

Scientific Crime Detection Laboratory

Footwear Manual

Version: 6.0

Effective: 12/1/2023

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DOCUMENTATION

Footwear Notes/Report

Footwear notes should mention examinations conducted, procedures utilized, relevant observations, and evidence photographed should be documented in the examiner's notes. The examination notes must include a complete record of observations to support conclusions reached.

A separate comparison worksheet should be completed for each known footwear to questioned impression comparison that is done. For example, if a single impression is submitted that is subsequently found to contain three partial overlapping impressions these should be sub-itemized by the analyst and a minimum of three comparison worksheets (each with a conclusion) should be produced.

As well as the worksheets the analyst may produce; a natural size test impression (of each footwear item analyzed), a natural size marked up test impression showing areas of correspondence (of each footwear item compared) and a natural size image of the questioned footwear impression. These items are considered work product and may either be returned with the evidence or retained within a footwear track file that will be stored within the laboratory.

A laboratory report should contain a list of the evidence items analyzed. The results, conclusions and opinions section of the report should contain:

- Number and description of footwear impressions on each submitted item
- Recovery medium
- How footwear impression was processed/enhanced at the laboratory
- Description of footwear items and test impression method
- Limitations of the comparison
- Level of association/non-association
- Potential other sources of the impression

The examiner can include any photos and details that support their conclusions. It may be appropriate to mention any factors that have affected the conclusions (e.g. clarity, distortion, movement, or contamination). The conclusion scale should be included as part of the report when used.

Reviews: 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.

Technical Records: 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).

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IMAGE SUBMISSION POLICY

Images generated by a law enforcement agency may be submitted in the following ways:

- Via email
- Via Zendto
- Evidence transfer of images on physical media (e.g. CD, DVD)
- Anchorage Police Department AXION Digital Imaging Server

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.

Where the submitting agency has collected numerous crime scene images it is recommended that only images of footwear impressions are submitted. The analyst can request additional images be submitted if necessary.

Email Submission

Images will be accepted via email for the following purposes only:

- intelligence/database searches
- evaluation of obvious overall tread design

Documentation and Reporting of Images

In addition to other casework documentation requirements, the following additional documentation will be required for submitted images:

- The notes will identify the filenames of all images submitted.
- If all images are not used, the notes and report will clearly indicate which were selected and the reason for the selection.

Image File Handling

File handling requirements depend upon the type of image and the method of acquisition or submission.

Images submitted on physical media

- Images submitted to the laboratory on physical media are evidence. They will be tracked in LIMS and returned to the submitting agency. The image will be uploaded to ADAMS Web.
 - 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.

Images submitted electronically

- “FW Images”, a virtual item of evidence will be created in LIMS for all images submitted via email with the description containing the image file numbers. The chain of custody will include the submitting officer, the analyst creating the virtual item, and the Digital Imaging Server as the final location. All images will then be acquired to ADAMS Web.

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FOOTWEAR INTELLIGENCE

When a footwear impression image is electronically submitted to the laboratory for an intelligence search, the following procedure should be used:

The footwear impression image(s) along with some basic case information (agency case #, offense date, offense type and location) should be either emailed to dps.footwear.intelligence@alaska.gov with the subject line reading footwear intelligence search request (or similar) or submitted via Zendto. To preserve the image quality, it is recommended that the submitting agency use Zendto. This can be done via the link on the Alaska Scientific Crime Detection Laboratory homepage.

A trained analyst receives the email, creates a case/request/item of evidence in LIMS and then searches the Alaskan Reference Collection (ARC) and any other resources at their disposal to determine the outsole design and manufacturer. The ARC is a searchable 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.

If the analyst cannot find the outsole design on the ARC they may choose to do a manufacturer search either online (on the manufacturer or shopping websites e.g. nike.com, zappos.com etc.) or by visiting the stores in the vicinity, taking photos and impressions necessary with the store owner/manager's consent. The analyst can also upload a copy of the questioned impression to an online footwear practitioner's forum (hosted by enfsi.eu or swgtread.org) and appeal for information this way.

Images submitted for footwear intelligence searches are uploaded into ADAMS with a laboratory case number. If the analyst discovers the impression belongs to a certain outsole design and manufacturer, they produce footwear intelligence worksheet including any other information such as manufacturer and model. These intelligence report must be clearly marked with words to the effect of:

“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.”

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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.

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SOFTWARE (Photoshop & Foray)

The Authenticated Digital Asset Management System (ADAMS)

ADAMS is a digital asset software program made by 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/>

All casework imaging for examination purposes should be captured in RAW file format (digital photography) or in the TIFF file format (scanning). These images will be acquired to the ADAMS repository as the permanent record and are referred to as Assets. The Assets once acquired contain an electronic audit-trail. 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.

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

Note: 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.

Note: When acquiring scanned images of an evidentiary nature, analysts should utilize the maximum resolution of the scanning device (recommended nothing below 500ppi).

Adobe Photoshop

The Physical Discipline utilizes Adobe Photoshop for digital image enhancement. From ADAMS, an original image can be opened in Photoshop for digital processing. The goal of digital processing with regard to footwear impressions is to improve the contrast and remove any unnecessary color. 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.

EXAMINATION METHODOLOGY

Analysis, Comparison, Evaluation, Verification

The following methodology is a structured and systematic guide for footwear impression evidence. There are four parts to the methodology that includes: 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.

