. Biofoam deforms with minimal pressure, so care should be taken to press into the foam in a steady and level fashion to obtain the best results. Some individual characteristics may not be captured.

1. Press the outsole into the foam to the desired depth and remove.
2. Label the impression with pertinent case information.
3. Take exam quality photos with a scale pressed into the foam at the same level of the impression to create the test impression.

FOOTWEAR INTELLIGENCE

Footwear impressions that are submitted to the laboratory when no known footwear has been submitted or is available can be searched for a potential source, in an attempt to provide investigative information. Searches are also done on impressions in comparison cases during analysis before looking at the submitted known shoes to determine a potential source.

IMAGE SUBMISSION

Photos of footwear impressions can be submitted via ZendTo or emailed to the footwear intelligence email dps.footwear.intelligence@alaska.gov.

Basic case information needs to be provided so that a laboratory case can be created. This should include the agency case number, offense date, offense type, and location with photos attached to the email. If basic case information is not received with the pictures, the submitting officer should be contacted and the information obtained. This is to ensure that if shoes are eventually submitted with the associated photographed impressions, the date of collection and location can be included in the comparison report.

INITIAL ASSESSMENT

The submitted images should first be analyzed to determine if they are suitable for searching. Generally, an impression is considered suitable for searching if it contains patterned elements that are clear and consistent with a footwear impression. Also, if the impression is partial and the quantity of the visible pattern is of common nature (e.g. 90-degree zig zag elements or a single set of circles) the impression can be deemed unsuitable. If the analyst concludes that the image(s) are not suitable due to insufficient quantity and/or quality of detail, no search is required.

CASE CREATION

Instructions in the Evidence Room Manual should be followed to create a Footwear Intelligence case in Justice Trax LIMS after the submitted photographs have been determined to be suitable for searching. The email submission should be printed to PDF and attached to the case attachment tab in LIMS. This serves as the Request for Laboratory Services. An evidence item will be created in LIMS with the name of FW Images and the description of the FW Image evidence item containing and listing the photograph names received in the request. The intended disposition of footwear images received will be “retained in lab”. The FW Image names received with the request will be used throughout the note taking and report. The chain of custody will show the images going from the submitting officer (check via email box) then to the analyst, then to the Digital Imaging server and the evidence will be related to the FW Intel request

The images submitted will be uploaded into ADAMS with the generated case number.

DATABASE AND INTERNET SEARCH

The Alaska Reference Collection (ARC) is a searchable catalog of shoe impressions that is a subset of the UK National Footwear Reference Collection. The analyst can search just the ARC collection or the entire database which includes the UK National Footwear Reference Collection.

The analyst evaluates the outsole design elements (e.g. circles, bars, 4 sided shapes, etc.) and select the appropriate coding for the main outsole area and the heel area of the impression. A photo of the outsole can also be included in the search to narrow down the results. Certain brands of shoe can be selected to narrow down the search if a logo is seen or the design features look similar to an outsole recognized by the analyst. The outsole output from the database will produce pictures of similar outsoles that may have produced the unknown impression. If no records having a similar outsole design are found, another search using other coding parameters can be done for another search attempt.

DOCUMENTATION/REPORTING

The method of searching if performed will be documented. If a potential make/model match is found in the ARC database, the ARC database code will be recorded in the notes. The coding parameters of the search will also be recorded in the notes. If no similar outsole was found from the search, it will be stated in the notes and report. When a possible source is reported, the report will include a statement to the effect that the results may not be all-inclusive (e.g., made by NIKE or a similar outsole).

If the database fails to produce a suitable match, the analyst can do a manufacturer search online (e.g. Nike.com, zappos.com, etc.) or by visiting stores and taking pictures of potential shoe matches. The analyst will record which website or store provided the potential matching shoe.

At a minimum, the notes will document the name of the manufacturer, the model name if available, and a visual representation of the outsole from the search. Visual representation of footwear uppers may also be included, but the customer should be made aware that the uppers could possibly be different and not of the same color.

The following statement should be present on at least one page of the notes:

"**The information in this document is intended for intelligence purposes only.** This is not a report, result or conclusion. Please be aware that other manufacturers may produce the same or similar patterns and other styles and colors may be available. If footwear is recovered and a comparison and evidential report are required, please submit any impressions, footwear and a request for laboratory services to the Alaska Scientific Crime Detection Laboratory Evidence Department."

EXAMPLE REPORT WORDING

The submitted impression FW Image 2222.JPEG was searched against the Alaskan Reference Collection (ARC) database and was categorized as having been made by NIKE or similar outsole. Please see the attached notes.

The submitted impression FW Image 2222.jpg was searched against the Alaskan Reference Collection (ARC) database and not found.

