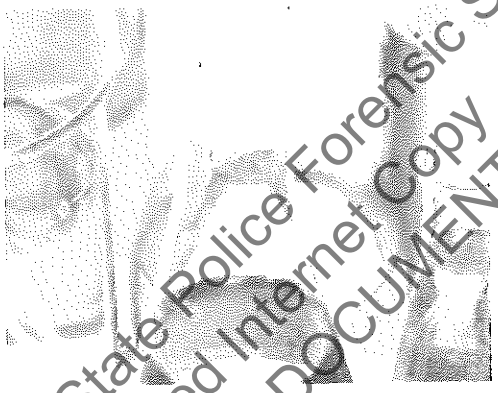
Idaho State Police
Forensic Services

Approval for Quality System Controlled Documents



Discipline/Name of Document: Latent Print Section Analytical Method

Revision Number: 5

Issue Date: 9/12/2007

APPROVED BY: Corinna C Owsley
Quality Manager

9/12/07
Date Signed

IDAHO STATE POLICE FORENSIC SERVICES
LATENT PRINT SECTION
ANALYTICAL METHOD

HISTORY PAGE

The original version of the Latent Fingerprint Section SOP Manual is dated August 30, 2000.

Revision 1, revised from revision 0 was effective July 13, 2001.

Revision 2, revised from revision 1 was effective December 27, 2001.

Revision 3, the entire manual was reviewed and revised from revision 2. Revision 3 is effective January 12, 2007.

Revision 4: Section 11 "Digital Imaging Procedure" was reviewed and revised from revision 3. Revision 4 is effective May 15, 2007.

Revision 5: Section 5.6 "Retained Evidence" clarified retained latent evidence procedure 5.6.1, added section 5.6.1.1 addresses the issue of retained evidence from crime scenes, Appendix C "Latent Section Abbreviations" removed from Analytical Method. Revision 5 is effective September 12, 2007.

IDAHO STATE POLICE FORENSIC SERVICES
LATENT SECTION ANALYTICAL METHOD

TABLE OF CONTENTS

1 BACKGROUND/SCOPE

1.1 The discipline of Latent Print Analysis is the process of determining whether a particular area of friction ridge skin produced a particular latent print.

1.2 It is a discipline based on the development and comparison of multiple levels of detail such as pattern type, ridge characteristics (also known as minutiae), ridge shapes, etc. between a latent print and a known print.

1.3 When there is agreement between the details in a latent or questioned print and those in the known print, without any unexplainable dissimilarities, an identification (individualization) can be declared.

1.4 The principles behind latent print evidence are: Friction Ridge Skin (FRS) is permanent, in that it does not change naturally throughout one's life and Friction Ridge Skin is unique and individual, no two areas of FRS have been found to possess identical ridge characteristics.

1.5 This Analytical Method defines both technical procedures for processing the majority of evidence encountered by the Latent Print Discipline and comparison methodology.

1.5.1 These methods will describe procedures and techniques that are routinely used in the examination of evidence.

1.5.2 These methods cannot be expected to address each and every situation or type of evidence encountered.

1.5.3 The individual analyst must exercise sound judgment in selecting the methods which will best suit the requirements of the evidence submitted in a specific case; therefore, the procedures are designed to accommodate the majority of evidence encountered.

2 REFERENCES

ASCLD/LAB - International, March 2004, Rev. 0, *Supplemental Requirements for the Accreditation of Forensic Science Testing and Calibration Laboratories.*

International Laboratory Accreditation Cooperation (ILAC), Guide 2 - Traceability of Measurements of Measurement Results, 2002.

International Organization of Standardization (ISO)/International Electrochemical Commission (IEC), ISO/IEC17025 - *General requirements for the competence of testing and calibration laboratories*, 2005 (ISO/IEC 17025:2005(E).

The Scientific Working Group on Friction Ridge Analysis, Study and Technology (SWGFAST) - *SWGFAST documents are officially published in the Journal of Forensic Identification*, 2006.

Idaho State Police Forensic Services – Quality Manual ISO/IEC 17025:2005 Compliant.

3 DEFINITIONS

ACE-V
Comparison methodology consisting of Analysis, Comparison, Evaluation, and Verification.

AFIS
Automated Fingerprint Identification System.

ALTERNATE LIGHT SOURCE (ALS)/FORENSIC LIGHT SOURCE
Any light source, other than a laser, used to excite luminescence of latent prints, body fluids, etc.

ANALYSIS
The methodical examination of friction skin impressions; separation into parts so as to determine the nature of the whole.

ARCH - PLAIN
A fingerprint pattern in which the ridges enter on one side of the impression, and flow, or tend to flow, out the other with a rise or wave in the center.

ARCH -TENTED
A type of fingerprint pattern that possesses either an angle, an up-thrust, or two of the three basic characteristics of the loop.

ARTIFACT
1. Any distortion or alteration not in the original friction ridge impression, produced by an external agent or action.
2. Any information not present in the original object/image, inadvertently introduced by image capture, processing, compressions, transmission, display or printing.

BIFURCATION
The point at which one friction ridge divides into two friction ridges.

CHARACTERISTICS/MINUTIAE
Features of the friction ridges. Commonly referred to as minutia(e), Galton detail, point, feature, ridge formation, or ridge morphology (dot, bifurcation, and ending ridge).

CLARITY
Visual quality of a friction ridge impression.

CLASS CHARACTERISTICS
Characteristics used to put things into groups or classes (e.g., arches, loops, and whorls).

CLASSIFICATION
Alpha/numeric formula of finger and palm print patterns used as a guide for filing and searching.

COMPARISON
The observation of two areas of friction ridge impressions for finding similarities and/or differences.

CORE
The approximate center of a pattern.

CREASE
A line or linear depression; grooves at the joints of the phalanges, at the junction of the digits and across the palmar and plantar surfaces that accommodate flexion.

DELTA
That point on a ridge at or nearest to the point of divergence of two type lines, and located at or directly in front of the point of divergence.

DERMIS
The layer of skin beneath the epidermis.

DISCREPANCY/DISSIMILARITY
A difference in two friction ridge impressions due to different sources of the impressions (exclusion).

DISTORTION
Variances in the reproduction of friction skin caused by pressure, movement, force, contact surface, etc. Distortion is not a discrepancy and is not a basis for exclusion.

DOT
An isolated ridge unit whose length approximates its width in size.

EDGEOSCOPY
Study of the morphological characteristics of friction ridges; contour or shape of the edges of friction ridges.

ELASTICITY
The ability of skin to recover from stretching, compression, or distortion.

ELIMINATION PRINTS
Exemplars of friction ridge skin detail of persons known to have had access to the item examined for latent prints.

ENDING RIDGE
A single friction ridge that terminates within the friction ridge structure.

EPIDERMIS
The outer layer of the skin.

ERRONEOUS IDENTIFICATION
The incorrect determination that two areas of friction ridge impressions originated from the same source.

EVALUATION
The determination of the significance, value, or clarity of a friction ridge impression by careful observation and study.

EXCLUSION
The determination that two areas of friction ridge impressions did not originate from the same source (non-identification).

FINGERPRINT
An impression of the friction ridges of all or any part of the finger.

FOCAL POINTS
Those areas that are enclosed within the pattern area of loops and whorls. They are also known as the core and the delta.

FRICTION RIDGE
A raised portion of the epidermis on the palmar or plantar skin, consisting of one or more connected ridge units of friction ridge skin.

FRICTION RIDGE DETAIL (MORPHOLOGY)
An area comprised of the combination of ridge flow, ridge characteristics, and ridge structure.

FRICTION RIDGE UNIT
Single section of friction ridge containing one pore.