Analysis

Analysis/Examination of Questioned Impressions

To minimize potential bias the questioned impression(s) should be fully analyzed before any known footwear is analyzed. Evidence items should be examined to determine if there is sufficient detail and clarity to establish if a possible footwear impression is present. Where 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 submitting agency or individual.

After any subsequent recovery technique or chemical enhancement, it is necessary to re-photograph the impression.

The suitability of a footwear impression for comparison is determined by analyzing the quality of the impression, documenting its limitations. The analyst then considers the number of impressions and designation (right or left) of each impression, sub itemizing each individual impression and writes a brief description of each apparent sole design visible in the impression. The analyst visualizes the impression under different light sources and may enhance the impression using photography and/or alternative lifting methods. The analyst considers the quality, clarity, distortion, and visible class characteristics when deciding on the suitability.

Once the analyst is satisfied there is sufficient detail in the impression for comparison, the analyst opens the known footwear.

Analysis/Examination 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. The laboratory analyst will create the appropriate test impression from the known footwear in the laboratory. Any items of footwear or impressions that are obtained or recovered during the

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investigation (including elimination samples) should be submitted along with the questioned impression(s) for comparison.

The general condition of the upper and sole, brand, and label/size information (if discernable) of known footwear should be documented. Evidence for other exams (e.g. trace, bio-screening) should be collected prior to any processing of known footwear.

Photos of known footwear should be taken to document overall appearance and outsole design. It is recommended that a notation be made as to the date on which known footwear was seized. 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).

Comparison

A preliminary side-by-side examination should be made between the known footwear and the evidence impression to determine if there are visual similarities in outsole design.

If the outsole design(s) are clearly different from the questioned impression(s), additional comparisons are not required.

If the outsole design(s) are similar in any way to the questioned impression(s), test impressions of the known footwear will be prepared, and further evaluations conducted. Side-by-side comparisons are usually only done when a cast or 3D impression is the only submitted questioned impression. In cases where 2D impressions or scaled photographs are submitted for comparison the overlay method (superimposition) will nearly always be of more practical use.

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.

The analyst may want to examine other shoes of this or other styles, sizes and molds to confirm the appearance of a random acquired characteristic or design features. They may consult a reference collection or local/online store or manufacturer for this purpose.

The design features of an impression can be traced onto a clear sheet. This tracing can be used as a comparison tool.

The analyst should copy the test impression and mark the copy with the location of the matching characteristics. This can be done digitally or manually.

The analyst compares the questioned impression to the known footwear by side by side or, more usually superimposition. Consideration is initially given to the class characteristics of:

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Design
Physical Size/Alignment/Configuration
General Wear

The analyst must take into consideration when conducting their comparison factors such as type of impression, time delay (between the crime occurring and the seizure of the known footwear), manufacturing process, reproducibility, impression deposition and medium.

If there is correspondence in the above features the analyst gives consideration to the identifying characteristics:

Specific Wear
Random Acquired Characteristics (nicks, cuts, scratches, inclusions etc.)

Evaluation

The analyst is to evaluate all the data observed in the analysis and comparison phase and reach a conclusion 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 demonstrated and 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.

Examiners are encouraged to use the following standardized SWGTREAD terminology to express their conclusions in laboratory reports. The conclusions listed are followed by report wording example in bold print. The standardized terminology should not be regarded as the only way to express opinions in reports, there will be occasions where forcing an examiner to use the standard terminology to express their findings may not accurately represent the evidence and it may even be misleading to do so. The guidelines are not standards and should not be used as such. In following any guideline, the examiner should always consider that sometimes the examination will lead into paths that cannot be anticipated and that no guidelines can cover exactly.

Verification

For all footwear impression cases with an opinion of Exclusion, High Degree of Association, or Identification a verification will be conducted.

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. The verifier will select the verification tag 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.

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

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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.

Range of Conclusions

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

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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.

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- 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. For an 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. A discipline checklist may be used to document completion of the individual components of the technical and administrative reviews.

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.

APPENDIX A – ADDITIONAL 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 (e.g.: blood, albumin, various fluids of similar constituents as footwear residue, etc.).

An 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 controls 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.

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All chemical enhancement processes are control tested each time they are used. An impression in an appropriate residue is placed on an appropriate substrate and tested prior to applying the chemical to any evidence. Any Positive or Negative control results for casework are recorded in the Analyst's case notes.

Specific information for controls such as reactionary substance or expected results are found in the Footwear Work Instructions Appendix.

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 the Digital Workplace repository. Access to the Digital Workplace 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.

Personnel

All training documented in the Footwear Impressions Training Manual is supervised and signed off by competent, experienced Forensic Scientist III or Forensic Scientist IV analysts

The Footwear Impressions Training Manual includes a section on court testimony. A moot court is required before an analyst is released for independent casework.

The Footwear Impressions Training Manual includes sections on other forensic disciplines, court procedures and ethics.

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

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.

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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.

Accommodation 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.

Validation of Methods

When a new method is developed or documented in the 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 method developed by the laboratory/modified for use by the laboratory.

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

Estimation of uncertainty of measurement

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

Footwear Case Sampling/Triage

The questions asked in the Footwear Discipline can be, “Did a particular shoe leave an impression on an evidence item?” but also “What type of shoe made the print?”, “How many offenders were there?”, “What transpired at the scene of the crime?” The answer to the first question will often not be a binary (identification or exclusion) response as there is a scale of conclusions. See above section on evaluations.

Based on evidence quantity and/or quality, an analyst can process select samples to answer the above questions, starting with the most probative sample based on impression location. An analyst may select and process a portion of the evidence that may have latent footwear impressions. An analyst may choose to further process a patent impression to improve quality.

