

Technical Procedure for Latent Evidence Processing

1.0 Purpose- This procedure shall be followed for the chemical and physical processing of evidence for the presence of latent prints.

2.0 Scope- This procedure applies to all friction ridge and impression evidence processing cases.

3.0 Definitions:

- **Non-porous** - Any item of evidence, or part of an item of evidence, that does not absorb fingerprint residue.
- **Porous** - Any item of evidence, or part of an item of evidence, that may absorb fingerprint residue.
- **Semi Porous/Mixed** - Any item of evidence that exhibits the qualities of both porous and non-porous evidence.

4.0 Equipment, Materials, and Reagents:

4.1 Equipment and Materials

- Protective gloves and apron/lab coat
- Face shield visor and/or safety goggles
- Appropriate glassware
- Fingerprint brushes
- Camera/scanner
- Lifting tape
- Silicone casting material
- Fume hood
- Alternate Light Source with appropriate filter and goggles
- Humidity equipment
- Application apparatus
- Appropriate storage container

4.2 Reagents

- All approved non-porous processing reagents
- All approved porous processing reagents
- All approved adhesive processing reagents
- All approved blood print processing reagents
- All approved miscellaneous processing reagents

Follow the instructions for use in the Latent Evidence work instructions for the particular reagent that is being used.

5.0 Standards and Controls

5.1 Positive Controls/Test Prints

Test prints, also called control samples or positive controls, shall be created and developed using all prepared reagents at the time of preparation as well as during all chemical processing steps. The test print shall be prepared on a substrate similar to the actual item of evidence. The results of the test print shall be recorded in Resource Manager at the time of the reagent preparation and in the case record during all chemical processing steps. A positive result is defined as the presence/development of friction ridge detail within the test print.

5.2 Performance Verifications

New equipment shall be verified prior to being used in casework according to the lab-wide **Procedure for Equipment Calibration and Maintenance** to ensure the equipment is functioning properly.

5.2.1 Cyanoacrylate ester fuming equipment- Deposit a test print on an appropriate non-porous surface. Follow the appropriate work instructions for the piece of equipment.

5.2.2 Alternate light sources- Deposit test prints on a variety of surfaces to ensure reagents for non-porous, porous, blood and tape surfaces that requires the use of an ALS to view are included. Some reagents require the use of cyanoacrylate ester fuming prior to the application of the reagent. Follow the appropriate work instructions for the piece of equipment.

5.2.3 Heat/humidity chamber- Deposit a test print on an appropriate porous surface and use an appropriate porous processing reagent. Follow the work instructions for this piece of equipment.

5.2.4 Document photographically (or by scanning) and record the findings.

6.0 Physical and Chemical Processing

Processing for the presence of latent prints is broken down into three general categories: non-porous, porous, and mixed/semi-porous. Additionally, the evidence received may contain adhesive surfaces and/or be contaminated by blood, body fluid(s), and/or other biohazardous and non-biohazardous material. Prior to beginning any processing technique, the forensic scientist shall note the category/categories of the evidence to be examined to determine the most appropriate course of action. The forensic scientist has the authority to determine the most appropriate method(s) by which to process a particular item based upon his or her training and experience. At each step during the course of the examination and/or processing, the forensic scientist shall evaluate the sufficiency of any friction ridge detail observed. If the forensic scientist deems it appropriate, the friction ridge detail may be documented photographically, via a scanned image, and/or lifting/casting the ridge detail prior to proceeding to the next processing step.

Note: Forensic scientists shall wear gloves while handling all evidence that is to be physically or chemically processed for latent prints.

-
- 6.1 Initial Examination for All Types of Evidence-** regardless of the surface of the item of evidence being processed, the first two steps of the examination are the same.
- 6.1.1** Examine the item(s) of evidence under ambient lighting conditions. Record any observations.
- 6.1.2** Examine the item(s) of evidence with an available alternate light source (ALS) that is equipped with various wavelengths. The forensic scientist shall view the evidence to detect latent impressions which may fluoresce inherently.
- 6.2 Alternate Light Source – ALS** is used to visualize inherent fluorescence and ridge detail developed during certain chemical processing steps. Various wavelengths shall be used on items of evidence as certain substances fluoresce under different wavelengths. Follow the instructions for use for the particular light source that is used. A strong, hand-held magnifier may be used to enhance visualization of the latent impression. Record the ALS and wavelengths used and any observations.
- 6.2.1 Safety -** Eye protection shall be worn when an ALS is being used. This applies to any other individual who may be in the same room or area. This is particularly important when examining reflective surfaces as the light source may be reflected and result in eye damage. Never look directly into any light source as this will cause eye damage. Do not expose the light source to the skin; it will not immediately cause harm, but may have long term effects with prolonged exposure.
- 6.3 Full Spectrum Color Imaging System (FSIS)-** The FSIS is used to visualize and capture ridge detail prior to and along with current processing techniques, see FSIS Work Instructions. This system includes the option of shortwave Ultra Violet light (254nm) and Infrared filters to enhance the visualization of latent impressions. Record the light used and any observations.
- 6.3.1 Safety-** Eye protection shall be worn when the FSIS is being used. Do not expose the light source to skin; exposure to UV rays may cause sunburn and may have long term effects with prolonged exposure.
- 6.4 Non-porous Processing – Analytical Approach**
- 6.4.1** Chemically and physically process the item(s) of evidence. Record any observations.
- 6.4.2** The following is a list of the recommended and available processing reagents and procedures for non-porous items of evidence that are submitted for analysis.
- 6.4.2.1 Cyanoacrylate Ester (CE) Fuming**
- 6.4.2.1.1** The cyanoacrylate ester fumes polymerize the latent impression. Any of the commercially prepared cyanoacrylate ester products that are maintained within the Latent Evidence section are approved for use. Cyanoacrylate ester fuming may be administered via multiple methods.