FURROWS
Valleys or depressions between the friction ridges.

GALTON DETAILS
Term referring to friction ridge characteristics attributed to the research of English fingerprint pioneer, Sir Francis Galton.

HENRY CLASSIFICATION
A system of fingerprint classification named for Sir Edward Richard Henry.

IAFIS
Integrated Automated Fingerprint Identification System. The FBI's national AFIS.

INCIPIENT RIDGE
A friction ridge not fully developed which may appear shorter and thinner in appearance than fully developed friction ridges (interstitial, nascent).

INCONCLUSIVE
The inability to either individualize or exclude an area of friction ridge detail.

INDIVIDUALIZATION/IDENTIFICATION
The determination that corresponding areas of friction ridge impressions originated from the same source to the exclusion of all others.

INTERVENING RIDGES
The number of friction ridges between two characteristics.

KNOWN PRINT (FINGER, PALM, FOOT)/EXEMPLAR
A recording of an individual's friction ridges with black ink, electronic imaging, photography, or other medium on a contrasting background.

LATENT PRINT

Transferred impression of friction ridge detail not readily visible; generic term used for questioned friction ridge detail.

LEVEL 1 DETAIL
Friction ridge flow and general morphological information.

LEVEL 2 DETAIL
Individual friction ridge paths and friction ridge events (e.g., bifurcations, ending ridges, and dots).

LEVEL 3 DETAIL
Friction ridge dimensional attributes , e.g., width, edge shapes, and pores.

LIFT
An adhesive or other medium on which recovered friction ridge detail is preserved.

LIVE-SCAN
Electronic recording of friction ridges (fingers and/or palms).

LOOP - ULNAR
A type of pattern in which one or more ridges enter upon either side, re-curve, touch or pass an imaginary line between delta and core and pass out, or tend to pass out, on the same side the ridges entered. The flow of the pattern runs in the direction of the ulna bone of the forearm (toward the little finger).

LOOP - RADIAL
A type of pattern in which one or more ridges enter upon either side, re-curve, touch or pass an imaginary line between delta and core and pass out, or tend to pass out, on the same side the ridges entered. The flow of the pattern runs in the direction of the radius bone of the forearm (toward the thumb).

MAJOR CASE PRINTS/COMPLETE FRICTION RIDGE EXEMPLARS
A systematic recording of all of the friction ridge detail appearing on the palmar sides of the hands. This includes the extreme sides of the palms, joints, tips, and sides of the fingers. Under special circumstances complete friction ridge exemplars may also need to be taken from the plantar portion of the feet.

MATRIX
The substance that is deposited by the finger.

MISSED IDENTIFICATION
The failure to make an identification (individualization) when, in fact, both friction ridge impressions are from the same source.

NCIC CLASSIFICATION
An alpha/numeric system of fingerprint classification.

NON-POROUS
Non-absorbent.

PATENT PRINT
Friction ridge impression of unknown origin, visible without development.

PATTERNS
The designation of friction ridge skin into basic categories of general shapes.

PLASTIC PRINT
Friction ridge impression of unknown origin that is impressed in a soft substrate to create a three-dimensional impression.

PORES
Small openings in the skin through which perspiration is released.

POROSCOPY
A study of the size, shape, and arrangement of pores.

POROUS
Absorbent.

PRESERVED
Casting, photography, lifting, or other method used to capture latent impressions for further examination.

QUALIFIED ANALYST
Is an individual who has completed the internal training program, passed competency testing, and been approved to perform case work.

QUALITATIVE
The clarity of information contained within a friction ridge impression.

QUANTITATIVE
The amount of information contained within a friction ridge impression.

REAGENT
Substance used in a chemical reaction to detect, examine, measure, or produce other substances.

RELATIVE POSITION
Proximity of characteristics to each other.

RIDGE FLOW
A series of adjacent friction ridges in a directional arrangement. Level 1 detail.

RIDGE PATH
The directional flow of a single friction ridge. *Level 2 Detail.*

RIDGEOLOGY
The study of the uniqueness of friction ridge skin and its use for personal identification (individualization).

SEQUENTIAL PROCESSING
Use of a series of development methods in a specific order to maximize development of friction ridge detail.

STOCK SOLUTION
Concentrated solution diluted to prepare a working solution.

SUBSTRATE
Surface upon which a friction ridge impression is deposited.

SUFFICIENCY
The analyst's determination that adequate unique details of the friction skin source exist in the impression to support the conclusion.

VERIFICATION
Confirmation of an analyst's conclusion by another qualified analyst.

WHORL - ACCIDENTAL
A fingerprint pattern consisting of two different types of patterns, with the exception of the plain arch, with two or more deltas; or a pattern which possesses some of the requirements for two or more different types; or a pattern which conforms to none of the definitions.

WHORL - CENTRAL POCKET LOOP
A type of fingerprint pattern which has two deltas and at least one ridge which makes, or tends to make, one complete circuit, which may be spiral, oval, circular, or any variant of a circle. An imaginary line drawn between the two deltas must not touch or cross any recurving ridges within the inner pattern area.

WHORL - DOUBLE LOOP
A type of fingerprint pattern that consists of two separate loop formations with two separate and distinct sets of shoulders and two deltas.

WHORL - PLAIN
A type of fingerprint pattern which consists of one or more ridges which make, or tend to make, a complete circuit, with two deltas, between which, when an imaginary line is drawn, at least one recurving ridge within the inner pattern area is cut or touched.

WORKING SOLUTION
Solution at the proper dilution for processing.

4 RESPONSIBILITIES

4.1 The Latent Program Supervisor is responsible for ensuring that personnel adhere to established analytical methods, safety practices, and laboratory policies and procedures.

4.2 The Latent Program Supervisor shall ensure that analyst's training records are on file in the latent section.

4.3 Individual analysts are responsible for adherence to established analytical methods, safety guidelines, and laboratory polices and procedures.

4.4 Latent print analyst duties include, but are not limited to:

- 4.4.1 Development of friction ridge impressions;
- 4.4.2 Documentation of visible or developed friction ridge impressions;
- 4.4.3 Analysis, comparison, and evaluation of friction ridge impressions;
- 4.4.4 Verification of compared friction ridge impressions;
- 4.4.5 Issuing reports of examination activities;
- 4.4.6 Performing technical and administrative casework reviews;
- 4.4.7 Obtaining known exemplars from living and deceases subjects;
- 4.4.8 Responding to crime scenes to the extent to which they are trained;
- 4.4.9 Satisfactorily completing annual proficiency tests;
- 4.4.10 Presenting expert testimony in court.

5 EVIDENCE HANDLING PROCEDURES

5.1 Evidence handling will be in accordance to ISPFS Quality/Procedure Manual Section 5.8 HANDLING ITEMS OF EVIDENCE.

5.2 In order to ensure a correct count, money shall be counted by the analyst and witnessed by one other person when first opened (if possible) and again when it is resealed.

5.3 Evidence that contains a measurable amount of a controlled substance will not be accepted in the Latent Section.

5.3.1 Officers delivering evidence in person will be requested to separate out the substance prior to submission.

5.3.2 If a controlled substance is received in the Latent Section via the U.S. Mail or UPS it will be returned to the agency without being processed.

5.3.2.1 The submitting agency will be contacted, advised of this policy, and requested to resubmit the item only after the controlled substance has been removed.

5.4 Submission of hands, fingers, or feet of deceased persons to the Latent Section shall only occur when normal printing procedures have failed or cannot be applied due to decomposition.

5.4.1 Hands, fingers, or feet should only be removed by the attending medical examiner/coroner or under their authority and supervision.