Once an analyst has identified a footwear impression as having been made by a specific shoe(s) of interest on an item, the processing and comparison for that item and/or case may cease.

When a sampling plan/triage is utilized, it will be documented in the case records in LIMS.

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.

Calibration Standards and Instrumentation Maintenance

Equipment used in the Footwear Discipline consists of:

- Stereo Microscopes
- Rulers
- Digital Cameras
- Scanners

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- 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 B – PROCESSING QUESTIONED FOOTWEAR IMPRESSIONS

RECOVERY OF IMPRESSIONS

Visual Search

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Look for visible impressions utilizing ambient and/or other light sources. To search for two and three-dimensional impressions, utilize oblique lighting. Note that during a visual search using oblique illumination, impressions may only be visible when illuminated from a particular angle(s), necessitating the need for a thorough search. Photograph any impressions detected before attempting enhancement methods.

Photography

Before attempting any of the enhancements outlined in this manual the analyst should first examine and photograph the questioned impression using oblique light. The analyst will then assess the impression to ascertain the surface the impression is on and what the residue or matrix consists of. A thorough and correct appraisal will allow the analyst to select the best technique for recovering/enhancing the impression. If the analyst is lacking some information (e.g. the weather at the time of the offense, to decide if there may be a wet origin impression present) they should attempt to contact the submitting officer. If they are unable to obtain sufficient information, they should begin recovery/enhancement with the least destructive processes first.

Lifting

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.

Examiners should use the least invasive method first, prior to lifting impressions, photograph or digitally capture the impression. The order and use of these individual techniques is determined by considerations such as substrate, components of the impression, and environmental conditions. If in doubt, treat all impressions as dry origin and apply the methods listed below. If unsuccessful, attempt collection as indicated for wet origin impressions.

Lifted impressions should be labeled and packaged with pertinent case related information (e.g. case number, substrate, direction of travel).

Electrostatic Lifting 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). Identify the area of

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the impression, cut a portion of the lifting film to fit the area and annotate the back of the sheet with identifying information. Place the film (black side down) on the impression. 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 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 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. This technique can be used to “clean” an excessively dusty/dirty impression prior to gel lifting. Generally, electrostatic lifting is the first technique used, as this process will not prevent the use of other lifting and enhancement techniques subsequently. This method is noninvasive and even if unsuccessful, it does not preclude subsequent use of additional methods of detection. To visualize the lifted impressions, the lifts should be examined in a dark room with a high intensity light source held at an oblique angle to the surface of the lift. The lifting film should never be reused.

Lifts should be photographed prior to packaging. Smaller lifts can be stored in individual clean dust free containers (e.g., file folders, clean boxes, etc.). These containers should never be reused. Larger lifts can be stored by carefully rolling the non-lifting surface on the outside. After rolling, the edge can be secured with a small piece of tape. 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 Detection Apparatus (ESDA) can be used to recover slightly indented impressions (barely visible or latent) on paper or cardboard. Place the paper containing the impression face up on the vacuum bed. Turn on the pump that sucks the paper completely flat. Extend the clear film across the paper avoiding any folds or wrinkles in the film. A high voltage charge is then applied to the impression using the corona bar at a distance ~1cm, repeat several times. At places where an indented impression is present a difference in voltage will occur. Holding brush parallel to the surface brush the toner powder lightly over the film with a camel hairbrush. The powder will be attracted to the area of the impression. Place an adhesive cover sheet over the film and photograph.

Gelatin Lifting. Black gel lifts offer excellent contrast with light dust and dry residue, wet origin impressions once powdered and some chemically enhanced blood impressions in combination with alternate light sources/filters. Black fingerprint powder can also be successfully utilized with black gel lifts and oblique lighting photography. Before using gel lifts ensure the lifter is at room temperature, performance and adhesion is affected by excessive cold and excessive heat can destroy the gel lifter. To recover an impression using a gel lift, slowly peel back clear acetate cover sheet. In

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very dusty conditions protect the uncovered gel lift during the resting period. Once the cover is removed handle the gel lift minimally picking up the corner, from one direction lie the gel lift over the impression and gently roll out any air bubbles. Leave the gel lift on the impression for at least 10 minutes then slowly peel back from one end.

Gelatin lifters may stretch when the clear cover is removed. Care should be taken when removing the cover to limit the stretch. The lifter should be allowed to rest until it returns to the original size, before applied to the impression.

Gelatin lifts of residue impressions should be photographed as soon as possible after collection prior to packaging and/or replacing the acetate. When replacing the clear cover, place the clean side of the clear cover in contact with the gelatin lift or use a new acetate cover. The side previously in contact with the gel lift should not be replaced on the impression to prevent re-deposition of the residue.

Gelatin lifts can be stored in individual clean dust free containers. These containers should never be reused.

Adhesive Lifting

Adhesive lifters are available in white and clear. They include footprint-sized sheets and various widths of rolled tapes. White backgrounds are recommended for clear adhesive. Clear adhesive on a clear background is not recommended. These lifts are normally used for impressions developed with dark colored powders and are not recommended for lifting dust or residue impressions. Rolled tapes are available in five-inch widths and are preferred to narrower tapes.

Adhesive lifts should be placed in a container that is large enough to hold the lifts and protects the lifts from damage (e.g., manila envelope, paper bag, plastic bag, etc.).