See instructions for use on each method. Once applied, at analyst discretion, allow the cyanoacrylate ester fumes to sufficiently dry before further processing.

6.4.2.1.2 Safety- Cyanoacrylate ester fumes may cause some irritation when in contact with the eyes or skin and may be harmful if inhaled or ingested. Additionally, cyanoacrylate ester is an adhesive/glue. Care shall be taken to avoid application to unintended surfaces.

6.4.2.1.3 Note: Cyanoacrylate ester may be used past any published best used by or expiration date, as long as, the test print develops appropriately during fuming.

6.4.2.2 Fingerprint Powder(s)

6.4.2.2.1 Any of the commercially prepared fingerprint powders that are maintained within the Latent Evidence section (e.g., black, bi-chromatic, magnetic) are approved for use. The type of powder and brush to be utilized depends on the surface of the item(s). Choose the powder that provides the most contrast.

6.4.2.2.2 Application

6.4.2.2.2.1 Dip the brush/magnetic wand into the powder containing vessel. Ensure that the tips of the bristles make contact with the powder surface. For non-magnetic powders, tap away excess powder from the brush. Lightly brush the powder over the surface of the item of evidence using only the tips of the brush. Carefully brush the entire surface of the item until ridge detail becomes visible. Some latent impressions are light in color and will not appear dark after powder is applied. Low levels of moisture in the latent print may account for this. An effective way to develop these types of impressions is to introduce moisture to the latent print. This may be accomplished by breathing moist air onto the area containing the latent print. Allow the moisture to dry and reapply the powder (it is not necessary to allow the moisture to dry when using magnetic powders). Once the latent impression has become visible, gently remove any excess powder adhering to the impression. Preserve impressions photographically and/or by utilizing a lifting technique.

6.4.2.2.2.2 Any of the fingerprint lifting tapes maintained within the Latent Evidence section (e.g., clear, frosted, polyethylene) and silicone casting materials (e.g., Mikrosil, Accutrans) are approved for use. Depending on the surface of the item(s) and the size of the area of friction ridge detail to preserve, select an appropriate type and size of lifting tape or silicone casting material.

6.4.2.2.2.1 Lifting tape: Tape shall be removed from the roll in one motion in order to prevent streaks. Apply tape evenly in order to prevent wrinkles and/or air bubbles. Firmly hold the folded-over end of the tape, slowly press the free end onto the surface to be lifted and smooth the length of tape over the surface. Remove the tape in a smooth, continuous motion. Place the tape on a sheet of white paper (or lift card which is of contrasting color) in the same manner as the tape was applied to the surface.

When several prints are developed (side by side or grouped closely together), lift all on one piece of tape. Wider tapes shall be used for multiple prints (or place two or more strips of tape over the impression and lift together).

6.4.2.2.2.2 Mikrosil: Place an equal length of an appropriately contrasting color of Mikrosil and hardener on a mixing pad. Thoroughly mix the Mikrosil and hardener together. Using a wooden spatula, apply the Mikrosil to the area of interest, allow to harden and carefully remove.

6.4.2.2.2.3 Accutrans: Using the automix gun, place an appropriately contrasting color of Accutrans on the area of interest, allow to harden and carefully remove.

6.4.2.2.2.4 Label each lift or cast with the appropriate case number, item number, date, forensic scientist initials, location the lift(s)/cast(s) originated from and any other cross reference information that is necessary.

6.4.2.2.3 **Safety-** Powdering should be done inside a fume hood or in a well-ventilated area.

6.4.2.3 Fluorescent Dye(s)

6.4.2.3.1 Any of the approved fluorescent dyes that are maintained within the Latent Evidence section (e.g., Rhodamine 6G[R6G]) are approved for use. R6G adheres to the chlorosis (white/grey buildup) that occurs after processing with

CE. Once applied, the use of an ALS is required to view the fluorescence; latent prints will fluoresce bright yellow.

When photographing any developed ridge detail, an orange filter must be added to the camera.

6.4.2.3.2 Application

6.4.2.3.2.1 Dipping Method – Completely submerge the item in the working solution.

6.4.2.3.2.2 Brush Method – Dip the brush into the working solution and brush directly on the item.

6.4.2.3.2.3 Spray Method – Spray the item with the working solution to completely saturate the item.

6.4.2.3.2.4 Note: After application, allow the item to dry completely prior to proceeding.

6.4.2.3.3 Limitations- The CE fuming process is vital to the success of Rhodamine 6G processing.

6.4.2.3.4 Safety- Rhodamine 6G solution may be fatal if swallowed; smaller amounts can cause blindness. It may also cause irritation when in contact with the eyes, skin, or respiratory tract. The methanol used in this solution is flammable and shall be handled with extreme care.

6.5 Porous Processing – Analytical Approach

6.5.1 Chemically process the item(s) of evidence. Record any observations.

6.5.2 The following is a list of the recommended and available processing reagents and procedures for porous items of evidence that are submitted for analysis.

6.5.2.1 1,2-Indanedione-Zinc (In-Zn)

6.5.2.1.1 Any of the approved formulations that are maintained within the Latent Evidence section are approved for use. In-Zn reacts with amino acids present

in fingerprint residue and produces fluorescent impressions when the reaction is complete. Once applied, the use of an ALS is required to view the fluorescence; latent prints will fluoresce bright yellow. When photographing any developed ridge detail, an orange filter must be added to the camera.

6.5.2.1.2 Limitations- Latent prints treated with 1,2-indanedione-zinc will fluoresce yellow under an ALS. Background fluorescence shall be considered when using this chemical.

6.5.2.1.3 Safety-The process shall always be performed in a fume hood as the reagent may cause skin and respiratory irritation, cause serious eye damage, and may be harmful if ingested. Glacial acetic acid and ethyl alcohol are extremely flammable and shall be handled properly.