5.4.2 When possible, it is desirable to have the hands severed at the wrist, and forwarded in their entirety. This eliminates the possibility of getting fingers mixed up or incorrectly labeled. If it is not possible to send the hands, the fingers may be submitted. Fingers should be severed at the palm, placed in individual containers, and immediately labeled as to which finger it is.

5.4.3 It is requested that hands, fingers, etc. be submitted as soon as possible in the same condition as found. If the hands were immersed in water, transport in water. If found dried out, place in an airtight container and transport without using any preservative.

5.4.4 Tissue should be refrigerated if possible.

5.4.5 **Do not use a formaldehyde solution** to preserve the tissue as it causes it to become brittle and hard, making the task of obtaining identifiable prints very difficult.

5.4.6 Body parts received by the lab shall be sealed and placed in an evidence refrigerator or freezer.

5.4.7 Biological evidence shall be promptly returned to the submitting agency after being processed.

5.5 Latent print processing has the potential to irreparably damage items of evidence.

5.5.1 If an item is suspected to have great value (monetary or sentimental), the analyst should contact the submitting agency to explain potential damage and gain verbal approval prior to processing.

5.6 RETAINED EVIDENCE

5.6.1 Latent print evidence generated by the Latent Section in the laboratory shall be retained for future reference.

5.6.1.1 Latent print evidence generated in the field may be retained by the laboratory or turned over to the agency having jurisdiction over the case. This decision shall be on a case-by-case basis.

5.6.2 Latent lifts, photographs/digital images, and fingerprint cards/copies used to effect individualizations will be sealed in an envelope, logged in as retained evidence (LE – Latent Evidence), and stored in the vault.

5.6.3 Retained latent evidence is considered both evidence and examination documentation.

5.6.4 Retained evidence shall only be released at the request of the submitting agency's or prosecutor's representative. It shall be signed over to the agency representative taking custody of it.

6 GENERAL LATENT PROCESSING

6.1 Latent print evidence is processed according to the nature of the substrate (surface) to be processed.

6.1.1 Substrate types include porous, semi-porous, and non-porous.

6.1.2 Processing is generally carried out in a sequential manner employing methods appropriate to the substrate type.

6.2 Latent print evidence is also processed with regards to what the latent print matrix may consist of. For example a latent print may be composed of perspiration, blood, or a combination of both.

6.2.1 Eccrine sweat glands are most concentrated on the palmar portion of the hands and plantar portion of the feet. Secretions from these glands consist of 99.0 to 99.5 percent water and 0.5 to 1.0 percent solids (organic substances and inorganic salts).

6.2.2 Latent prints may also consist of fats and oils (sebum) secreted by the sebaceous glands. These glands are most concentrated on the nose, ear, and groin areas. They are not located on the palmar portion of the hands and plantar portion of the feet, but sebum may be transferred to them via contact with other portions of the body.

6.2.3 Fats, oils, and other contaminants may also be transferred to friction ridge skin by contact with sources external to the body.

6.3 For the purpose of this manual, latent print methods are divided into three categories: light based methods, physical methods, and chemical methods.

6.3.1 LIGHT BASED METHODS

6.3.1.1 Latent prints may be visualized through the use of various angles and wavelengths of light.

6.3.1.2 Visualization of latent prints through the use of forensic lighting methods is non-destructive and should be attempted prior to other processing methods.

6.3.2 PHYSICAL METHODS

6.3.2.1 The development of latent prints through the use of physical methods does not involve a chemical reaction between the impression and the method used.

6.3.2.2 Physical methods encompass dusting and other discoloration methods often relying on the adhesive quality of certain latent prints.

6.3.2.3 The taking of known exemplars from a living or deceased person shall be considered a physical method for the purposes of this manual.

6.3.3 CHEMICAL METHODS

6.3.3.1 The development of latent prints through the use of chemical methods occurs because of a chemical reaction between the latent print residue components and the reagent.

6.3.3.2 Reagents shall be tested after they are prepared and prior to use. If the same lot of working solution is used multiple times in the same day, only the initial control tests must be noted on the "ISP FS Latent Section Control Test Log". Subsequent use of the reagent use on the same day shall revert to the prior tests. Control test results shall also be recorded in the case documentation.

6.3.3.3 Traditional film development shall be considered a chemical method for the purposes of this manual.

7 QUICK REFERENCE SEQUENTIAL PROCESSING GUIDE

7.1 GENERAL EVIDENCE:

7.1.1 POROUS:

1. Visual: White light/Alternate Light Source (ALS)
2. Iodine Fuming
3. Visual: White light
4. Diazafluorenone DFO
5. Visual: ALS
6. Ninhydrin
7. Visual: White light
8. Physical Developer
9. Visual: White light

7.1.2 NON-POROUS:

1. Visual: White light
2. Cyanoacrylate Fuming
3. Visual: White light/ALS
4. Dye Stain
5. Visual: ALS or Ultraviolet light (UV) as required
6. Powders: Luminescent or non-luminescent
7. Visual: White light/ALS

7.2 BLOOD EVIDENCE:

7.2.1 POROUS:

1. Visual: White light/UV (fabric-background luminescence)
2. Amido Black or Ninhydrin
3. Visual: White light

7.2.2 NON-POROUS:

1. Visual: White light
2. Cyanoacrylate Fuming
3. Visual: White light
4. Amido Black or Ninhydrin
5. Visual: White light/ALS
6. De-stain/Rinse solution
7. Visual: ALS
8. Powders: Luminescent or non-luminescent
9. Visual: White light/ALS

7.3 CARTRIDGE CASES:

1. Visual: White light
2. Cyanoacrylate Fuming

3. Visual: White light/ALS
4. Dye Stain
5. Visual: ALS

7.4 GLOSSY PAPER/GLOSSY CARDBOARD:
1. Visual: White light
2. Iodine
3. Cyanoacrylate Fuming
4. Visual: White light/ALS
5. Powders: Luminescent or non-luminescent
6. Visual: White light/ALS
7. Ninhydrin
8. Visual: White light
9. Physical Developer
10. Visual: White light

7.5 HUMAN SKIN:

7.5.1 Decomposing and/or Macerated Friction Ridge Skin (water soaked)
1. Ink and/or powder lift method (if possible)
2. Photography

7.5.2 Mummified Friction Ridge Skin (dried)
1. Ink and/or powder lift method (if possible)
2. Photography
3. Casting
4. Attempt to re-hydrate

7.5.3 Burned Friction Ridge Skin
1. Photograph
2. Ink

7.6 LEATHER:
1. Visual: White light
2. Visual: ALS
3. Cyanoacrylate Fuming:
4. Visual: White light/ALS
5. Powders: Luminescent or non-luminescent
6. Visual: White light/ALS

7.7 PAINTED SURFACES:
1. Latex Paint: process as for porous evidence
2. Semi-gloss/enamel paint: process as for non-porous evidence

7.8 PHOTOGRAPHIC PAPER:

7.8.1 Glossy side (process first):
1. Visual: White light

2. Cyanoacrylate fuming
3. Visual: White light/ALS
4. Powders: luminescent or non-luminescent
5. Visual: White light/ALS

7.8.2 Reverse side (if paper) - process as for porous evidence

7.9 RUBBER/SYNTHETIC GLOVES:

1. Visual: White light
2. Iodine
3. Cyanoacrylate fuming
4. Visual: White light/ALS
5. Ninhydrin
6. Dye Stain
7. Visual: ALS
8. Powders: Luminescent or non-luminescent
9. Visual: White light/ALS