Casts. A cast represents an actual life-size molding of an impression. Casts and photographs supplement one another and together can provide the maximum information about an impression. Casts should be cleaned in the laboratory by the analyst no sooner than 48 hrs after collection. If necessary, prior to cleaning, preserve any soil or other evidence attached to the cast for additional analysis. Soil and sand can be cleaned from casts using water and soft brush taking care not to disturb any imbedded debris or particulates that could leave voids in the cast and photograph with a scale and oblique light. Casting materials may include but are not limited to: dental stone, sulfur/sulfur cement, Mikrosil or Snowstone. All footwear impressions that are to be cast should be first photographed as described in section 3.2. Casts should always be submitted and examined along with the corresponding photographs of that impression. The cast or photograph alone often don't provide high quality impressions but together the complement each other and allow the analyst to see more detail.

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PHYSICAL PROCESSING

Powders

Powder is used for developing detail on various surfaces. There are multiple colors of powders, magnetic powders, as well as fluorescent powders which require the use of an alternate light source (ALS) and appropriate filters. Powder processing can be used at the Forensic Scientists' discretion.

All powders are purchased and not prepared in the laboratory.

Application

1. Choose a type of powder and appropriate brush
 - a. Plain/Fluorescent powder – Fiberglass or Nylon, Feather duster, short bristle brush
 - b. Magnetic Powder – Magnetic Wand
2. Apply the powder to the surface by lightly dusting over the surface. Only the tips of the brush/metal shavings should come in contact with the surface.
3. Use oblique light or intense light to better visualize the impression.
4. Digitally preserve impression. There are circumstances where lifting the impression would be beneficial. Gelatin lifters are usually the best medium for this. They should then be re-photographed.

Note: Fluorescent powders can be very faint and easily overlooked. It is recommended the gel lift be examined utilizing the ALS with the appropriate filter. If an ALS is used for visualization, it will be documented in the notes.

Safety Consideration

Suitable protective clothing, mask, and gloves should always be worn. Avoid contact with skin and eyes. Use a fume hood to remove dust from the area if needed.

Literature References

Federal Bureau of Investigation. The Science of Fingerprints.

CHEMICAL PROCESSING – RESIDUE IMPRESSIONS

Using chemical techniques and procedures it is possible to develop footwear impressions by way of chemical reactions with specific components of the impression residue.

The type of substrate and matrix will dictate the selection of the processing method, with the final goal of increased contrast/visualization.

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.

Reagent preparation lot numbers are recorded in the analyst notes. All reagents are prepared using the procedures listed below. Any deviation from the standard procedure will be documented in the notes.

POTASSIUM THIOCYANATE

Description of Process

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.

Sequence

Potassium Thiocyanate is typically utilized instead of other processes.

Process

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Potassium thiocyanate is typically prepared in the laboratory and not purchased as a working solution.

1. Preserve any suitable visible impressions present on evidence prior to applying thiocyanate solution.
2. 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.
3. Let dry.
4. Photograph either as is or using a green filter.

Note: Developed impressions on some dark-colored surfaces may be viewed with a light source for increased contrast.

Makes 150ml

Chemicals needed	Amount
Acetone	120ml
Water	15ml
Potassium thiocyanate	15g
Sulfuric acid (dilute <10%)	8.5ml

Instructions

To 120ml of acetone add 15ml of water and 15g of potassium thiocyanate. 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.

Shelf life is 3 months

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

Control Testing

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

Safety

When mixing always add the sulfuric acid to the acetone/water mix, never the other way around or it may explode. Chemicals used in this process are toxic and are irritants.

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

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CHEMICAL PROCESSING – BLOOD IMPRESSIONS

Using chemical techniques and procedures it is possible to develop footwear impressions in blood by way of chemical reactions with specific components of the bloody impression. Some chemicals require the prior use of a fixing agent to ensure they are not washed away or dissolved during the enhancement. The fixative is sometimes incorporated into the stain, other stains require a fixative such as 5-sulfosalicylic acid to be applied first. The list of chemical processing techniques which may or may not be used includes, but is not limited to the following:

AMIDO BLACK

Description of Process

Amido Black 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. 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. Cyanoacrylate ester fuming may be detrimental to this process.

Sequence

Amido Black is typically utilized instead of other processes. The fixative (5-sulfosalicylic acid) is usually incorporated into the working solution.

Process for Use

Amido Black is typically prepared in the laboratory and not purchased as a working solution. Shelf life is indefinite for Amido Black and Rinse Solution.

1. Preserve any suitable visible impressions present on evidence 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. 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).
5. Let dry.
6. Examine the item for footwear impressions and indicate the impression with suitable markings as appropriate to be preserved by digital imaging/photography.

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Note: Developed footwear impressions on some dark-colored surfaces may be viewed with a light source for increased contrast.