6.5.2.2 Ninhydrin HFE-7100

6.5.2.2.1 Any of the approved formulations that are maintained within the Latent Evidence section are approved for use. Ninhydrin reacts with the amino acids present in fingerprint residue and turns purple when the reaction is complete.

6.5.2.2.2 Safety-The process shall be performed in a fume hood as the reagent causes skin and serious eye irritation and may cause respiratory irritation if inhaled.

6.5.2.3 Application for 1,2 Indanedione-Zinc and Ninhydrin

6.5.2.3.1 Dipping Method – Completely submerge the item in the working solution.

6.5.2.3.2 Brush Method – Dip the brush into the working solution and brush directly on the item.

6.5.2.3.3 Spray Method – Spray the item with the working solution to completely saturate the item.

6.5.2.3.4 Note: After application, allow the item to dry completely prior to proceeding.

6.5.2.4 Physical Developer

6.5.2.4.1 Any of the approved formulations that are maintained within the Latent Evidence section are approved for use. Physical Developer is a silver-based reagent that reacts with components of sweat in fingerprint residue to form

gray deposits. When processing items of evidence, four glass trays will be needed to complete the procedure. The purified water tray may be used for the initial and final step. The purified water must be replaced if any heavy

contamination occurs while processing numerous items. Forceps without serrated edges shall be used to handle or transfer item(s) from tray to tray. Care must be taken to avoid any unnecessary creasing or rough edges on the item(s) as this may cause unwanted deposits of silver. Place enough of each of the following solutions in the appropriate glass tray to completely submerge the item of evidence.

6.5.2.4.2 Application

6.5.2.4.2.1 Tray #1 – Purified Water- Place the tray on an agitator and agitate the tray during this step. Place the item(s) in tray #1 (purified water) for approximately 5-10 minutes. This will remove the previously applied chemicals and dirt which may be on the item.

6.5.2.4.2.2 Tray #2 – Maleic Acid- Place the tray on an agitator and agitate the tray during this step. Place the item(s) in tray #2 (maleic acid) for approximately 5-10 minutes. Ensure that there are no bubbles noted on the item(s) prior to continuing.

6.5.2.4.2.3 Tray #3 – Working Solution- Place the tray on an agitator and agitate the tray during this step. The time necessary to process items of evidence will vary depending on the number and size of the items. Place the item(s) in tray #3 (Working Solution) for approximately 10 minutes. Inspect the item(s) periodically to prevent overdevelopment of the impressions.

6.5.2.4.2.4 Tray #4 – Rinse Tray- Tap water or purified water may be used in this tray. Place the item(s) in tray #4 for approximately 3-5 minutes. This will prevent further development of the impressions and remove unnecessary solutions from the item. Remove the item(s) from the rinse tray and allow the item(s) to dry completely prior to proceeding. The developed impressions may be more visible after the drying process is completed.

6.5.2.4.2.5 Low contrast impressions may be improved by re-treating the item(s) with Physical Developer starting with the working solution. In the re-treatment process, it is not necessary to use the maleic acid solution. Visible impressions shall always be photographed prior to re-treating as there is the possibility they may be destroyed or over-developed.

6.5.2.4.3 Safety-The chemicals used in this process may cause severe skin burns and eye damage upon contact and may cause respiratory irritation if inhaled.

6.5.3 Enhancement of processes

6.5.3.1 Latent impressions will develop over time at room temperature.

6.5.3.2 Several methods are available to enhance the development process when utilizing porous reagents.

6.5.3.2.1 **Heat/Humidity Chamber** - Items may be placed in a humidity chamber to assist in latent print development. See instructions for use.

6.5.3.2.2 **Hot-air dryer** - This equipment is used to expedite the drying process. Take care to avoid contact between the dryer and the item.

6.5.3.2.3 **Iron (Steam or no steam)** - The iron is used to provide heat and/or moisture (steam) to the item. Hold the iron above the item and move over the entire surface taking care to avoid contact between the item and the iron.

6.5.3.2.4 **Microwave** - Heat a microwave-safe tray or beaker of water in the microwave in order to produce steam. Place the item in the microwave for approximately 5 minutes, or until impressions develop. Do not turn on the microwave with the evidence inside and do not allow the evidence to contact the hot water bath.

6.5.3.2.5 **Plastic Bag** - Place the item in a sealed plastic bag until latent impressions develop.

6.5.4 Based on the condition of the evidence at the time of submission, some processing steps may be omitted. If omitting the visual examination, inherent luminescence, and/or post-dye ALS examination, the forensic scientist shall note in the worksheet a reason that the step was omitted.

6.6 Semi-porous/Mixed Processing – Analytical Approach

6.6.1 Chemically and physically process the item(s) of evidence. Record any observations.

6.6.2 Semi-porous/mixed items of evidence may be processed utilizing methods that are determined by the forensic scientist to be most appropriate for the surface. The method and order of processing may be determined based on the training and experience of each forensic scientist. See 6.3 and 6.4 for the steps for non-porous and porous processing.

6.7 Adhesive Processing – Analytical Approach

6.7.1 Adhesive surfaces are often found in conjunction with standard porous and/or non-porous surfaces. In the instances where adhesive surfaces are present, it is required to process the porous/non-porous surfaces first. Additionally, the use of adhesive processing reagents on the non-adhesive portion of

tape may lead to further development of friction ridges. See **6.3** and **6.4** for the steps for non-porous and porous processing.

6.7.2 Chemically process the item(s) of evidence. Record any observations.

6.7.3 The following is a list of the recommended and available processing reagents and procedures for adhesive items of evidence that are submitted for analysis.

6.7.3.1 Crystal Violet (CV)

6.7.3.1.1 Any of the approved formulations or pre-mixed solutions that are maintained within the Latent Evidence section are approved for use. CV is applied to the adhesive side of tape and can be used to develop impressions on duct tape, masking tape, clear plastic tape, plastic surgical tape, reinforced packing tape and packing labels. The non-adhesive side of the tape must be processed prior to using CV.