7.10 TAPE:

7.10.1 Non-adhesive side of all tapes:

1. Visual: White light
2. Cyanoacrylate Fuming
3. Visual: White light/ALS
4. Dye Stain
5. Visual: ALS
6. Powders: Luminescent or non-luminescent
7. Visual: White light/ALS

7.10.2 Adhesive side of tape (select method that contrasts with the color of the tape):

1. Visual: White light
2. Gentian Violet
3. Visual: White light
4. Small Partial Reagent or Stick Side Powder
5. Visual: White light

OR

1. Visual: White light
2. Cyanoacrylate Fuming
3. Visual: White light/ALS
4. Dye Stain
5. Visual: ALS

7.11 VARNISHED WOOD:

1. Visual: White light
2. Cyanoacrylate fuming
3. Visual: White light/ALS
4. Dye Stain (water solution)

5. Visual: ALS
6. Powders: Luminescent or non-luminescent
7. Visual: White light/ALS

7.12 WET SURFACES:

7.12.1 POROUS:

1. Visual: White light
2. Dry to room temperature
3. Visual: White light/ALS
4. Physical developer

7.12.2 NON-POROUS:

1. Visual: White light
2. Small Particle Reagent (SPR)
3. Visual: White light/ALS
4. Lift

8 LIGHT BASED METHODS

8.1 ALTERNATE LIGHT SOURCE

8.1.1 BACKGROUND:

Alternate light sources (ALS) are portable, multi-waveband, and tunable light sources that are used to enhance or visualize potential items of evidence. Latent impressions may be composed of various substances such as blood, perspiration, chemicals or other organic substances that react differently to different wavelengths of light. When a luminescent deposit is excited with a particular wavelength of light, the deposit absorbs the light and re-emits it at a different wavelength. The short-lived light being re-emitted is termed fluorescence. The ALS can also be used to detect the presence of certain body fluids such as semen and saliva. There are several alternate light sources available to analysts that adequately meet the needs described in this manual.

8.1.2 SCOPE:

8.1.2.1 The ALS is used to attempt to create contrast between an impression and the substrate it is on.

8.1.2.2 Fluorescence may occur due to a naturally occurring substance within the latent print residue itself (inherent luminescence), may be transferred to the friction ridge skin via contamination and re-deposited, or may be chemically induced in latent print residue with certain dyes and powders known to exhibit fluorescent properties. Fluorescence of the substrate may also occur.

8.1.3 EQUIPMENT AND MATERIALS:

Alternate light source
Filtered goggles

8.1.4 REAGENTS:

Not applicable

8.1.5 PROCEDURE:

8.1.5.1 Turn the power rocker switch on. The fan will begin to operate. Make sure the fan comes to full operating speed. You should be able to hear the fan come up to speed in a few seconds.

8.1.5.2 Turn on the lamp switch. The lamp should turn on in a few seconds. On some models, a ticking sound prior to the lamp engaging is normal.

8.1.5.3 Choose the band-width you wish to use. Some models have a variable power dial that may need to be adjusted.

8.1.5.4 Observe evidence with the appropriate wavelength/goggle combination:

< 400nm	yellow or clear UV safe
400-450nm	yellow
450-540nm	orange
540->700nm	red

8.1.5.5 Push the lamp rocker switch to off.

8.1.5.6 Wait for the unit to cool down. After feeling the body of the unit and the exhaust to determine that the unit is cool, the power rocker switch may be turned off.

8.1.6 ADDITIONAL INFORMATION:

8.1.6.1 The Omniprint 1000(A) is a monochromatic light source that has a range of 450-570 nm with one port of white light. When using the fiber optic cable, do not use the white light selection at full power for more than thirty seconds, as this will damage the cable. The operator may unscrew the lens from the cable and attach the lens directly to the unit, allowing hands-free operation.

8.1.6.2 Allow the unit to run for longer periods of time instead of turning the unit off and on for short periods. Repeatedly turning the unit off and on will shorten the life of the lamp. The lamp should be left on for a minimum of ten-fifteen minutes.

8.1.6.3 Maintenance shall consist of cleaning the exterior of the ALS with a soft cloth dampened with a mild detergent solution and using a cotton swab moistened with glass cleaner to clean the optical filters. Bulbs should be replaced as needed.

8.1.6.4 If an ALS malfunctions, it will be taken out of service until it can be repaired. The ALS shall be tagged indicating that it is out of service. Maintenance, service, etc. will be recorded in the maintenance log.

8.1.6.5 No calibration is required of these units.

8.1.6.6 The manufacturer's operator manuals for this equipment shall be read prior to using the equipment.

8.1.7 CONTROLS:

Not applicable

8.1.8 SAFETY:

8.1.8.1 As with other electrical appliances, guard against electrical shock. This can be accomplished by ensuring that all connections are proper and that no loose, damaged, or frayed wires exist. Make sure the ALS is unplugged before attempting any maintenance and do not use outdoors if wet conditions exist.

8.1.8.2 The eyes are generally more vulnerable than the skin, and appropriate eye protection must be used to protect them. Permanent eye damage can occur from reflected, refracted, or direct illumination to the eye. Most of the light emitted by an ALS is not absorbed, but is reflected and scattered off the surface being examined. Extreme care should be taken around highly reflective surfaces. Never look directly into the light or allow beams to bounce off the surface into your eyes or the eyes of another person in the vicinity. Filtered goggles or shields shall be utilized when using this equipment as they provide protection from potentially harmful rays and provide additional enhancement for viewing latent prints.

8.1.8.3 The nature and extent of all potential hazards are not yet known because in-depth assessments have not been made on most of the high intensity light sources used in forensic identification work.

8.1.9 REFERENCES:

Advances In Fingerprint Technology, Henry Lee and R. E. Gaensslen, pages 90, 115-118.

An Introduction to Lasers, Forensic Lights, and Fluorescent Fingerprint Detection Techniques, E. Roland Menzel, (1991).

Friction Ridge Skin, James F. Cowger, (1983), pages 106-107.

Omnichrome Evidence Detection with Forensic Laser Technology, (1989).

Omniprint 1000A Operating Instructions, Omnichrome.

Mini-CrimeScope Tunable Forensic Light Source Model MCS-400W Operation and Maintenance Instructions (2003).

8.2 KRIMESITE IMAGER

8.2.1 BACKGROUND:

The KRIMESITE IMAGER (KSI) is an image-intensifying device that locates untreated latent prints and other evidence of forensic interest on non-porous surfaces by utilizing Reflective Ultra-Violet Imaging System technology (RUVIS). Ultra-violet (UV) light will reflect off of a fingerprint at a different wavelength or speed than it will off the substrate. This creates contrast that you are able to visualize because the KSI system takes UV light and converts it to visible light.

8.2.2 SCOPE:

8.2.2.1 No treatment with powders or chemicals is necessary, however, use of the imager may greatly enhance results obtained by cyanoacrylate fuming.

8.2.2.2 The KSI is most effective on non-porous surfaces, but can detect recently deposited prints on some porous surfaces.

8.2.2.3 The KSI is not affected by ambient light, which means it can be used in daylight or total darkness, indoors or outdoors.

8.2.2.4 The most appropriate method to preserve KSI-located impressions is through photography.

8.2.2.5 The KSI system may be used in the laboratory or when providing technical field assistance.

8.2.3 EQUIPMENT AND MATERIALS:

Short wave 254 nm ultraviolet light source
Camera
Reflective Ultraviolet Imaging System
Tripod
Eye protection

8.2.4 PROCEDURE:

8.2.4.1 Attach the KSI to a tripod or use it as a hand held device.

8.2.4.2 Position the sliding filter system assembly to the UV position window (mirror facing away from analyst and the catalogue number facing the analyst).