Instructions for the preparation of

Amido Black Developer (Methanol based)

Makes 1000 mL

Chemicals needed	Amount
Amido Black Powder	2 g
Methanol	900 mL
Glacial Acetic Acid	100 mL

INSTRUCTIONS

Combine the chemicals listed above and mix on a stirring device until all the Amido Black Powder is dissolved. This should take approximately 30 minutes

Shelf life is indefinite

Source: Chemical Formulas and Processing Guide for Developing Latent Prints (Revised 1994)

U.S. Department of Justice, Federal Bureau of Investigation
Laboratory Division, Latent Fingerprint Section

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Instructions for the preparation of **Amido Black Rinse** (Methanol based)

Makes 2000 mL

Chemicals needed	Amount
Methanol	1800 mL
Glacial Acetic Acid	200 mL

INSTRUCTIONS

Combine the chemicals listed above.
The Amido Black Rinse can be mixed manually

Shelf life is indefinite

Source: Chemical Formulas and Processing Guide for Developing Latent Prints (Revised 1994)

U.S. Department of Justice, Federal Bureau of Investigation
Laboratory Division, Latent Fingerprint Section

AMIDO BLACK

Control Testing

Reactionary substance: synthetic blood impression (Sirchie catalog No. SYN88) on light colored substrate

Positive results – purple, blue, black color change

Negative results – no color change

Safety

Mix only in a vent hood. When mixing or using, must wear gloves and eye protection. Chemicals are flammable and skin irritant. Caution should always be exercised around a bloody crime scene or handling items which contain blood. Excess is disposed of as any flammable liquid. Protective lab coats, footwear, eyewear, and latex gloves should be worn. Since Amido Black is mixed with methanol, which is highly flammable extreme caution should be taken.

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LEUCO CRYSTAL VIOLET (LCV)

Description of Process

LCV stains the proteins in the blood turning the impression a dark violet color. LCV works with extremely faint traces of blood.

LCV may destroy blood for biological screening/DNA testing. Have evidentiary blood samples chemically tested and preserved by appropriate personnel prior to processing. Suitable for both porous and non-porous surfaces.

Sequence

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. The fixative (5-sulfosalicylic acid) is usually incorporated into the working solution.

Process for Use

LCV is typically prepared in the laboratory and not purchased as a working solution. Shelf life is 30 days or 3 months if refrigerated.

1. Preserve any suitable visible impressions present on evidence prior to applying LCV solution.
2. Apply the LCV solution by lightly spraying/misting dried impressions in apparent blood. Background staining may develop over time.
3. Let dry.
4. Examine the item for footwear impressions and indicate the impression with suitable markings as appropriate to be preserved by digital imaging/photography as soon as possible due to background development

Note: Developed footwear impressions on some dark-colored surfaces may be viewed with a light source for increased contrast.

Makes 500ml

Chemicals needed	Amount
5-sulfosalicylic acid	10g
3% Hydrogen peroxide	500ml
Leuco Crystal Violet	1.1g
Sodium Acetate	4.4g

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LEUCO CRYSTAL VIOLET (LCV)

Instructions
Dissolve 10 g of 5-sulfosalicylic acid in 500 ml of 3% hydrogen peroxide. Add approximately 30 ml of the hydrogen peroxide/5-sulfo solution to 1.1 g of leuco crystal violet. Mix thoroughly. Add this solution back to the main hydrogen peroxide/5-sulfo solution. Add approximately 30 ml of the hydrogen peroxide/5-sulfo/lcv solution to 4.4g sodium acetate. Mix thoroughly. Add this solution back to the main hydrogen peroxide/5-sulfo/lcv solution. Store in a dark bottle, or in the dark.

Shelf life is 30 days or 3months if refrigerated.

Source: Federal Bureau of Investigation Laboratory Division. Processing Guide for Developing Latent Prints. 2000.

Control Testing

Reactionary substance: synthetic blood impression (Sirchie catalog No. SYN88) on light colored substrate

Positive results – violet color change

Negative results – no color change

Safety

When dealing with biological samples and chemical reagents suitable protective clothing, gloves and eyewear should always be worn. Avoid contact with skin and eyes.

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ACID YELLOW 7

Description of Process

Acid Yellow 7 is a dye solution that is used for staining bloody impressions that are turned yellow after treatment. They then fluoresce under blue/blue-green light. This enhancement only works on non-porous surfaces.

Acid Yellow 7 may destroy blood for biological screening/DNA testing. Have evidentiary blood samples chemically tested and preserved by appropriate personnel prior to processing.

Sequence

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-sulfosalicylic acid) is usually applied to the impression before staining with Acid Yellow 7.

Process for Use

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

1. Preserve any suitable visible impressions present on evidence prior to applying fixative solution.
2. Immerse impression in fixative for 3-5 minutes.
3. Remove and rinse well with distilled water.
4. Immerse or spray mist in 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 impressions 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.

Makes 1000ml of fixative and 1000ml of Acid Yellow 7 working solution

Fixative

Chemicals needed	Amount
5-Sulfosalicylic acid	20g
Distilled water	1000ml

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Instructions

Add components to a beaker/flask of sufficient size and mix till complete dissolution, using a magnetic stirrer.

ACID YELLOW 7

Shelf life: indefinite in a dark bottle

Source: BVDA.com product information sheet

Acid Yellow 7

Chemicals needed	Amount
Acid Yellow 7	1g
Distilled water	700ml
Acetic acid (glacial, 99%)	50ml
Ethanol (98% or higher)	250ml

Instructions

Preferably use an Erlenmeyer flask for preparation of the Acid Yellow 7 solution. Add water first and dissolve the Acid Yellow 7 powder in the water by swirling the flask or using a magnetic stirrer and a PTFE-covered stir bar. The powder will dissolve quickly. Then add ethanol and acetic acid (order not important.).

Shelf life: 1 day in a light proof vessel

Source: BVDA.com product information sheet

Control Testing

Reactionary substance: synthetic blood impression (Sirchie catalog No. SYN8) on any substrate, lifted with black gelatin lifter and visualized using a blue green light

Positive results – yellow color change

Negative results – no color change

Safety

When dealing with biological samples and chemical reagents suitable protective clothing and gloves should always be worn. Avoid breathing aerosols of the fixative and dye solution, when using aerosols use fume cabinet. Wash hands thoroughly after each session. Wear amber protective eye wear when viewing results under laser light

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FUSCHIN ACID / HUNGARIAN RED

Description of Process

Fuchsin Acid stains the bloody impressions a deep magenta color.