6.7.3.1.2 Application- Pour the Crystal Violet solution into a glass processing tray. Soak the tape or label in the solution for approximately 1-2 minutes to dye the impressions. Rinse the item with tap water to remove the excess chemicals and allow the item to dry completely prior to proceeding.

6.7.3.1.3 Limitations-The process is most effective in developing latent impressions on adhesive surfaces as the dye involved in the chemical attaches to the dead skin cells and some sebaceous materials when the tape and/or adhesive surface comes in contact with the friction ridges. Subsequent dye staining processes and ALS examinations may be used after Crystal Violet to develop additional impressions.

6.7.3.1.4 Safety-The process shall be performed in a fume hood as the reagent causes serious eye damage and may be harmful if ingested. Crystal Violet is suspected of causing cancer. The Crystal Violet solutions have toxic properties and shall be handled with care. The solutions shall be used in a fume hood when processing evidence or when mixing. Protective goggles, gloves and apron/lab coat shall be worn as the staining solution will stain clothing and skin. Review the SDS for detailed information.

6.7.3.2 Sticky-Side Powder

Any of the approved formulations or pre-mixed solutions that are maintained within the Latent Evidence section are approved for use. This procedure applies to the adhesive side of tape and can be used to develop impressions on duct tape, masking tape, clear plastic tape, plastic surgical tape, reinforced packing tape, packing labels, paperbacked labels, double-sided foam tape and adhesive bandages.

6.7.3.2.1 Application

6.7.3.2.1.1 Method # 1

Using a camel hair brush, brush the Sticky-Side powder paste onto the adhesive side of the tape. The solution shall remain on the tape for approximately 10 to 15 seconds. After approximately

10 to 15 seconds, place the tape in a rinse tray of purified water and agitate to remove the excess powder. Allow the tape to dry.

6.7.3.2.1.2 Method # 2

Place approximately 1 teaspoon amount of Sticky-Side Powder in a tray of purified water (the rinse water from Method #1 may be used in this step). Agitate or stir the solution until the powder is completely dissolved. Submerge the item in the solution with the adhesive side up allowing the particles to settle on the tape or label. This step may take a period of time to develop with the latent impressions appearing somewhat fainter. Faint latent impressions may require additional processing time and may be returned to the solution. Allow the item to dry completely.

6.7.3.2.1.3 Note: Some items (such as adhesive labels or paper coated labels) may not be suitable for the brush technique; when dealing with these items, an alternative process may be used.

6.7.3.2.2 Preservation note- Developed impressions may also be lifted from the adhesive side of the tape; however, care shall be taken when attempting this procedure as the adhesive from the tape may also be lifted. Lifting the impressions may alter the contrast of the developed impression.

6.7.3.2.3 Limitations- If commercially prepared Sticky-Side Powder is not available, one of the other approved formulations may be substituted. Follow the same mixing procedures and application techniques previously stated. Both sides of the tape should also be examined during analysis as this procedure will often develop latent impressions on the non-adhesive side of the tape. Sticky-Side Powder may be used after cyanoacrylate ester and may be followed by fluorescent dyes and/or ALS examinations.

6.7.3.2.4 Safety-The process shall be performed in a fume hood as the fumes may cause some irritation when in contact with the eyes or skin and may be harmful if inhaled or ingested.

6.7.3.3 TapeGlo

6.7.3.3.1 Any of the pre-mixed solutions that are maintained within the Latent Evidence section are approved for use. This procedure can be used to develop impressions on the adhesive side of duct tape, masking tape, clear plastic tape, plastic surgical tape, reinforced packing tape, packing labels and black electrical tape. Once applied, the use of an ALS is required to view the fluorescence. When photographing any developed ridge detail, an orange filter must be added to the camera.

6.7.3.3.2 Application

6.7.3.3.2.1 Plastic-Backed Adhesive Tape- Place tape, adhesive side up, in a plastic or glass container that is large enough to accommodate the item. Pour TapeGlo into the container so that the tape is completely covered by the solution. Allow the solution to remain on the tape for 10-15 seconds. Remove the tape from the solution and rinse with tap water to remove the excess chemicals and allow to dry completely prior to proceeding. (Purified water may be used at a crime scene, but it is not a requirement.) Examine with an ALS.

6.7.3.3.2.2 Cloth or Paper-Backed Adhesive Tape- Place tape in a tray of fresh, clean purified water. Allow tape to become saturated for 30 seconds. Remove the tape and place in a new tray, adhesive side up, which is large enough to accommodate the evidence. Pour TapeGlo into the container so that the tape is completely covered in the solution. Allow the solution to remain on the tape for 10-15 seconds. Remove the tape from the solution and rinse with tap water or purified water to remove the excess chemicals. Allow tape to dry completely prior to proceeding. Examine with an ALS.

6.7.3.3.2.3 Alternate Process #1- Use a disposable foam applicator or a camelhair brush to brush TapeGlo gently onto the adhesive surface. Rinse and examine with an ALS.

6.7.3.3.2.4 Alternate Process #2- Place TapeGlo liquid in a spray bottle and spray TapeGlo onto the adhesive surface. Be sure that the adhesive surface is completely covered with a thin layer of solution. Rinse and examine with an ALS.

6.7.3.3.3 Limitations-The non-adhesive side of the tape shall be processed prior to using TapeGlo (this will include the cyanoacrylate ester and powder processes, if applicable). An impression may be weak or may not appear during the above procedures and may be enhanced with the introduction of specialized light from an ALS.

6.7.3.3.4 Safety-The process shall be performed in a fume hood as the fumes may cause some irritation when in contact with the eyes or skin and may be harmful if inhaled or ingested. TapeGlo is a water-based solution and is a slight irritant to the eyes and may irritate the skin of sensitive individuals. Protective goggles, gloves and apron/lab coat shall be worn to protect clothing and skin. Review the SDS for detailed information.