The submitted impressions FW Image 2222.JPG did not contain enough detail and clarity to be searched.

If you recover footwear and require an evidential comparison, please submit the footwear, all scaled impressions, and a completed request for laboratory services form under this laboratory case number 26-00000.

LOCAL FOOTWEAR REFERENCE COLLECTION

The laboratory keeps an alphabetized (by manufacturer) reference collection of outsole design. It consists of test impressions of footwear submitted for casework and anonymized prior to storage. Impressions are identified by manufacturer, model/style, size, country of manufacture and numerical code.

Each sample in the reference collection is given a unique identifier based on the make, the database reference and a sequential number. The samples within the reference collection are collated in a spreadsheet that is kept in the Footwear discipline folder I> Discipline Shares>Footwear>Local Footwear Reference Collection.xls. Hardcopies are contained in the Local Footwear Reference Collection and kept in sequential order in two filing cabinets within the Physical laboratory.

The Local Footwear Reference Collection is defined as a paper reference collection or cataloguing of outsole designs utilized for various scientific reasons, to include, but not limited to:

To give exemplar(s) of each outsole design seen at the lab.

To provide additional information on class characteristics (design, mold, size, wear) for an examiner during a footwear comparison.

To enable sizing an impression during a footwear intelligence request.

To provide an exemplar resource for training new forensic scientists or in developing new technology.

EXAMINATION METHODOLOGY

Information that may be provided from an examination includes how many different outsole or tread designs are present, how the questioned impression was made, the direction of travel of an impression, and possibly a determination of order of deposition. Limitations to an examination include substrate features, quality of the original questioned impression or image(s), and/or the method of documentation and collection.

Prior to commencing the Impressions examination, the analyst should review the Request for Laboratory Services (RLS) and the case activities prior to starting casework (e.g., officer's reports or conversation records), to determine if the collection of biological evidence is needed. Biological swabs should be collected before any processing methods are done on the submitted footwear if requested. If the analyst encounters red-brown staining on submitted footwear, the DNA supervisor should be contacted to determine if blood swabs need to be collected for analysis.

Enhancement techniques may be used on questioned impression evidence, as needed. The analyst should refer to the appropriate sections of this manual for digital, chemical, and physical enhancement policies. If enhancements of the questioned impressions are used and found to provide additional details, then the enhanced impressions should be reassessed, and documented as to what was found in the examination documentation.

The following methodology is a structured and systematic guide for footwear impression evidence. There are four parts to the methodology that include Analysis, Comparison, Evaluation, and Verification. This process, which is sometimes referred to as ACE-V, is common to all comparative disciplines.

The procedures presented are intended to assist the examiner in the comparison of footwear impressions. They are to be used in conjunction with all applicable laboratory policies and proper scientific methodology.

IMAGING

The questioned impression evidence may consist of photographic or digital images, casts, lifts, or the actual object that has the questioned impression on it.

When an impression area is first observed, it is documented and preserved by imaging it. If subsequent processing techniques improve or further develop the impression, it will be re-imaged.

See the Digital Imaging section of this manual.

COMPARISON INTRODUCTION

Footwear impression comparison examinations are performed with a questioned impression(s) and a known object. A known object is one that may be a potential source of the questioned impression (e.g., shoes worn by a suspect). Actual footwear items are the preferred known samples for comparison. Photographs or impressions of known footwear limit the conclusions that can be made from comparisons.

The conclusions from comparisons with a known shoe may provide the submitting agency with information about the degree to which the known shoe was the source, or was not the source, of the impression.

Comparisons follow the Impressions version of the ACE-V method Analysis, Comparison, Evaluation, and Verification. This process, which is sometimes referred to as ACE-V, is common to all comparative disciplines and developed for NIST OSAC Physics/Pattern disciplines. Part of the comparison process is an analysis of test impressions to determine if features on the shoe are reproducible. Determining whether marks are randomly acquired characteristics (RACs) and a final comparison of wear and RACs should be performed using the known shoe itself.

Comparisons may be performed between a questioned footwear impression and reference outsoles for the purpose of determining shoe size when the make/model of the questioned impression has been determined. Various sizes of reference outsoles are available from the Alaska reference collection or shoes obtained from stores and can be compared to the questioned impression if it possesses sufficient quality, completeness, and design features that allow for an accurate shoe size determination to be made.

The procedures presented are intended to assist the examiner in the comparison of footwear impressions. They are to be used in conjunction with all applicable laboratory policies and proper scientific methodology.

A comparison consists of the following steps in the order they are to be performed. The comparison steps are written with a focus on footwear and tire comparisons but should be adapted as necessary for comparisons to other known objects.