8.2.4.3 Turn the KSI unit on and verify the red light is lit.

8.2.4.4 Turn on the ultraviolet light source. If using both 6-watt bulbs on the UV source, turn one bulb on at a time or both bulbs of the unit will only illuminate at half-power.

8.2.4.5 For best results, direct the UV light at a 15° to 45° angle from the surface of interest. Point the KSI perpendicular to the surface.

8.2.4.6 Set the aperture to the f/3.5 position (completely open).

8.2.4.7 Focus the 60mm lens.

8.2.4.8 Focus the eyepiece until you have the clearest largest picture.

8.2.4.9 When scanning an item or area for possible latent evidence the most effective distance for viewing is 0 –5 ft with the 12 watt UV light source and 5-10 ft with the 30 watt UV light source. The operator of the lamp and all others present should remain behind the light source when it is turned on.

8.2.4.10 If a latent impression is located, mark the location using the marking devices supplied or an adhesive scale. Always use a UV scale to insure proper sizing when photographing images with the KSI.

8.2.4.11 Use the Canon Power Shot G3 or other appropriate digital camera to capture KSI images.

8.2.4.12 After locating a latent print, attach the KSI unit to the copy stand or a tripod.

8.2.4.13 Focus using the short-wave UV light. Make sure that the KSI aperture is all the way open (f/3.5) and leave the KSI eyepiece in.

8.2.4.14 Attach the digital camera using the adapter.

8.2.4.15 Turn the camera on, ensure it is set to auto, turn on the MACRO setting, turn off the flash, and set to highest resolution possible.

8.2.4.16 Press the shutter button half way to activate the auto focus.

8.2.4.17 Use the zoom function to fill the viewing field with the latent image.

8.2.4.18 Capture the image by fully pressing the shutter button. It is preferable to use the remote to avoid shaking the camera.

8.2.4.19 Once the examination is complete, turn all equipment off, and store appropriately.

8.2.5 ADDITIONAL INFORMATION:

8.2.5.1 Refer to the digital camera manufacture's operator manual for full camera operation.

8.2.5.2 General maintenance consists of periodic laser pointer battery replacement, cleaning the surface of the KSI band pass filer with a lens cleaning solution and tissue, and cleaning the short-wave UV lamps and KSI UV lens with an alcohol moistened soft cloth. General maintenance shall be performed as needed.

8.2.5.3 UV lamps should be replaced as needed, taking care to dispose of lamps in a proper environmental manner as they contain mercury.

8.2.5.4 If the KSI malfunctions, it will be taken out of service until it can be repaired. The KSI shall be tagged indicating that it is out of service. Maintenance, service, etc. will be recorded in the maintenance log.

8.2.5.5 No calibration is required of this unit.

8.2.5.6 The manufacturer's operator manuals for this equipment shall be read prior to using the equipment.

8.2.6 CONTROLS:

8.2.6.1 Testing of the KSI is performed prior to each use.

8.2.6.2 This test involves the making of a quality latent print on a non-porous surface similar to the evidence being examined, if possible.

8.2.6.3 The test print is viewed with the KSI as outlined in the procedure.

8.2.6.4 An analyst shall not proceed with the processing of the evidence until a control test bearing positive results (visualization of a green colored print) has been carried out and documented in the laboratory case notes.

8.2.6.5 The area surrounding the intentionally deposited latent print shall serve as a negative control.

8.2.7 SAFETY:

8.2.7.1 Serious eye and skin injury along with allergic reactions may result if personnel are inadequately protected from the lamp or other improper use of the equipment occurs.

8.2.7.2 Exposure to UV-C and UV-B present great risk to the cornea. The short-wave UV-C light used with the KSI operates at 254 nm. Short-term injury may include keratoconjunctivitis (snow blindness or welders flash, a condition where the corneal epithelial cells are damaged or destroyed) and severe sunburn-like symptoms. Chronic (repeated) exposure is known to cause premature aging of the skin and skin cancers.

8.2.7.3 Never operate the UV lamps without wearing protective eyewear. Failure to do so may result in severe burns, long-term injury to the eyes, or blindness. Avoid needless exposure. UV light, although invisible, reflects in a manner similar to visible light. Turn lamps off when not in use.

8.2.7.4 All persons present should utilize protective measures including, UV absorbing face shields or glasses, long sleeved shirts, and gloves when the lamps are in use. These measures may not eliminate all UV radiation, but they will lessen the risk of severe exposure.

8.2.7.5 Some individuals are abnormally sensitive to UV radiation. If you believe yourself to be particularly sensitive to sunlight, do not work in an area where short-wave UV light is in use. Certain

common medications and cosmetics may greatly increase your sensitivity to UV radiation. Consult your physician concerning any medication you may be taking.

8.2.7.6 Use extra caution when new lamps are installed as radiation levels may be markedly higher.

8.2.8 REFERENCES:

"Detecting and Enhancing Latent Fingerprints with Short Wave UV Reflection Photography," Wang Gui Qiang. Proceedings of the International Symposium on Fingerprint Detection and Identification, Israel National Police, 1991 pgs. 37-49.

"Evaluation of a Reflected Ultraviolet Imaging System for Fingerprint Detection," Richard Saferstein, and Susan L. Graf. *Journal of Forensic Identification*, 51 (4), 2001 pgs. 385-393.

Krimesite Imager User's Manual, Sirchie Finger Print Laboratories, Inc.

"Krimesite Training Notes," Instructor: Chris Harris, Sales and Training Representative, Sirchie Fingerprint Laboratories, Inc.

"Reflected Ultraviolet Imaging System Applications," Edward R. German. Proceedings of the International Symposium on Fingerprint Detection and Identification, Israel National Police, 1996 pgs. 115-118.

"UV Detection of Untreated Latent Fingerprints," Hadrian Fraval, Alex Bennett, and Eliot Springer. Proceedings of the International Symposium on Fingerprint Detection and Identification, Israel National Police, 1996 pgs. 51-58.

9 PHYSICAL METHODS

9.1 FLAME METHOD

9.1.1 BACKGROUND:

Some hard, smooth surfaces, especially galvanized metal, present problems for the latent analyst in the detection of latent print deposits. The latent prints dry out and resist the adhesion of cyanoacrylate esters and/or powders. The use of a dense smoke, such as that produced by the combustion of camphor or masking tape, provides heat that softens the latent print deposit. The particulates in the smoke bond with the deposit and color the ridge detail so that the latent print can be visualized.

9.1.2 SCOPE:

9.1.2.1 The flame method may be used to develop latent prints on substrates such as copper and galvanized metal where standard methods may not work as well.

9.1.2.2 The flame method may be used after cyanoacrylate and standard fingerprint powders have been used.

9.1.2.3 Surfaces that need other forensic examinations such as biology or trace examinations should be carefully evaluated prior to processing to determine if the flame method will have an impact on subsequent examinations.

9.1.3 EQUIPMENT AND MATERIALS:

Shallow metal or glass container
Matches
Fingerprint brushes

9.1.4 REAGENTS:

Camphor blocks
Masking tape

9.1.5 PROCEDURE:

9.1.5.1 Place a block of camphor or coiled strip of masking tape in a metal or glass container.

9.1.5.2 Ignite one edge of the camphor or the tape.

9.1.5.3 The combustion produces a dense black smoke.

9.1.5.4 The surface to be processed is passed through the column of smoke until the surface is coated with a thin layer of soot particles. The analyst should ensure that the surface does not get

too hot, as this may cause damage to the item being examined. Care must also be taken to ensure that the layer of soot does not become too heavy as the ridge detail may be destroyed or obscured.