6.7.4 Preservation notes of the developed impressions- When photographing clear tapes, ensure that the adhesive side of the tape is facing the camera to record the correct position of the impression. A piece of paper may be placed behind the impression to improve the contrast of the image on clear or transparent tapes. With black electrical tapes where the latent impression is transferred to RC paper, reverse from left to right to record in the correct position.

6.8 Blood Print Processing - Analytical Approach

6.8.1 Surfaces contaminated with blood or other biohazardous materials are often found in conjunction with standard porous and/or non-porous surfaces. It is at the discretion of the forensic scientist, based on his or her training and experience, as to the order by which the item will be processed. See **6.2** and **6.3** for the steps for non-porous and porous processing.

6.8.2 Chemically process the item(s) of evidence. Record any observations.

6.8.3 The following is a list of the recommended and available processing reagents and procedures for items of evidence contaminated with blood or other biohazardous materials that are submitted for analysis.

Note: It has been noted that Ninhydrin-HFE 7100 is also effective at developing friction ridge detail in blood or other biohazardous material on porous surfaces. Ninhydrin may be utilized in conjunction with other blood print processing.

6.8.3.1 Amido Black

6.8.3.1.1 This procedure applies to items of evidence, porous and non-porous, that contain impressions in blood that require enhancing. Any of the approved

formulations or pre-mixed solutions that are maintained within the Latent Evidence section are approved for use.

6.8.3.1.2 Application- Amido Black may be applied to evidence either by using a spray bottle or by dipping the evidence. Completely cover the target area and allow to develop for approximately 3 to 5 minutes. Rinse the item with tap water to remove any excess reagent after development.

6.8.3.1.3 Limitations- Amido Black will not detect the normal constituents of latent impressions; therefore, Amido Black must be used in sequence with other processing techniques. It is essential to develop any traditional latent impressions prior to treatment with Amido Black. Careful treatment with powders before Amido Black will not interfere with Amido Black processing. Ninhydrin, if used, must precede the application of Amido Black. Some impressions in blood on porous surfaces such as paper or cardboard may be improved by using Physical Developer after the application of Amido Black.

6.8.3.1.4 Safety- Amido Black shall be used only in a well-ventilated area such as a fume hood. The glacial acetic acid and formic acid in the solution may be corrosive. Protective goggles, gloves and apron/lab coat shall be worn when transporting the reagent. This solution may also be used at crime scenes provided that proper safety precautions are applied; however, only use in well ventilated areas or utilize a fan to remove the fumes produced.

6.8.3.2 Coomassie Blue

6.8.3.2.1 This process applies to porous and non-porous items of evidence that may contain bloody impressions that require developing/enhancing. This procedure may also be used in processing adhesive sides of tapes. Any of the approved formulations or pre-mixed solutions that are maintained within the Latent Evidence section are approved for use.

6.8.3.2.2 Application

6.8.3.2.2.1 Spray Method- Completely cover the area of interest with the staining solution. Spray the item with the de-staining solution to clear the background. The de-staining solution shall be used generously to remove the excess staining solution. Allow the item to dry completely prior to proceeding.

6.8.3.2.2.2 Immersion Method- Completely immerse the item in a tray of staining solution. Immerse the item for approximately 30-90 seconds. Remove the item from the staining solution and place in a separate tray of de-staining solution for approximately 1 minute and agitate to clear the background. This procedure may be

repeated with a fresh de-staining solution if the background is not completely clear. Remove the item from the solution and allow the item to dry completely prior to proceeding.

6.8.3.2.3 Preservation note- The impression may be lifted directly from the item only after the item is completely dry.

6.8.3.2.4 Safety- Glacial acetic acid and methanol can be harmful if inhaled or ingested and shall be used in a fume hood when mixing and/or processing evidence. This technique may be used at crime scenes; however, use only in a well ventilated area or use a fan to remove the fumes produced.

6.8.3.3 Merbromin

6.8.3.3.1 Any of the pre-mixed solutions that are maintained within the Latent Evidence section are approved for use. This reagent must be used in conjunction with an ALS to develop latent impressions in blood. This technique may be used on porous or non-porous surfaces. Merbromin will

react with heme groups in the blood causing the blood to fluoresce yellow. Prior to spraying the item of evidence with any of the solutions, the bloody impression shall be dried or cured to prevent the print from dissolving when the solution is applied.

6.8.3.3.2 Application

Carefully spray item of evidence with Working Solution A (Merbromin Solution). Allow the area to dry completely. Spray the item a second time with Working Solution A and again allow the area to dry completely prior to proceeding.

After the second application of Working Solution A has completely dried, carefully spray item with Working Solution B (hydrogen peroxide solution). Spray item a second time with Working Solution B and allow the area to dry completely prior to proceeding. A fine mist shall be used when spraying the item of evidence with the hydrogen peroxide solution.

View the item under the ALS with orange goggles and /or filters. When photographing any developed ridge detail, an orange filter must be added to the camera.

6.8.3.3.3 Limitations- The latent impressions developed with Merbromin shall be photographed immediately as exposure to air will slowly cause the development of a fluorescent background which will mask the latent

impression. Merbromin will cause the blood on an item to fluoresce yellow and is not recommended on items which fluoresce the same color.

6.8.3.3.4 Safety- Merbromin is carcinogenic and shall be handled with caution. Inhalation, ingestion and skin contact shall be avoided. The process shall be performed in a fume hood.

6.8.3.4 Leuco Crystal Violet (LCV)

6.8.3.4.1 This process applies to non-porous items of evidence and some porous items of evidence that may contain bloody impressions that require developing/enhancing. Any of the approved formulations or pre-mixed solutions that are maintained within the Latent Evidence section are approved for use.