1. Analysis of the Questioned Impressions
2. Initial Analysis of the Known Outsole
3. Preparation and Assessment of Known Evidence
4. Comparison of Question Impressions to Known Evidence
5. Evaluation and Conclusions
6. Verification

ANALYSIS OF QUESTIONED IMPRESSIONS

To minimize potential bias the questioned impression(s) should be fully analyzed before any known footwear is opened or analyzed. If the unknown footwear impression photos are received electronically, and not as an item on the RLS entered into LIMS by the evidence section, the evidence item will be created in LIMS with the name of FW Images. The description of the FW Image evidence will include how many images were received, the full names of the images as received, and the disposition of the evidence set as "Retained in Lab". The image names will follow the item throughout the notes and report.

The initial analysis of the questioned impression includes determining the origin of the impression (2D, 3D), the substrate the impression in on, the recovery method used (when the recovery and or enhancement techniques are completed outside of the laboratory prior to submission the analyst should clearly document in their notes that this was done by the law enforcement officer (LEO)), the suitability of the impression for comparison by analyzing the quality and clarity of the impression, as well as if there is sufficient features and noting the limitations.

If multiple questioned impressions are found, the analyst should assess them all. If there are many or overlapping impressions, then the analyst may need to decide which impressions to assess and must include documentation of their reasoning. The analyst will record the number of impressions and designate (right or left) each impression, sub-itemizing each impression and give a brief description of each sole design visible in the impression. The analyst can visualize the impression under different light sources and may enhance the impression using photography and/or alternative lifting or chemical methods. If there is any subsequent recovery technique or chemical enhancement, the type of processing will be noted and the date the processing was performed, and the impression will be re-photographed.

Items of evidence where multiple impressions have been recovered shall contain a unique identifier for each impression preserved. Sticker tags may be used, and a marking can be added to the item to ensure each area can be traced back to the original item. When documenting each individual area on the item does not fit or is not practical, an overall photo of the item may be captured with all stickers labeled and visible.

Due to the continuous wear changes to footwear outsoles, the collection times of both the unknown impressions and the known shoes should be documented. The collection times may be obtained from the RLS and/or labels on item packaging or from markings on the item.

After the initial assessment, the analyst may also assess the impression's possible wear and randomly acquired characteristics (RACs).

The analyst will search for the questioned impression in the ARC database, and record any results found from the search, or state the impression design was not found. The analysis start date, and the date of the database search will be recorded in the notes.

If the questioned impression is determined to be unsuitable for comparison, the analyst will document why it is unsuitable (e.g., insufficient detail) and will move to Step 5, the Evaluation and Conclusions section.

If the questioned impression is determined to be suitable for comparison, then the analyst will continue to step 2 and observe the known object(s).

Analysis of questioned impressions guidance

ANALYSIS OF KNOWN FOOTWEAR

Actual footwear items are the preferred known samples for comparison. Photographs or impressions of known footwear limit the conclusions that can be made from comparisons.

Documentary photos of known footwear should be taken to document overall appearance and outsole design. The general condition of the upper and sole, brand, and label/size information (if discernable) of known footwear should also be photographed and documented. The type of footwear, the date and location of the footwear seized will be noted. A description of the outsole design should be recorded in the notes (e.g. four-sided blocks across heel, circles and curved bars apparent on main sole).

Evidence for other exams (e.g. trace, bio-screening) should be collected prior to any processing of known footwear. The known shoe can be searched in the ARC database if identifying tags or markings cannot be found.

After the assessment of the known shoe the analyst will determine if there are similarities or dissimilarities of the general outsole design of the known footwear and the questioned impressions.

A preliminary side-by-side examination should be done of the known footwear and the questioned impressions. If there is significant non-correspondence of outsole design, then the analyst may discontinue the remaining steps of the comparison process and move to Step 5 the Evaluation and Conclusions section.

If there is correspondence in outsole/tread design (or non-correspondence that may be insignificant) between the questioned impression and the known object, then continue to step 3 for a full assessment of the known evidence.

Guidance for Known Footwear Analysis

ASSESMENT AND TEST IMPRESSIONS OF KNOWN FOOTWEAR

A full assessment of the known footwear evidence will be completed by first imaging the footwear with examination quality photos (including a scale in the same plane with the bottom of the outsole), with various lighting angles, creating test impressions, and possible examination of new examples of the known footwear if they are available.

Before making test impressions, the analyst should note any significant debris on the footwear such as stone holds, gum, or any other feature that is not part of the manufactured outsole.

Note: loose dirt debris that comes off of the known footwear while creating the test impressions does not need to be retained.