Fuchsin Acid may destroy blood for biological screening/DNA testing. Have evidentiary blood samples chemically tested and preserved by appropriate personnel prior to processing. Suitable for both porous and non-porous surfaces.

Sequence

Fuchsin Acid is typically utilized instead of other processes, but the resultant impression can be gel lifted and photographed under ultraviolet light. The fixative (5-sulfosalicylic acid) is usually incorporated into the working solution.

Process for Use

Fuchsin Acid is typically prepared in the laboratory and not purchased as a working solution. Shelf life is 30 days or 3 months if refrigerated.

1. Preserve any suitable visible impressions present on evidence prior to applying Fuchsin Acid solution.
2. Apply the Fuchsin Acid solution by lightly spraying/misting dried impressions in apparent blood, leave for 1-3 minutes.
3. Rinse the excess dye away using distilled water.
4. Examine the item for footwear impressions and indicate the impression with suitable markings as appropriate to be preserved by digital imaging/photography as soon as possible due to background development. Photograph either as is or using blue/green light and a yellow/orange filter.
5. To further increase contrast lift the stained impression using a white gel lifter (allow to sit on impression for at least 15mins). This impression will fluoresce under ultraviolet light and can be photographed with the appropriate filter. Photography should occur soon after lifting as the impression will diffuse into the gelatin over time.

Makes 1000ml

Chemicals needed	Amount
5-Sulfosalicylic acid	20g
Distilled water	1000ml
Fuchsin acid	2g

Instructions
Dissolve the sulfosalicylic acid and fuchsin acid in the water.

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FUSCHIN ACID / HUNGARIAN RED

Shelf life: 30 days, 3 months if refrigerated

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

Control Testing

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

Positive results – magenta color change

Negative results – no color change

Safety

When dealing with biological samples and chemical reagents suitable protective clothing and gloves should always be worn. Avoid contact with skin and eyes. Wear protective eye wear when viewing results under ultraviolet light.

PROCESSING KNOWN FOOTWEAR/PREPARATION OF TEST IMPRESSIONS

Prior to making test impressions, the examiner should recognize and preserve other relevant physical evidence as well as document and photograph the original condition of the shoes, outsoles, and tread design.

When appropriate, test impressions should be made of the entire outsole. Test impressions of specific areas of the outsole may also be made. Replicate test impressions should be made to capture variability among different impressions.

A variety of two-dimensional and three-dimensional test impression methods may be appropriate and can be prepared at the examiner's discretion, but the analyst will want to closely emulate the original deposition of the impression (e.g. an impression produced by a running perpetrator on a hard 2D surface would be best compared to a known impression produced under the same conditions).

Excess dirt should be removed from the outsole with care so as to not damage the outsole or remove any stone holds or other objects present within the design elements before test impressions are made. In some cases, test impressions may be made prior to removal of excess dirt from the outsole.

The list includes but is not limited to the following:

Preparation of Test Impression(s)

Biofoam/Mikro Track — 3-dimensional test impression method. The footwear is worn and gently pressed onto the impression foam, engineered for producing orthotics. The foam indented impression should then be photographed and can be cast if necessary.

Adhesive Lifts— 2-dimensional test impression method that may be useful for recording fine detail on the border or arch areas of footwear. The outsole is dusted with fingerprint powder. A clear adhesive acetate lifter is placed (sticky side up) on the edge of a desk/bench/table or other hard surface. The footwear is then placed against the sticky side of the adhesive lift. Gradually pull the adhesive lift and footwear towards you with one hand using the other to smooth the lift across the outsole of the footwear. Once the outsole has been completely covered by the lift turn footwear over and use a soft fabric towel to smooth the edges of the adhesive lifter out and make sure it has contacted all areas of the outsole. Slowly remove the adhesive lift. A clear cover or white backer is applied to preserve the lift and rolled out to avoid any air bubbles. Label immediately to ensure you visualize the correct side during comparison.

Inkless test impression – quick 2-dimensional test impression method used to record general design detail. Step with the footwear onto the chemical coater, making certain the sole is completely covered with the colorless chemical. Then step on the chemically sensitized paper. A high contrast print will develop within seconds but may be lacking in fine detail.

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Other— 3-D test impression methods using various substrates/products (e.g. Polyvinyl siloxane, Zetalabor, clay, sand, snow, Mikrotrack or similar materials)

Once the test impression is done information – case number, item number, left or right shoe, size, country of manufacture and label details and recorded. The preparer of the test impression and the shoe size of the preparer should also be documented on the test impression for all dynamic test impressions.

An additional 2D test impression of each pair of shoes should be taken, do not record the case or item number. These test impressions will form the basis of a hard copy of a footwear reference collection that can be consulted during the comparison process to aid the analyst in forming their conclusions. This outsole pattern should be searched against the Alaska Reference Collection database, described below, if it already exists on there no further action required, unless the impression the analyst has just taken is either significantly clearer than the existing database impression or shows details that are not visible in the existing database impression.

If the impression is not already on the Alaska Reference Collection and the left and right items of footwear are mirror images of one another, as most are, then one impression should be uploaded to the database for consideration for inclusion under the module links> suggestion queue tab of the Alaska Reference Collection.