9.1.5.5 Extinguish the camphor or masking tape.

9.1.5.6 Brush the soot-coated surface with a fiberglass brush to expose the developed latent prints.

9.1.5.7 Developed prints are evaluated to determine their suitability for comparison.

9.1.5.8 Prints deemed to be of value are marked, photographed, and/or lifted at the discretion of the analyst.

9.1.6 ADDITIONAL INFORMATION:

9.1.6.1 Surfaces processed with this method may be damaged if too much heat is applied to the surface.

9.1.6.2 The process is dirty due to the dense oily smoke produced by combustion.

9.1.6.3 Shelf life of camphor is indefinite when stored in a cool dry place.

9.1.6.4 Collect camphor for disposal with hazardous waste. Masking tape may be disposed of in the trash.

9.1.7 CONTROLS:

9.1.7.1 Testing of the flame method is performed prior to each use.

9.1.7.2 This test involves the making of a quality latent print on a surface similar to the evidence being examined (if possible) and following the processing procedure.

9.1.7.3 An analyst cannot proceed with the processing of the evidence until a control test bearing positive results (development of a black print) has been carried out and documented in the laboratory case notes.

9.1.7.4 The area surrounding the intentionally deposited latent print shall serve as a negative control.

9.1.8 SAFETY:

9.1.8.1 Safety is a concern because of the open flame required for use. Ensure that no flammable solvents are in the vicinity.

9.1.8.2 This method should be performed in a fume hood or in a well-ventilated area to avoid contamination of the air with smoke and accidentally setting off the fire alarm.

9.1.9 REFERENCES:

Friction Ridge Skin, James F. Cowger, (1983), page 102.

Scott's Fingerprint Mechanics, Robert D. Olsen, (1971), pages 260-263

Fingerprint Techniques, Andre A. Moenssens, (1971), pages 126-127

9.2 IODINE FUMING

9.2.1 BACKGROUND:

Iodine fuming is one of the oldest latent print methods currently employed in the examination processes for the visualization of latent prints. Iodine vapors are physically absorbed by fats and oils of a latent print deposit and turn the latent print a yellow/brown color.

9.2.2 SCOPE:

9.2.2.1 Iodine is non-destructive and can be used on porous and non-porous surfaces.

9.2.2.2 Use when attempting to develop prints that are thought to be recently deposited and/or composed of fatty or oily residue. Iodine reacts to recently deposited prints better than old ones because the fats tend to become less receptive to this process with time.

9.2.2.3 Other latent print methods such as DFO or ninhydrin tend to dissolve the fats that the iodine reacts with. Therefore, if iodine fuming is to be used, it must be used prior to other latent print development processes.

9.2.2.4 Iodine is not suitable for metals or dark surfaces.

9.2.3 EQUIPMENT AND MATERIALS:

Fume hood
Chamber or a heavy-duty sealable plastic bag
Iodine fuming "gun"

9.2.4 REAGENT:

Iodine crystals

9.2.5 PROCEDURE 1 - CHAMBER METHOD:

9.2.5.1 In a fume hood, break open a glass ampoule of iodine crystals to reveal the iodine crystals.

9.2.5.2 Place the crystals in an airtight chamber (ex. sealable heavy plastic bag, commercial fuming chamber, etc.).

9.2.5.3 Apply heat if necessary. The application of heat may be accomplished in various ways including transfer of body heat, contained hot water, or an electric heater. Iodine crystals will start to sublimate, go from a solid to a gas, resulting in purplish fumes with the application of heat (approximately 100° F).

9.2.5.4 Place the control test and the questioned surface in the chamber and proceed with fuming.

9.2.5.5 The control test and evidence are monitored by viewing through the chamber to determine when processing is complete.

9.2.5.5.1 Latent prints, if developed, will turn a yellow-brown color.

9.2.5.5.2 The process needs to be carefully monitored so that over-development does not occur.

9.2.5.6 Developed prints are evaluated to determine their suitability for comparison.

9.2.5.7 Prints deemed to be of value are marked and photographed as soon as possible, and notes are taken.

9.2.6 PROCEDURE 2 - GUN METHOD:

9.2.6.1 Alternatively, the surface may be processed by using a commercially available fuming gun. The fuming "gun" consists of a length of rubber tubing (that acts as a mouthpiece) with a length of plastic tubing (about 6") attached. The plastic tubing contains an ampoule of iodine crystals, glass wool, and calcium chloride crystals to absorb the moisture that is introduced into the tube when the apparatus is blown into.

9.2.6.2 This method shall be performed in a fume hood or an area with generous ventilation (ex. outdoors).

9.2.6.3 The "gun" is used by breaking the ampoule open to reveal the iodine crystals and wrapping one's hand around the tube. The warmth from the hand is sufficient to cause the iodine to sublimate. The formation of purple fumes is indicative of iodine vapors.

9.2.6.4 When fumes are noticed, the mouthpiece is blown into, and the fumes are directed onto the substrate.

9.2.6.4.1 Latent prints, if developed, will turn a yellow-brown color.

9.2.6.4.2 The process needs to be carefully monitored so that over-development does not occur.

9.2.6.5 Developed prints are evaluated to determine their suitability for comparison.

9.2.6.6 Prints deemed to be of value are marked and photographed as soon as possible, and notes are taken.

9.2.7 ADDITIONAL INFORMATION:

9.2.7.1 The resulting yellow-brown latent prints can vanish and must be preserved.

9.2.7.2 It is suggested that the camera be set up prior to iodine processing.

9.2.7.3 Iodine prints that have faded, or are completely gone, can sometimes be redeveloped by reprocessing. Iodine reprocessing

cannot be done if other methods have been used or if too long of a time span has elapsed.

9.2.7.4 Shelf life of sealed iodine is indefinite.

9.2.7.5 Iodine crystals originating from glass ampoules shall be disposed of in the hazardous waste containers located in the fume hoods. Excess tubing shall be removed from the fuming guns (thrown away) and the remainder (portion containing iodine) shall be placed in the hazardous wastes containers located in the fume hood.

9.2.8 CONTROLS:

9.2.8.1 Testing of iodine crystals is performed prior to each use.

9.2.8.2 This test involves the making of a quality latent print (oil based) on a test surface similar to the evidence being examined.

9.2.8.3 The test print is exposed to the fumes in the same manner as the questioned surface would be.

9.2.8.4 When using the chamber method, testing of the iodine crystals and processing may be conducted at the same time. When using the fuming gun, an analyst shall not proceed with the processing of the evidence until a control test bearing positive results (development of a yellow-brown print) has been carried out and documented in the laboratory case notes and on the control tests work sheet.

9.2.8.5 The area surrounding the intentionally deposited latent print shall serve as a negative control.

9.2.9 SAFETY:

9.2.9.1 Safety is a serious concern when using the iodine fuming method. *Iodine is toxic in any form. ALWAYS AVOID INHALING IODINE FUMES AND NEVER BREATHE IN WHEN USING THE FUMING "GUN" APPARATUS!!*

9.2.9.2 Iodine fumes may irritate the skin and damage the respiratory tract. Headaches that can last for several days may result from exposure to iodine. Long-term effects to the thyroid gland may result from exposure.

9.2.9.3 Adequate ventilation when using the method is mandatory as the fumes are corrosive to metals and may discolor other surfaces that they come in contact with.

9.2.9.4 Iodine shall be purchased in disposable fuming guns or glass ampoules. The ampoules shall stay sealed until use.

9.2.10 REFERENCES:

Friction Ridge Skin, James F. Cowger, (1983), pages 93-96.

Fingerprint Techniques, Andre A. Moenssens, (1971), pages 114-120.