Test impressions are used to compare and evaluate specific outsole designs, physical size, position and degree of wear, mold characteristics, and any individual identifying characteristics to determine correspondence between the known footwear and the evidence impression. The use of magnification or special lighting may be appropriate. Although the comparison is conducted primarily through the medium of the test impression the actual item of footwear must be examined to confirm the location and validity of the characteristics observed.

At least two dynamic impressions should be made of each shoe with an inkless pad (one for examination and one for the Alaska Reference Collection) and at least one static impression (fingerprint powder & adhesive paper). The test impressions should be assessed side by side to confirm the majority of the outsole details have been recorded. Additional test impressions may be created if necessary.

The test impressions will be scanned with a scale of at least 600 dpi, saved as a .TIFF and uploaded and retained in ADAMS. The test impressions that is selected for examination will be cropped and sized to be included in the examination bench notes.

Refer to the Test Impression section of this manual for creating test impressions.

COMPARISON OF QUESTIONS IMPRESSONS TO KNOWN EVIDENCE

Impressions that have been selected as suitable for comparison are compared to the known footwear. If the impression was 3D and a cast submitted, side by side comparison is performed. 2D impressions or scaled photographs are compared by using superimposition in Photoshop.

During the comparison, that analyst will first compare the outsole design, the physical size/alignment/configuration, and general and specific wear. Consideration must be taken when comparing the impression in regard to the type of impressions, if there was any time delay (between the crime occurrence and when the known shoes were seized), manufacturing process, reproducibility, and the impression deposition. If the outsole design, size and wear correspond, then specific wear and Randomly Acquired Characteristics (RAC's) should then be compared. A stereomicroscope should be used on the known footwear to confirm the RAC's

The limitations in questioned impressions and/or evidence that are due to substrate features, nature of the impressions, and the method of collection as well as any additional interferences or limitations (e.g., smeared impressions, image quality issues, distortion).

Correspondence or no correspondence of design, physical size/alignment, wear, RAC's, and the dates of comparison.

If at any point during the comparison an exclusionary difference is observed that cannot be evaluated or explained by any of the limitations documented in the examination, the analyst should move to Step 5 the Evaluation and Conclusions section.

EVALUATION AND CONCLUSION

The analyst is to evaluate all the data observed in the analysis and comparison phase and reach a conclusion based on the comparison as to the degree of association or non-association between the questioned impression and known footwear. Opinions and interpretations will be clearly marked in laboratory reports.

The methodology of how the analyst arrived at their conclusion should be documented in their bench notes, test impressions, photograph of the questioned impression and report to the extent that another trained analyst should be able to verify the findings without re-examining the original evidence.

Any features that were used to specifically support the selection of one conclusion over another must be documented clearly in the examination documentation.

Examiners are encouraged to use the adapted standardized terminology to express their conclusions in laboratory reports from the Scientific Working Group for Shoeprint and Tire Tread Evidence (SWGTREAD) "Range of Conclusions Standard for Footwear and Tire Impression Examinations (03/2013)" (See Section 9.0).

The standardized terminology should not be regarded as the only way to express opinions in reports; the wording of the conclusions should be reported as closely as possible when it is an accurate representation of the observations and findings. If a conclusion does not accurately represent the observations and findings, yet there is a closest conclusion level available, then it should be selected and re-worded to the extent needed to communicate the conclusion accurately. Qualifying statements that describe observations or findings not mentioned specifically in the conclusion wording should be added for completeness, when applicable (e.g., specific additional feature observed, specific limitations of the evidence, etc.). The guidelines are not standards and should not be used as such.

VERIFICATION

For all footwear impression cases with an opinion of Exclusion, High Degree of Association, or Identification a verification will be conducted. The verifier may be the technical reviewer, or another analyst assigned as the technical reviewer. The verifier will use the application of the comparison process (steps 1 – 5) to either support or refute the conclusions of the original analyst.

The original analyst will create a unique verification tag in FORAY for the crime scene impression(s) and test impression(s) used that resulted in an opinion of Exclusion, High Degree of Association, or Identification, and create a verification request in LIMS. The original analyst will also create a digital composite sheet with the unknown impression and the known test impression unmarked for the verifier and put it in the work product folder for Footwear on the I: drive.

The verifier will select the verification tag in ADAMS which will show them only the images in need of verification. All verifications will be documented in LIMS, and the verifier will specify the designated conclusions for each verification made in the verification report.

For an opinion of High Degree of Association or Identification, verifications will be performed using the unmarked digital composite created by the original case Analyst, marking their findings on this composite, and saving it back as the verification composite. The verifier will confirm the documented image number and case number are correct on the composites during verification. The verifier will acquire all of the composites to ADAMS after the verification has been completed.