Limitations of Test Impressions

Test impressions may not always fully reproduce characteristics due to inherent variability in the impression making process.

The limit of methodology/detection is defined by the substrate and the method chosen to take test impressions.

Footwear evidence may have inherent limitations that can interfere with the procedures in this document. Limitations, when known, should be noted and recorded. Limitations most often include, but are not limited to substrate features, the method of collection, and the inability to accurately reproduce conditions under which the questioned impression was made.

Other evidence must be considered prior to making test impressions from known footwear, such as biological materials, trace evidence, etc. The making of test impressions may damage other types of physical evidence present on the footwear outsole tread.

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APPENDIX C – 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
DAB	Diaminobenzidine
DEV	Developed
DFO	1,8 Diazafluoren-9-one
DIFF	Different
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
I/S	Inside

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JT/JTRAX	Justice Trax
	Left
L#	Lot Number
LAT	Latent
LCV	Leuco Crystal Violet
LSD	Lacks Sufficient Detail
LACC	Limited Association of Class Characteristics
MP	Magnetic Powder
NEG or Ø	Negative
O/S	Outside
PH	Photography or Photograph
POSS?	Possible or Possibly
PS	Adobe Photoshop
Q	Quality
	Right
RAC	Random Acquired Characteristic
T/C	Tape Closed
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)
	On copy of test impression denotes corresponding random acquired characteristic (on questioned and known impression)

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APPENDIX D

FOOTWEAR INTELLIGENCE TECHNICAL AND ADMINISTRATIVE REVIEW CHECKLIST

	Technical Review	Administrative Review
LAB NUMBER:		
ANALYST:		
Date Submitted for Review:		
Technical Review Started: Reviewer:		
Administrative Review Started: Reviewer:		
Pages are numbered correctly, lab case #, item # and analyst initials are on each page	■	
Requesting agency, agency case #, lab case #, and officer's name are correct	■	
Item number /photograph /descriptions on report/notes are consistent with submission email		■
The date evidence was submitted/opened and/or sealed is documented	■	
The nature of any enhancement performed is documented in notes		■
Item descriptions are consistent with evidence images present		■
Items created in LIMS		■
Date of offense/impression deposition/date of recovery documented		■
Database search date is listed		■
All images stored in Foray	■	
Reviewer agrees with categorization/findings (positive case)		■
Reviewer re-searches impression (negative case)		■

Check grammar/spelling/punctuation in report	■	
Results/conclusions/opinions are given for each item examined		■
Conclusions/opinions drawn from results comply with laboratory guidelines		■
Conclusions/opinions drawn from results are supported by documentation in the notes		■
All case related notes and attached/scanned documents are present	■	
Chain of Custody for all tested items can be tracked through RLS and LIMS	■	

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FOOTWEAR TECHNICAL AND ADMINISTRATIVE REVIEW CHECKLIST

		Technical Review	Administrative Review		
LAB NUMBER:					
ANALYST:					
Date Submitted for Review:					
Technical Review Started: Reviewer:					
Administrative Review Started: Reviewer:					
Pages are numbered correctly, lab case #, item # and analyst initials are on each page		■			
Requesting agency, agency case #, lab case #, and officer's name are correct		■			
Item numbers / packaging / descriptions on report / notes are consistent with RLS			■		
The date evidence was opened and/or sealed is documented		■			
Bench notes contain lot #s, control test results and expiration dates for all reagents used			■		
The type of recovery/enhancement performed is documented in notes			■		
Item descriptions are consistent with evidence images present, including left or right impression			■		
Retained items created in LIMS; all retained and unexamined items HELD in LIMS		■			
Date of impression deposition and date of footwear recovery documented			■		
Substrate/matrix and distortion accurately assessed			■		
Scales checked with calibrated ruler			■		
Sufficient number/quality of test impressions produced			■		
All images, test impressions and bench notes stored in Foray		■			
Composite/mark up produced annotating correspondence observed			■		
Check grammar/spelling/punctuation in report		■			
Results/conclusions/opinions are given for each item examined			■		
Conclusions/opinions drawn from results comply with laboratory guidelines			■		
Conclusions/opinions drawn from results are supported by documentation in the notes			■		
Tech reviewer agrees with critical findings (±1 box)			■		
Conclusions include limitations and possible other sources			■		
Chain of Custody for all tested items can be tracked through RLS and LIMS		■			
Elimination samples requested, if appropriate			■		

Bench notes

Report/Conclusions

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APPENDIX E - REVISION HISTORY

Location	Revision Made
ALL	Corrected grammar and spelling throughout
Table of Contents	Added "References"
Page 3: Image Submission Policy	Added "Via Zendto" Added "Where the submitting agency has collected numerous crime scene images it is recommended that only images of footwear impressions are submitted. The analyst can request additional images be submitted if necessary."
Page 4: Image File Handling & Footwear Intelligence	Added "electronically", "electronically submitted", "or submitted via Zendto. To preserve the image quality, it is recommended that the submitting agency use Zendto", "that includes both the UK national footwear reference collection and the Alaska subset of the ARC database"
Page 7: Analysis	Removed "It is best to photograph impressions in their original condition before any enhancements are attempted. An L shaped scale must be placed alongside the impression as close to the impression and in the same plane as the impression as possible. The camera must be directly over top of and sufficiently close to the impression to capture the maximum amount of detail. Actual size photographs for comparison purposes can be produced in-house. Specialized lighting techniques may be utilized to enhance footwear impressions. The photographer should record images in RAW format and should attempt to fill the frame to ensure maximum detail is recorded."