6.8.3.4.2 Application

Using a fume hood and rubber gloves, spray or completely submerge the item of evidence in the LCV solution and allow to dry completely. Spraying with a fine mist is the most effective method to apply the solution.

Development of the impressions will occur in approximately 30 seconds and the area may be blotted with tissue or paper towels to remove excess solution. Allow the area to dry completely and re-apply the solution to improve the contrast of the impression.

Notes: This dye will adhere to the bloody impression; however, a certain amount will adhere to the item itself. If the impression over-develops or becomes dark, wash the area with distilled water to remove the excess dye. The excess dye will wash away and, in most cases, the dye adhering to the latent impression will remain. LCV is a catalytic test for blood and will bind with the proteins found in blood which will limit the running or leaching of the developed impression.

The LCV developed impression may be enhanced with the use of an ALS.

6.8.3.4.3 Preservation note- When LCV is applied in sunlight or a lighted environment, the impression shall be photographed as soon as possible to avoid unwanted background development.

6.8.3.4.4 Limitations- Avoid the cyanoacrylate ester process if LCV will be used on an item of evidence. Serological samples shall be taken prior to treating an item of evidence with LCV. The hydrogen peroxide solution will become a catalyst

for oxidation of the hemoglobin and its derivatives found in blood thus producing a violet colored dye. The Crystal Violet in this process will bind

with the proteins which have been affixed by the 5-sulfosalicylic acid to develop latent impressions and limit the running and leaching which may occur in other processes. Care shall be taken when development occurs with LCV as it is extremely light sensitive.

6.8.3.4.5 Safety- It is harmful if inhaled, swallowed, or absorbed through the skin / eyes.

6.9 Miscellaneous Processing - Analytical Approach

6.9.1 At times, items of evidence are submitted that have unique processing needs. Items that have been submerged in water and items that contain greasy friction ridge stains (ex: soda or greasy food residue stains) require special processing considerations. When it becomes apparent that either of these circumstances exists, it is at the discretion of the forensic scientist, based on his or her training and experience, as to the most prudent processing technique to be utilized. See **6.3** and **6.4** for the steps for non-porous and porous processing.

6.9.2 The following is a list of the recommended and available processing reagents and procedures for miscellaneous items of evidence that are submitted for analysis.

6.9.2.1 Sudan Black

6.9.2.1.1 This process applies to non-porous items of evidence that contain impressions in grease that require enhancing. Sudan Black is used to enhance dried stain deposits or greasy impressions on non-porous items of evidence. Sudan Black is less sensitive than other dyes which may be used. It should be considered for use on items which may be contaminated with grease, foodstuffs or dried deposits of soft drinks. This process will stain the fatty components of sebaceous sweat producing a blue-black impression. Shake the solution prior to application to ensure the dye is evenly distributed throughout the solution. Any of the approved formulations or pre-mixed solutions that are maintained within the Latent Evidence section are approved for use.

6.9.2.1.2 Application

6.9.2.1.2.1 Immersion Method

Place Sudan Black solution in a tray. Solution should be deep enough to allow for submersion of the item of evidence. Submerge the item of evidence for 2 minutes. Remove from tray and submerge in a tray of purified water or rinse with running tap water to remove excess dye. Allow the item to dry

completely before proceeding (do not use heat to accelerate the drying process).

Developed impressions will appear blue-black. The above steps may be repeated in order to improve the contrast of any developed impressions.

6.9.2.1.2.2 Spray Method

Spray the item of evidence with the dye to cover the area of interest completely. Using a spray bottle, rinse off excess dye with purified water or tap water. Allow the item to dry completely before proceeding (do not use heat to accelerate the drying process). Developed impressions will appear blue-black. The above steps may be repeated in order to improve the contrast of any developed impressions.

6.9.2.1.3 Notes- Solution may be reused if not visibly contaminated after processing. Sudan Black may be used on surfaces which are extremely contaminated with greasy deposits or soiled with heavy concentrations of dried fluids.

6.9.2.1.4 Limitations- This process shall not be used on dark or printed plastic surfaces. This may affect the contrast needed to view and photograph the developed impressions. All serological examinations shall be conducted prior to treatment with Sudan Black. In instances where Sudan Black is utilized, it is also required to process the item(s) of evidence utilizing non-porous and/or porous processing techniques. It is at the discretion of the forensic scientist, as to the order by which the item will be processed. See **6.3** and **6.4** for the steps for non-porous and porous processing.

6.9.2.1.5 Safety- Sudan black is suspected of causing genetic defects. Methanol is flammable, fatal if ingested, and is harmful if inhaled. Always use a fume hood when mixing and/or processing evidence. This technique may be used at crime scenes; however, use only in well-ventilated areas or use a fan to remove the fumes produced.

6.9.2.2 Small Particle Reagent (SPR)

6.9.2.2.1 This process applies to moist or wet porous and nonporous items of evidence that are to be examined for the presence of latent prints. This procedure may also be used in processing the exterior of vehicles, window frames, weapons, etc. even if the item is, or has been, exposed to rainy conditions. Plastic items

such as PVC, Mylar, Polyethylene and waxed paper are good items for the use of SPR.

6.9.2.2.2 Application- Thoroughly agitate the solution prior to use. Generously spray SPR solution onto the surface area and rinse with tap water.

6.9.2.2.3 Preservation note- The SPR will act like a fingerprint powder once allowed to completely dry and may be lifted and/or photographed.

6.9.2.2.4 Limitations- The reagent is an aqueous suspension of molybdenum disulfide which is very lipid sensitive. SPR may also be used on surfaces which have no indication of being wet or having been exposed to moist environmental conditions.

6.9.2.2.5 Safety- Titanium dioxide is suspected of causing cancer. Always mix chemicals in a fume hood. If mixing this chemical in the field, use in a well ventilated area.