If the verifying Analyst disagrees with the original Analysts conclusions, disagreement will be discussed between analysts. If an agreement cannot be reached between the verifier and original Analyst, the disagreement will be documented in LIMS and then sent to the Physical Discipline Supervisor or Footwear Technical Lead for resolution. The Physical Section Supervisor may designate another analyst or wish to send the comparison to another qualified analyst in another lab system to review the case in question until a conclusion is reached.

COMPARISON REPORTING

The report should include the following:

- All items of evidence that were analyzed and that they were acquired to ADAMS
- Which items of evidence moved forward to comparison if triage of evidentiary items occurred
- A description of the known footwear received
- Which unknown impression was compared to which known footwear, including whether it was left or right and if they were full or partial impressions
- The limitations for each item that was compared
- All conclusion levels for each item compared with the definitions of the conclusions

The conclusions listed are followed by a report wording example in bold print.

Identification (definite conclusion of identity)—this is the highest degree of association expressed in footwear examinations. The questioned impression and the known footwear share agreement of class and randomly acquired characteristics of sufficient quality and quantity to conclude that the known footwear is identified as having made the questioned impression.

> **In the opinion of the examiner, the particular known footwear was the source of, and made, the questioned impression. There are no indications that another item of footwear made the questioned impression.**

High degree of association—The questioned impression and the known footwear must correspond in the class characteristics of design, physical size and general wear. For this degree of association there must also exist: (1) wear that, by virtue of its specific location, degree and orientation make it unusual and/or (2) one or more randomly acquired characteristics.

In the opinion of the examiner, the characteristics observed strong associations between the questioned impression and the known footwear; however, the quality and/or quantity were insufficient for an identification. Other footwear with the same class characteristics observed in the impression are included in the population of possible sources only if they display the same wear and/or randomly acquired characteristics observed in the questioned impression.

Association of class characteristics—The class characteristics of both design and physical size must correspond between the questioned impression and the known footwear. Correspondence of general wear may also be present.

In the opinion of the examiner, the known footwear is a possible source of the questioned impression and therefore could have produced the impression. Other footwear with the same class characteristics observed in the impression are included in the population of possible sources.

Limited association of class characteristics—Some similar class characteristics were present; however, there are significant limiting factors in the questioned impression that do not permit a stronger association between the questioned impression and the known footwear. These factors may include but are not limited to: insufficient detail, lack of scale, improper position of scale, improper photographic techniques, distortion caused by mark deposition and significant lengths of time between the date of the occurrence and when the footwear were recovered that could account for a different degree of general wear. No confirmable differences were observed that could exclude the footwear.

In the opinion of the examiner, factors (such as those listed above) have limited the conclusion to a general association of some class characteristics. Other footwear with the same class characteristics observed in the impression are included in the population of possible sources.

Indications of non-association —The questioned impression exhibits dissimilarities when compared to the known footwear; however, the details or features were not sufficiently clear to permit an exclusion.

In the opinion of the examiner, dissimilarities between the questioned impression and the known footwear indicated non-association; however, the details or features were not sufficient to permit an exclusion.

Exclusion—This is the highest degree of non-association expressed in footwear impression examinations. Sufficient differences were noted in the comparison of class and/or randomly acquired characteristics between the questioned impression and the known footwear.

In the opinion of the examiner, the particular known footwear was not the source of, and did not make, the impression.

Lacks sufficient detail – There are two possibilities for this conclusion.

1. No comparison was conducted: the examiner determined there were no discernable questioned footwear impressions or features present. This opinion applies when there is insufficient detail to conduct any comparison.

In the opinion of the examiner, an impression was either not present or the impression lacked sufficient detail for any comparison.

2. A comparison was conducted: the examiner determined that there was insufficient detail in the questioned impression for a meaningful comparison. This opinion only applies to the known footwear that was examined and does not necessarily preclude further examinations with other known footwear.

   In the opinion of the examiner, the impression lacked sufficient detail for a meaningful comparison regarding the particular known footwear outsole.

TECHNICAL AND ADMINISTRATIVE REVIEW

For all footwear impression and footwear processing requests, the assigned analyst performs Analysis, Comparison, and Evaluation. The reviewing analyst will have access to the bench notes, test impressions, scaled photographs of impressions and the original items upon request. All footwear impression and footwear impression cases will undergo technical and administrative review.

All Technical and Administrative reviews will be documented within LIMS. All original and corrected version(s) of the analyst's original observations are stored in LIMS. Any changes to be made by the original analyst will be noted in the "Reject Findings" reviewer box. Rejected data is retained in the technical record through LIMS Audit Trail or the attachments.