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	<p>Added “Where 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 submitting agency or individual.”</p>
Page 16: Validation of Methods	<p>Removed “Themis” Added “Sharepoint”</p>
Appendix B: Recovery of Impressions (pgs. 18-19)	<p>Added “Visual Search</p> <p>Look for visible impressions utilizing ambient and/or other light sources. To search for two and three-dimensional impressions, utilize oblique lighting. Note that during a visual search using oblique illumination, impressions may only be visible when illuminated from a particular angle(s), necessitating the need for a thorough search. Photograph any impressions detected before attempting enhancement methods.”</p> <p>Added “Lifting”</p> <p>Added “Examiners should use the least invasive method first, prior to lifting impressions, photograph or digitally capture the impression. The order and use of these individual techniques is determined by considerations such as substrate, components of the impression, and environmental conditions. If in doubt, treat all impressions as dry origin and apply the methods listed below. If unsuccessful, attempt collection as indicated for wet origin impressions. Lifted impressions should be labeled and packaged with pertinent case related information (e.g. case number, substrate, direction of travel).”</p> <p>Added “This technique”, “and annotate the back of the sheet with identifying information.”</p> <p>Added “Generally, electrostatic lifting is the first technique used, as this process will not prevent the use of other lifting and enhancement techniques subsequently. This method is noninvasive and even if unsuccessful, it does not preclude subsequent use of additional methods of detection. To visualize the lifted impressions, the lifts should be examined in a dark room with a high intensity light source held at an</p>

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	<p>oblique angle to the surface of the lift. The lifting film should never be reused.” Lifts should be photographed prior to packaging. Smaller lifts can be stored in individual clean dust free containers (e.g., file folders, clean boxes, etc.). These containers should never be reused. Larger lifts can be stored by carefully rolling the non-lifting surface on the outside. After rolling, the edge can be secured with a small piece of tape. 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.”</p>
Appendix B cont. (pgs. 20-21)	<p>Added “Gelatin lifters may stretch when the clear cover is removed. Care should be taken when removing the cover to limit the stretch. The lifter should be allowed to rest until it returns to the original size, before applied to the impression. Gelatin lifts of residue impressions should be photographed as soon as possible after collection prior to packaging and/or replacing the acetate. When replacing the clear cover, place the clean side of the clear cover in contact with the gelatin lift or use a new acetate cover. The side previously in contact with the gel lift should not be replaced on the impression to prevent re-deposition of the residue. Gelatin lifts can be stored in individual clean dust free containers. These containers should never be reused.</p> <p>Adhesive Lifting</p> <p>Adhesive lifters are available in white and clear. They include footprint-sized sheets and various widths of rolled tapes. White backgrounds are recommended for clear adhesive. Clear adhesive on a clear background is not recommended. These lifts are normally used for impressions developed with dark colored powders and are not recommended for lifting dust or residue impressions. Rolled tapes are available in five-inch widths and are preferred to narrower tapes. Adhesive lifts should be placed in a container that is large enough to hold the lifts and protects</p>

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	<p>the lifts from damage (e.g., manila envelope, paper bag, plastic bag, etc.).”</p> <p>Added “Casts should be cleaned in the laboratory by the analyst no sooner than 48 hrs after collection. If necessary, prior to cleaning, preserve any soil or other evidence attached to the cast for additional analysis. Soil and sand can be cleaned from casts using water and soft brush taking care not to disturb any imbedded debris or particulates that could leave voids in the cast and photograph with a scale and oblique light.”</p> <p>Added “The type of substrate and matrix will dictate the selection of the processing method, with the final goal of increased contrast/visualization. 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.</p> <p>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.</p> <p>Reagent preparation lot numbers are recorded in the analyst notes. All reagents are prepared using the procedures listed below. Any deviation from the standard procedure will be documented in the notes.”</p>
Appendix B cont. (pgs. 33-34)	<p>Added “PREPARATION OF TEST IMPRESSIONS</p> <p>Prior to making test impressions, the examiner should recognize and preserve other relevant physical evidence as well as document and photograph the original condition of the shoes, outsoles, and tread design. When appropriate, test impressions should be made of the entire outsole. Test impressions of specific areas of the outsole may also be made. Replicate test impressions should be made to capture variability among different impressions.”</p> <p>Added “Excess dirt should be removed from the outsole with care so as to not damage the outsole or remove any stone holds or other objects present within the design elements before test impressions</p>

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	<p>are made. In some cases, test impressions may be made prior to removal of excess dirt from the outsole.”</p> <p>Removed: “black”, Added “fingerprint”</p> <p>Added “The preparer of the test impression and the shoe size of the preparer should also be documented on the test impression for all dynamic test impressions.”</p> <p>Added “Limitations of Test Impressions</p> <p>Test impressions may not always fully reproduce characteristics due to inherent variability in the impression making process. The limit of methodology/detection is defined by the substrate and the method chosen to take test impressions. Footwear evidence may have inherent limitations that can interfere with the procedures in this document. Limitations, when known, should be noted and recorded. Limitations most often include, but are not limited to substrate features, the method of collection, and the inability to accurately reproduce conditions under which the questioned impression was made. Other evidence must be considered prior to making test impressions from known footwear, such as biological materials, trace evidence, etc. The making of test impressions may damage other types of physical evidence present on the footwear outsole tread.”</p>
Documentation	<p>Added- Reviews: 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.</p> <p>Technical Records: 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).</p>

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

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