Scott's Fingerprint Mechanics, Robert D. Olsen, (1978), pages 247-256.

Manual of Fingerprint Development Techniques, British Home Office, (1998), Chapter 4. Peavey Product Guide, (1999).

9.3 LIFTING METHODS

9.3.1 BACKGROUND:

Lifting methods are effective for the preservation of latent print impressions because the adhesive on the lifting medium is stickier than the surface on which the latent print deposit resides. It is a good idea to have a variety of lifting mediums as they vary in clarity, adhesion, and flexibility.

9.3.2 SCOPE:

9.3.2.1 Lifting methods are applicable to prints that have first been developed utilizing other methods such as powders, SPR, flame processing, and occasionally prints deposited in dust.

9.3.2.2 Lifts are inexpensive, easy, and a quick method of preserving developed latent images for future comparison.

9.3.2.3 Latent print lifting is one of the most common and effective methods of preserving latent print images at a crime scene.

9.3.2.4 Lifting may not be the most effective method of preserving a particular latent print.

9.3.3 EQUIPMENTAND MATERIALS:

Powder station exhaust vent or hood
Various sizes and types of standard lifting tapes
Hinge lifts
Elastic tapes
Gel lifters
Casting compounds

9.3.4 PROCEDURE 1 - HINGE LIFTS, TAPES, AND GEL LIFTERS:

9.3.4.1 Ensure that the surface has been prepared for lifting by removing excess powder.

9.3.4.2 Lifting mediums should be removed from their backing in a smooth, continuous motion without hesitation to avoid lines in the adhesive.

9.3.4.3 The lifting medium is then applied to the latent bearing surface in a smooth continuous motion taking care to avoid air pockets and creases. It may be necessary to firmly rub the lifting medium onto the surface using a fair amount of pressure.

9.3.4.4 Removal of the lifting medium from the latent bearing surface should also be performed in a smooth continuous motion and reapplied to the glossy side of the latent lift card in the same manner as noted above.

9.3.4.5 Latent lift cards shall be filled out as completely as possible and shall include the following:

Unique case identifier;
Date and initials;
Impression source (description or source identifier);
Significant information about the orientation and/or position of the latent print on the object through description and/or diagram(s). One should be able to pinpoint the area and orientation of a latent print on the object.

9.3.4.6 Lifts from multiple areas (different latents) shall be placed on individual cards.

9.3.4.7 Multiple lifts of the same latent may be placed on the same card.

9.3.5 PROCEDURE 2 - CASTING COMPOUNDS:

9.3.5.1 Ensure that the surface has been prepared for lifting by removing excess powder.

9.3.5.2 Casting material is mixed either by hand or though the use of an extruder gun.

9.3.5.3 Casting material is applied to the latent bearing surface in a manner that precludes air pockets. It may be necessary to place the casting material to the side of the latent and then smooth it across the surface.

9.3.5.4 The casting material is left in place until solidified.

9.3.5.5 It then is removed from the surface and attached to a latent lift card. The appropriate documentation is noted as detailed in 9.3.4.5.

9.3.6 ADDITIONAL INFORMATION:

9.3.6.1 Caution should be exercised in using general-purpose tapes (those not developed for lifting latents) as they may cause migration of some latent print ridge detail or may have striations or other imperfections making it hard to do comparisons.

9.3.6.2 Lifting should be performed after any necessary photography. The analyst's training and experience will determine the use and/or sequence of the lifting and photographic processes.

9.3.6.3 Store lifting mediums and casting compounds in a cool dry place.

9.3.6.4 Dispose of lifting mediums and casting compounds in the trash.

9.3.7 CONTROLS:
Not applicable

9.3.8 SAFETY:
There are no known health hazards associated with the use of lifting mediums or casting compounds.

9.3.9 REFERENCES:
<u>Scott's Fingerprint Mechanics</u>, Robert D. Olsen, (1978). Pages 369-387.

Fingerprint Techniques, Andre, A. Moenssens, (1971). Pages 109-112.

Friction Ridge Skin, James F. Cowger, (1983). Pages 85-88.

Manual of Fingerprint Development Techniques Home Office Police Scientific Development Branch (1998).

9.4 POWDER DETECTION METHODS

9.4.1 BACKGROUND:

Many commercially produced latent print powders are available and no powder is universally applicable to all types of non-porous surfaces. Most analysts stock a variety of different types and colors of powders as well as a variety of brushes for specialized applications. Powder particles physically adhere to latent print residue allowing the latent print to be visualized. This coloring of the friction ridge residue occurs because the residue has greater adhesion properties than the substrate.

9.4.2 SCOPE:

9.4.2.1 Latent print powders are used to develop invisible ridge detail, improve contrast of visible ridge detail, and to facilitate lifting and preservation of fingerprint evidence from non-porous surfaces.

9.4.2.2 The type of powder that is selected is dependent upon:

9.4.2.2.1 Whether resulting latents will be photographed. If so, a powder color that contrasts with the surface is often desirable.

9.4.2.2.2 The nature of the surface to be processed. Traditional powders are often most effective on non-textured surfaces while magnetic powders are often most effective on plastics and textured surfaces. The use of magnetic powders and wands should generally be avoided on substrates that contain iron. Fluorescent powders tend to have limited use. They are useful on multicolored surfaces or surfaces with a light texture that doesn't accept magnetic powder well.

9.4.2.3 The type of applicator selected is dependent upon:

9.4.2.3.1 The size of area to be dusted. Larger brushes are ordinarily used for large areas and smaller brushes on concentrated work or individual latent prints. Fiberglass brushes are often used for both instances.

9.4.2.3.2 The type of powder to be used. Magnetic wands are used in conjunction with magnetic powders while traditional powders are used with a variety of brushes. Traditional fluorescent powders are applied with a feather brush and their application requires the use of an ALS.

9.4.2.4 The prior use of cyanoacrylate esters often increases the adhesion of powders to latent print residue.

9.4.2.5 Powder processing is not suitable for surfaces that are wet, tacky, or exceptionally rough and is generally the last step in the latent print processing sequence.

9.4.3 EQUIPMENTAND MATERIALS:
Hood/exhaust vents/particulate filters
Traditional, magnetic, and fluorescent powders
Magnetic wand, feather brush, fiberglass brush, animal hair, etc.
Alternate light source
Filtered goggles

9.4.4 PROCEDURE 1 - TRADITIONAL POWDERS:

9.4.4.1 A variety of brushes or applicators may be utilized with the exception of magnetic wands.

9.4.4.2 Apply a small amount of powder to the brush and remove excess powder.

9.4.4.3 Powder should generally be applied to the surface in a smooth circular motion with only the tips of the brush touching the surface. Once the direction of ridge flow can be established, powdering should proceed by following the ridge flow until optimal development is achieved.

9.4.4.4 The adherence of powder to a latent print may be enhanced by utilizing the "huffing technique." Gently breathing on the surface while dusting for latent prints sometimes adds moisture to the latent print residue, thus enabling the powder to adhere more effectively. All visible moisture should be evaporated prior to powder application.

9.4.4.5 If too much powder has been applied, it may be possible to remove excess powder by tapping the object, blowing air over the surface, or by brushing it out.

9.4.4.6 Developed prints are evaluated to determine their suitability for comparison.

9.4.5.7 Prints deemed to be of value are marked and may be photographed or lifted.

9.4.5 PROCEDURE 2 - MAGNETIC POWDERS:

9.4.5.1 Magnetic powders generally utilize a magnetic wand in their application.

9.4.5.2 The wand is dipped into the magnetic powder where the powder is picked up by the tip of the wand. The powder actually forms a bristle-less brush that is then applied directly to the surface. The actual wand should not come in contact with the surface.