For the opinion of Association of Class Characteristics, the technical review should confirm the calibration of the questioned impression and that the size of the known footwear is in correspondence. The completion of the final laboratory report, technical review and administrative review are tracked electronically in LIMS.

Footwear intelligence requests are designed to generate investigative leads; as such they are not intended to be evidential reports, however they will be technically and administratively reviewed.

In the event that technical review is completed outside of the Alaska Scientific Crime Detection laboratory, administrative review should be completed prior to sending out and post any changes being implemented. This process is documented within case activities in LIMS.

External technical reviews will be conducted by another examiner who is competent in the footwear impression analysis/comparison. The reviewer should also have passed an external proficiency test in this category of testing within the last four years (and have not failed a proficiency test). The reviewer should work for an ISO 17025 accredited laboratory and have read the most current revision of the ASCDL Footwear Manual and the QAM. Where a long-

term agreement exists between agencies a contract, memorandum of understanding, or intergovernmental agreement shall be signed by both parties. The reviewing analyst will complete a signed affidavit for each case reviewed outlining the date that the review was completed and that the original work was satisfactorily completed per the discipline manual.

Deviations from this policy will be agreed upon prior to the review being completed and documented in the affidavit.

Technical records relating to the Footwear discipline are stored at the laboratory either in the LIMS, or in the Digital Asset Management System (ADAMS). Original and corrected data will be maintained in LIMS. (Specific activity dates for Footwear Intelligence and Impressions relating to photography or image enhancement, are captured in ADAMS via the Asset Audit Trail and on any composite images)

REFERENCES

ANSI/ASB Best Practice Recommendation 021, First Edition 2019. Best Practice for the Preparation of Test Impressions from Footwear of Tires

ANSI/ASB Best Practice Recommendation 049, First Edition 2020. Best Practice for Lifting of Footwear and Tire Impressions

ANSI/ASB Best Practice Recommendation 052, First Edition 2022 – Best Practice Recommendation for the Detection and Collection of Footwear and Tire Impression Evidence

ANSI/ASB Best Practice Recommendation 126, First Edition 2022. Best Practice for the Casting Footwear and Tire Impression Evidence at the Crime Scene

ANSI/ASB Technical Report 051, First Edition 2020, Errata 1, 2022. Scope of Work for a Footwear/Tire Examiner

ANSI/ASB Technical Report 050, First Edition 2021, Errata 1, 2022. Best Practice Recommendation for Photographic Documentation of Footwear and Tire Impression Evidence.

OSAC 2023-S-0017 Standard for the Articulation of Footwear and Tire Interpretations.

QUALITY ASSURANCE MEASURES

CONTROL TESTING

Controls (positive/negative) are utilized to test the efficacy of Footwear development chemicals.

In general, a development chemical is applied to established (literature, et al.) reactionary substance(s) with an expected result. The reactionary substance may not necessarily be footwear residue.

The analyst performing a control test should limit chemically misleading variables (e.g.: lack of humidity, insufficient residue, etc.). Fluorescent reactions should be run under appropriate excitation (ALS/Laser wavelength) conditions (utilization of filters, goggles, etc.). In the case of a negative result, a second control test should be run under similar conditions with the same lot. If a second negative result occurs, a new lot of the chemical should be prepared, logged, and control tested accordingly.

All chemical enhancement processes are control tested each time they are used. Any Positive or Negative control results for casework are recorded in the Analyst's case notes.

Specific information for controls such as reactionary substances or expected results are found in the Chemical and Physical Enhancement Section of this manual.

Initial control testing of development chemicals mixed at the laboratory is noted in the CHEM INV Excel Spreadsheet for each batch.

CONTROL OF RECORDS

Footwear notes are recorded in the Laboratory Information Management System (LIMS).

Digital photos and/or scans for footwear casework/bench notes are stored online in Foray ADAMS. Access to Foray ADAMS repository is limited to Physical section employees.

Chemicals received and used by the footwear discipline are recorded in the Physical Chemical Inventories located on the SharePoint.

TECHNICAL RECORDS

Casework technical records consist of:

The case report, bench notes created in PowerPoint with casework photos, and attached as jpg files in LIMS, and all evidential and overall photos of the evidence that are retained in ADAMS.

START DATES – END DATES – CASEWORK ACTIVITIES

The start and end date of the analysis will be documented for each case in the LIMS. The start date is the date analysis or evidence examination begins. The end date is the date the analyst finalizes the case, sending it for technical and/or administrative review. Dates for each process are noted next to the process, if different from the start date.

PERSONNEL

Each analyst fully trained in footwear comparisons takes an external proficiency test annually.

Footwear discipline literature review will be documented in LIMS under Utilities>Training Records>LitReview Impressions. Comprehension/relevance of reviewed literature should also be recorded in LIMS. Relevant articles will also be added to the reading section within the footwear training manual.