6.9.2.3 Acidified Hydrogen Peroxide (AHP)

6.9.2.3.1 This process applies to brass cartridges and brass cartridge cases. **Note:** Cartridges/cartridge cases made of material other than brass shall be processed utilizing the standard nonporous methods.

6.9.2.3.2 Application- Pour enough AHP into a beaker so that the depth of the AHP is approximately the height of the tallest (longest) item being tested. Place the item into the AHP mixture for seventy-five seconds (1 minute, 15 seconds).

Do not process with AHP for longer than seventy-five seconds. After the items have been exposed to the AHP for seventy-five seconds, neutralize the residual solution on the item immediately by submerging the item in purified water for 10 seconds as a rinse. Allow the item to dry completely. Visualize any developed latent prints utilizing ambient or white light.

6.9.2.3.3 Limitations- This process is only effective in developing latent impressions on brass cartridges and brass cartridge cases. AHP processing is not effective on silver, aluminum, nickel, or polymer coated cartridges/cartridge cases. In addition, AHP resulted in negligible ridge detail on Speer shell casings (gold-colored casings with a silver-colored head stamp center).

6.9.2.3.4 Safety- AHP can be harmful if inhaled or ingested and exposure may cause eye, skin, or respiratory irritation. AHP shall be used in a fume hood when processing evidence.

7.0 Recording of Analytical Data – All observations and conclusions shall be recorded according to the **Technical Procedure for Friction Ridge Analysis and Comparison**.

8.0 Limitations – Refer to the individual processing reagent sections.

9.0 Safety

9.1 Protective goggles, gloves, and apron/lab coat shall be worn during all processing.

9.2 Assume that all body fluids contain bloodborne pathogens and handle accordingly.

9.3 Additional safety measures are noted in each applicable processing reagent.

9.4 Refer to Appendix 1 for chemical hygiene and safety precautions for extremely hazardous and particularly hazardous substances.

10.0 Records – N/A

11.0 Attachments

- Appendix 1 – Chemical Hygiene and Safety Precautions for Extremely Hazardous and Particularly Hazardous Substances

12.0 References

Azoury, M., et al. “Old Latent Prints Developed with Powder: A Rare Phenomenon?” *Journal of Forensic Identification*. Vol. 54, 5: 534–541 (2004).

Freeman, H.N. “The Use of Fingerprint Powders to Develop Latent Prints on Electrical or Plastic Tapes.” *Journal of Forensic Sciences*. Vol. 47, 6: 417-420 (December 1991).

Hamm, E. “Enhancement and Development of Blood Prints.” *74th Annual Educational Conference International Association for Identification*. (June 22, 1989): 1-11.

Kent, T., ed. *Manual of Fingerprint Development Techniques: A Guide to the Selection and Use of Processing for the Development of Latent Fingerprints*. Police Scientific Development Branch, London (July 1992).

Kimble, G.W. “Powder Suspension Processing.” *Journal of Forensic Identification*. Vol. 46, 3: 273-279 (June 1996).

Laskowski, G.E. “A Preliminary Comparison of Soviet Fingerprint Powders with Selected U.S. Fingerprint Powders.” *Journal of Forensic Identification*. Vol. 41, 5: 321-332 (1991).

Lee, H.C. “Methods of Latent Print Development.” *Proceedings of the International Forensic Symposium on Latent Prints*. (July 1987): 15–24.

Lennard, C.J. and P.A. Margot. "Sequencing of Reagents for the Improved Visualization of Latent Fingerprints." *Proceedings of the International Forensic Symposium on Latent Prints*. (July 1987): 141-142.

Manual of Fingerprint Development Techniques: A Guide to the Selection and Use of Processes for the Development of Latent Fingerprints. Scientific Research and Development Branch, London (1986).

Pleckaitis, J. "Developing Friction Ridge Detail on the Interior of Latex and Nitrile Gloves." *Journal of Forensic Identification*. Vol. 57, 2: 230–239 (2007).

Saroa, J.S., G.S. Sodhi, and R.K. Garg. "Evaluation of Fingerprint Powders." *Journal of Forensic Identification*. Vol. 56, 2: 186–197 (2006).

Sodhi, G.S., J. Kaur, and R.K. Garg. "Fingerprint Powder Formulations Based on Organic, Fluorescent Dyes." *Journal of Forensic Identification*. Vol. 54, 1: 4–8 (2004).


Trozzi, T.A., R.L. Schwartz and M.L. Hollars. *Processing Guide for Developing Latent Prints*. (2000).


US Department of Justice. *Chemical Formulas and Processing Guide for Developing Latent Prints*. FBI Laboratory Division, Latent Fingerprint Section (1994).

Refer to the individual processing reagent instructions for use for additional references.

Revision History		
Effective Date	Version Number	Reason
04/06/2026	4	6.3 add-Full Spectrum Color Imaging System (FSIS)- The FSIS is used to visualize and capture ridge detail prior to and along with current processing techniques, see FSIS Work Instructions 6.3.1 add safety information 6.3.3- Remove Removed methylene chloride safety chart since MeCl is no longer used.

Appendix 1 – Chemical Hygiene and Safety Precautions for Extremely Hazardous and Particularly Hazardous Substances

Crystal Violet							
DANGER: PARTICULARLY HAZARDOUS SUBSTANCE							
	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="background-color: #0056b3; color: white;">HEALTH</td> <td style="text-align: right; color: white;">2</td> </tr> <tr> <td style="background-color: #ff0000; color: white;">FLAMMABILITY</td> <td style="text-align: right; color: white;">0</td> </tr> <tr> <td style="background-color: #ffff00;">REACTIVITY</td> <td style="text-align: right;">0</td> </tr> </table>	HEALTH	2	FLAMMABILITY	0	REACTIVITY	0
HEALTH	2						
FLAMMABILITY	0						
REACTIVITY	0						
Detection of Release	Light blue crystal						
Signs/Symptoms of Exposure	Causes serious eye damage. Prolonged exposure can cause nausea, headache, vomiting and nose bleed. The material may be tumorigenic and mutagenic.						
PEL	Contains no substances with occupational exposure limit values.						
Associated Hazards	May cause cancer. Causes serious eye damage. Harmful if swallowed. Very toxic to aquatic life with long lasting effects.						
Controls	Avoid contact with skin, eyes and clothing. Wash hands before breaks and immediately after handling the product. Use eye protection. Handle with gloves. Wear lab coat. Gloves: nitrile (break through 480 minutes)						
Safe handling, storage, disposal	Avoid formation of dust and aerosols. Keep container tightly closed in a dry and well-ventilated place.						
Emergency Procedures (2.2)(4.1)(6)	<p><u>Eye Contact:</u> Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.</p> <p><u>Inhalation Exposure:</u> If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.</p> <p><u>Ingestion:</u> Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.</p> <p><u>Skin Contact:</u> Wash off with soap and plenty of water. Consult a physician.</p> <p><u>Spills:</u> Avoid dust formation. Avoid breathing vapors, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust. Spills: Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal. Dispose in Hazardous Chemical Waste</p>						

Maleic Acid [Used in Physical Developer] DANGER: Particularly Hazardous Substance							
	<table border="1"> <tr> <td style="background-color: #0056b3; color: white;">HEALTH</td> <td style="text-align: center;">2</td> </tr> <tr> <td style="background-color: #ff0000; color: white;">FLAMMABILITY</td> <td style="text-align: center;">1</td> </tr> <tr> <td style="background-color: #ffff00;">REACTIVITY</td> <td style="text-align: center;">1</td> </tr> </table>	HEALTH	2	FLAMMABILITY	1	REACTIVITY	1
HEALTH	2						
FLAMMABILITY	1						
REACTIVITY	1						
Detection of Release	White powder; slightly sourish odor.						
Signs/Symptoms of Exposure	Skin irritation and/or allergic reaction; eye irritation; respiratory irritation.						
PEL	Contains no substances with occupational exposure limit values. Hazardous components without workplace control parameters						
Associated Hazards	May form combustible dust concentrations in air. Harmful if swallowed or in contact with skin. Causes skin irritation. May cause an allergic skin reaction. Causes serious eye damage. May cause respiratory irritation.						
Controls	Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.						
Safe handling, storage, disposal	Avoid contact with skin, eyes and clothing. Wear lab coat. Wash hands before breaks and immediately after handling the product. Use eye protection. Handle with gloves (nitrile rubber breakthrough time 480 min),						
Emergency Procedures	<p><u>Skin contact:</u> Take off contaminated clothing and shoes immediately. Wash off with soap and plenty of water. Take victim immediately to hospital. Consult a physician.</p> <p><u>Inhalation Exposure:</u> If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.</p> <p><u>Eye contact:</u> Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician. Continue rinsing eyes during transport to hospital.</p> <p><u>If swallowed:</u> Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.</p> <p><u>Spills:</u> Avoid breathing dust, vapors, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.</p>						

Merbromin Reagent							
DANGER: PARTICULARLY HAZARDOUS SUBSTANCE							
	<table border="1"> <tr> <td style="background-color: #0056b3; color: white;">HEALTH</td> <td style="background-color: #0056b3; color: white; text-align: right;">2</td> </tr> <tr> <td style="background-color: #ff0000; color: white;">FLAMMABILITY</td> <td style="background-color: #ff0000; color: white; text-align: right;">1</td> </tr> <tr> <td style="background-color: #ffff00;">REACTIVITY</td> <td style="background-color: #ffff00; text-align: right;">0</td> </tr> </table>	HEALTH	2	FLAMMABILITY	1	REACTIVITY	0
HEALTH	2						
FLAMMABILITY	1						
REACTIVITY	0						
Detection of Release	Mild acetone odor; clear-colored liquid						
Signs/Symptoms of Exposure	Irritation, nausea, headache, shortness of breath, dizziness, vomiting, skin burns, CNS depression						
PEL	OSHA PEL TWA 2',7'-Dibromo-5'-[Hydroxymercuril]-Fluorescein: 1mg/m ³ Ethanol: 1000ppm Formic acid: 5ppm Acetone: 1000ppm Hydrogen Peroxide: 1ppm						
Associated Hazards	May cause cancer. May damage fertility or the unborn child. Toxic if inhaled. Harmful in contact with skin. Causes serious eye irritation. May cause respiratory irritation. May cause drowsiness/dizziness. Causes damage to organs-repeat exposure (liver). May cause damage to organs through repeat exposure (CNS). Highly flammable liquid/vapor. Strong oxidizer.						
Controls	Wear protective gloves/clothing/eye protection/face protection.						
Safe handling, storage, disposal	Store in cool, well-ventilated area. Keep away from reactive materials and away from fire hazard or source of ignition. After use, wash hands and exposed skin with soap and water. Use only with adequate ventilation. Keep container closed. If possible, isolate container in well-ventilated area. Keep container closed tightly.						
Emergency Procedures	<p>Eye Contact: Flush with cool tap water for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing.</p> <p>Inhalation Exposure: Remove victim to fresh air. If distress continues, administer oxygen and contact physician</p> <p>Ingestion: drink large amounts of water. Do not induce vomiting.</p> <p>Skin Contact: Remove all contaminated clothing. Wash thoroughly with warm water</p> <p>In all cases if irritation or distress persists, contact physician or nearest poison control center.</p> <p>Spills: wear appropriate PPE. Small spills: wear PPE (goggles, gloves). Absorb on paper towels, evaporate in fume hood. Burn the absorbed material in an incinerator. If dry-clean up spill in a manner which minimizes dust spread.</p>						