SAFETY

Universal safety precautions should be taken when handling physical evidence due to potential biohazards. At minimum, lab coats and gloves should be worn to prevent contamination of the evidence and to the examiner. If DNA swabbing is requested, a mask is to be worn. Plastic protective covers should be worn over feet if evidentiary shoes are worn for test impressions.

ACCOMODATION AND ENVIRONMENTAL CONDITIONS

Each analyst has an evidence locker in their work area. Any unassigned work areas' evidence locker can be used as needed. The key box can only be opened by the Physical Section Supervisor. Keys are checked out by the Physical Section Supervisor or designee. The duplicate key from each locker is kept locked in the key box.

If an evidence locker key is lost, the Physical Section Supervisor must be notified immediately.

MONITORING PERFORMANCE

In addition to yearly external proficiency testing in footwear examination/comparison, once per accreditation cycle a representative sample of competent forensic scientists in the discipline will undergo additional performance monitoring activities from the following list:

- Internal footwear intelligence proficiency test
- Internal footwear processing proficiency test (chemical processing)
- Additional footwear comparison work depending on the quality of external proficiency testing (see below)
- Technical/Administrative review second check

The technical lead will assess the quality of external footwear examination/comparison proficiency tests. Where they are not felt to adequately represent the breadth of samples routinely seen in casework either an internal proficiency will be given to a representative sample of competent forensic scientists, once per accreditation cycle or a direct observation of a footwear examination/comparison case will be conducted by the technical lead. If a forensic scientist successfully completes an IAI footwear certification test in a cycle this will be taken in lieu of an additional internal footwear examination/comparison proficiency test.

VALIDATION OF METHODS

When a new method is developed or documented in literature the new method should be tested against existing methods and using several conditions that reflect the breadth of casework samples. The new method validation should be conducted by individuals deemed competent in

the footwear and approved by the footwear technical lead. Periodic review shall be carried out to confirm that the needs of the customer are still being fulfilled. Any modifications to the development plan shall be approved and authorized by the footwear technical lead.

Validations are new methods developed by the laboratory/modified for use by the laboratory.

Performance Checks are methods developed in published literature. Records of validations and performance checks are stored in SharePoint.

ESTIMATION OF MEASUREMENT OF UNCERTAINTY

Measurement of uncertainty does not apply to the Footwear Impression discipline.

CALIBRATION STANDARDS AND INSTRUMENTATION MAINTENANCE

Equipment used in the Footwear Discipline consists of:

- Stereo Microscopes
- Rulers
- Digital Cameras
- Scanners
- Electrostatic Lifting Apparatus
- Electrostatic Detection Apparatus
- Light Sources
- Alternative Light Sources (ALS)

STEREO MICROSCOPE

Each stereomicroscope will be checked prior to use to ensure that it is functioning properly.

This check will be performed by observing an item under the microscope and utilizing past experience in determining if the instrument appears to be giving a true and accurate representation of the evidence.

RULERS

NIST-calibrated rulers will be utilized but as no critical measurements are reported no calibration is necessary.

DIGITAL CAMERAS

Check settings prior to use. Service as necessary.

SCANNERS

Check settings prior to use. Service as necessary.

ELECTROSTATIC LIFTING APPARATUS

Check battery prior to use. If film adheres to surfaces and/or crackling sound can be heard the unit is functioning.

ELECTROSTATIC DETECTION APPARATUS

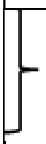
Electrostatic Detection Apparatus is control tested when evidence items are processed to ensure proper function. Service as necessary.

ALTERNATIVE LIGHT SOURCES

Any alternate light sources used are control tested when evidence items are processed to ensure proper function. Corresponding eye protection and filters must also be checked thusly.

APPENDIX A (Abbreviations)

+	Positive Control
=	Negative Control
#	Number
AB	Amido Black
ACC	Association of Class Characteristics
ACE-V	Analysis, Comparison, Evaluation - Verification
ALS	Alternative Light Source
ARC	Alaska Reference Collection database
AY7	Acid Yellow7
B&W	Black and White
BLK	Black
BP	Black Powder
CA	Cyanoacrylate Ester (Superglue)
CAD-CAM	Computer Assisted Design – Computer Assisted Manufacture
DOB	Date of Birth
DPS	Department of Public Safety
ESDA	Electrostatic Detection Apparatus
ESLA	Electrostatic Lifting Apparatus
EXC	Exclusion
FW	Footwear
GL	Gel Lift
HDA	High Degree of Association
ID	Identification
IMP	Impression
INA	Indications of Non-Association

JT/JTRAX	**Justice Trax**
L	**Left**
Lot#	**Lot Number**
LCV	**Leuco Crystal Violet**
LEO	**Law Enforcement Officer**
LSD	**Lacks Sufficient Detail**
LACC	**Limited Association of Class Characteristics**
MP	**Magnetic Powder**
NEG or Ø	**Negative**
PS	**Adobe Photoshop**
Q	**Quality**
R	**Right**
RAC	**Random Acquired Characteristic**
RLS	**Request for Laboratory Services form**
T/S	**Tape Sealed**
UV	**Ultraviolet**
VICT	**Victim**
VIS	**Visible**
W/	**With**
	**On copy of test impression denotes area of corresponding wear (on questioned and known impression)**

APPENDIX B

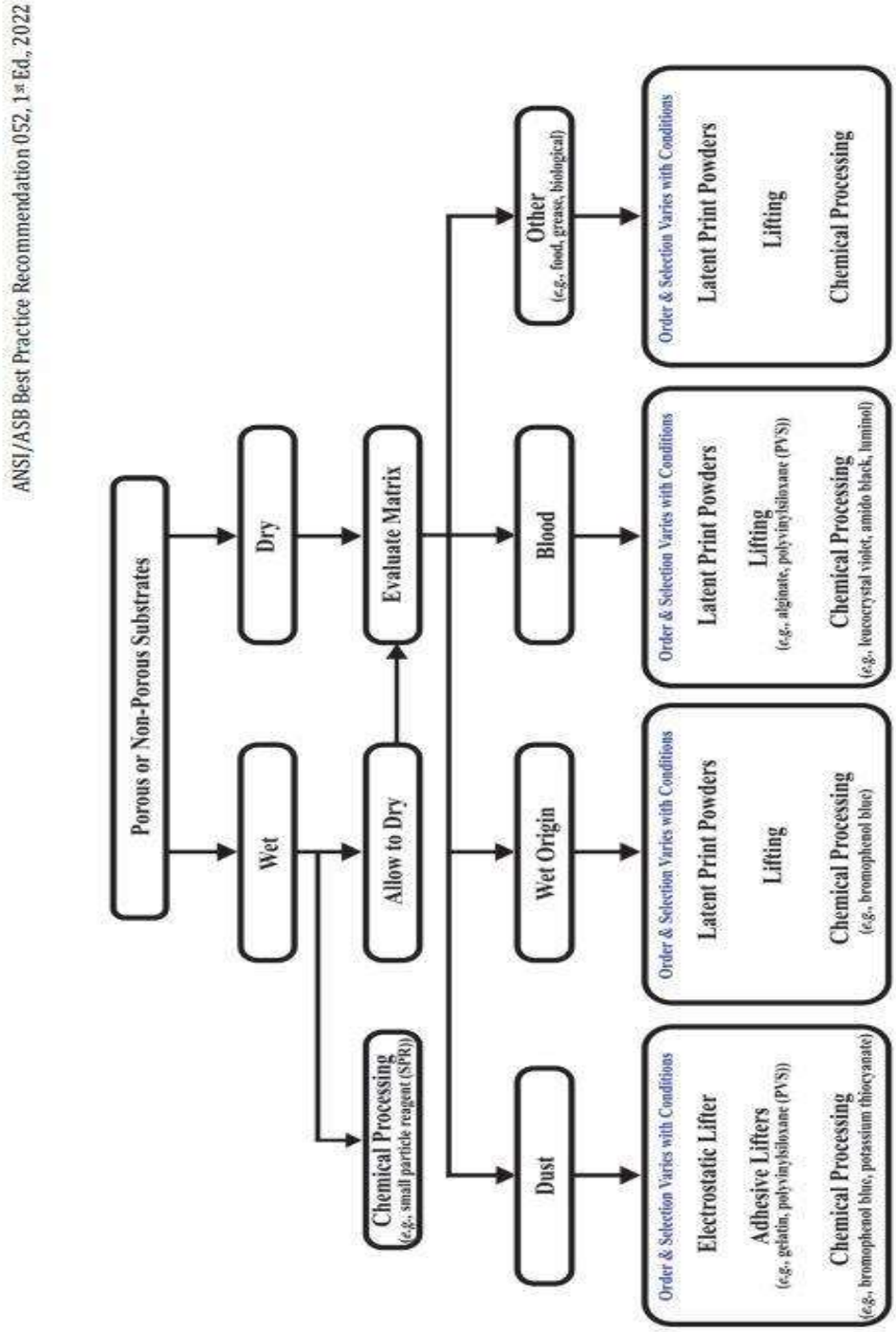


Figure 1—Flow Chart Guideline for Substrates and Matrices.