9.4.5.3 The application of magnetic powders is similar to the dusting method described in 9.4.4.3 & 9.4.4.4.

9.4.5.4 The plunger located at the end of the brush is pulled to its fully extended position to release the powder from the tip of the brush.

9.4.5.5 Excess powder may be removed by passing a wand over the surface without making contact.

9.4.5.6 Developed prints are evaluated to determine their suitability for comparison.

9.4.5.7 Prints deemed to be of value are marked and may be photographed or lifted.

9.4.6 PROCEDURE 3 - FLUORESCENT POWDERS:

9.4.6.1 A variety of brushes or applicators may be utilized.

9.4.6.2 Lightly dip the brush into the powder. Remove excess powder. A very small amount of fluorescent powder goes a long way.

9.4.6.3 If possible, it is best to use an ALS while applying the powder. This will prevent over powdering and loss of ridge detail. The application of fluorescent powders is similar to the dusting methods described in 9.4.4.3 & 9.4.4.4.

9.4.6.4 Developed prints are evaluated to determine their suitability for comparison.

9.4.6.5 Prints deemed to be of value are marked and may be photographed or lifted. When photographing latents developed with fluorescent powders, it is necessary to use an ALS and a camera filter that corresponds to the color of viewing goggle utilized with the ALS. It is necessary to use black latent lift cards with fluorescent powders.

9.4.7 ADDITIONAL INFORMATION:

9.4.7.1 Occasionally, latent quality may be enhanced by repeated powdering and lifting of the same area.

9.4.7.2 An ample number of appropriate brushes will help preclude cross-contamination of powders and brushes.

9.4.7.3 When powder-processing evidence known to be biologically contaminated, every effort shall be made to avoid cross contamination by utilizing previously unused brushes and powder. Brushes and powder will be discarded after use on contaminated items. Magnetic wands will be disinfected.

9.4.7.4 Powders stored in a cool dry place have an indefinite shelf life.

9.4.7.5 Dispose of powders in the trash.

9.4.8 CONTROLS:

Test impressions are generally not applicable. However, when there is doubt as to the suitability of a powder for processing a particular surface a test impression should be made on a similar surface if available. If a similar surface is not available, then an area of the suspected surface may be explored "blindly" (i.e. wiped clean and used for testing). This test impression shall be destroyed immediately after it has served its purpose.

9.4.9 SAFETY:

9.4.9.1 Safety concerns when using commercial fingerprint powders are minimal.

9.4.9.2 Analysts are required to use the hoods or exhaust vents positioned at each workstation when performing powdering and lifting in the laboratory.

9.4.9.3 When fingerprint powders are to be used for an extended period of time, a dust mask or half face respirator with dust filters should be worn to minimize the inhalation of the powder particles.

9.4.9.4 Persons using fingerprint powders should monitor reactions (if any) to the fingerprint powders.

9.4.10 REFERENCES:

Scott's Fingerprint Mechanics, Robert D. Olsen, (1978), pages 209-235.

Fingerprint Techniques, Andre A. Moenssens, (1971), pages 106-109 and 112-114.

Friction Ridge Skin, James F. Cowger, (1983), pages 85-88.

Manual of Fingerprint Development Techniques Home Office Police Scientific Development Branch (1998).

9.5 SMALL PARTICLE REAGENT

9.5.1 BACKGROUND:

Two types of small particle reagents (SPR) are available for use, traditional SPR which consists of a suspension of fine molybdenum disulfide (MoS_2) particles in a detergent solution and commercially available white SPR. These solutions works like a liquid fingerprint powder by adhering to the fatty portion of the latent print residue resulting in a gray or white colored latent.

9.5.2 SCOPE:

9.5.2.1 Small particle reagent is used to develop latent prints from a variety of surfaces including adhesives and non-porous items that are or have been wet.

9.5.2.2 The color of SPR should be chosen to contrast with the background.

9.5.2.3 SPR may be used by dipping or spraying. Dipping is the preferred method as spraying is less sensitive. It is, however, difficult to prevent damage to fingerprints located on the lower side of an article in a dish and spraying is a valid alternative when processing large items, vehicles, or responding to crime scenes.

9.5.2.4 Surfaces that need other forensic examinations such as biology, questioned document, or trace examinations should be carefully evaluated prior to processing to determine if the SPR procedure will have an impact on subsequent examinations.

9.5.3 EQUIPMENT AND MATERIALS:

Beaker
Balance
Magnetic stirrer/stirring bar
Spray bottles
Processing tray

9.5.4 REAGENTS:

Commercially available white SPR
Molybdenum Disulfide (MoS_2)
Photo Flo 200
Distilled water

Small Particle Reagent Working Solution:

1. Place a 1500 ml beaker on magnetic stirrer base.
2. Add 1000 ml of distilled water to the beaker.

3. Place a magnetic stirring bar in the beaker.
4. Dissolve 30g of MoS_2 in the water (MoS_2 comes in 30g bottles).
5. Add three to four drops of Photo Flo 200 to the solution.

9.5.5 PROCEDURE 1 - DIPPING METHOD:

9.5.5.1 Shake or stir the SPR thoroughly and pour the solution into a tray.

9.5.5.2 Add the item to be processed to the solution. The item should be submerged.

9.5.5.3 Agitate the solution in the tray for 2-3 minutes, remove the item from the SPR and gently rinse with tap water.

9.5.5.4 Allow the surface to dry (if feasible).

9.5.5.5 Developed prints are evaluated to determine their suitability for comparison.

9.5.5.6 Prints deemed to be of value are marked and may be photographed or lifted. Depending on the circumstances, the item may or may not be dried prior to lifting.

9.5.6 PROCEDURE 2 - SPRAY METHOD:

9.5.6.1 Place the SPR into a spray bottle and shake thoroughly. The bottle should be shaken often to keep the MoS_2 in suspension.

9.5.6.2 Spray the SPR onto the item being examined. If the location of the latent prints are known, spray the area above the prints and allow the SPR to flow over the prints. Otherwise, spray the area to be examined starting at the top and working downwards.

9.5.6.3 Gently rinse the processed area with tap water and allow it to dry (if feasible).

9.5.6.4 Developed prints are evaluated to determine their suitability for comparison.

9.5.6.5 Prints deemed to be of value are marked and may be photographed or lifted. Depending on the circumstances, the item may or may not be dried prior to lifting.

9.5.7 ADDITIONAL INFORMATION:

9.5.7.1 Pre-mixed molybdenum has an indefinite shelf life. The shelf life the SPR working solutions is at least six months, but shall be tested prior to each use.

9.5.7.2 Excess reagent shall be collected and placed in the hazardous waste container located in the fume hood.

9.5.8 CONTROLS:

9.5.8.1 Testing of SPR is performed each day prior to use.

9.5.8.2 This test involves the making of quality latent prints on a test surface similar to the one being examined.

9.5.8.3 The test print is exposed to the SPR in the same manner as the questioned surface.

9.5.8.4 An analyst shall not proceed with the processing of the evidence until a control test bearing positive results (development of a gray colored latent with traditional SPR or a white colored latent with white SPR) has been carried out and documented in the laboratory case notes and on the control tests work sheet.

9.5.8.5 The area surrounding the intentionally deposited latent print shall serve as a negative control.

9.5.9 SAFETY:

There does not appear to be any health hazards associated with small particle reagent, but the process should be monitored to see if there are any allergies. Lab coats, gloves, and safety glasses should be worn.

9.5.10 REFERENCES:

Manual of Fingerprint Development Techniques, British Home Office, (1998), chapter 4.

Advances in Fingerprint Technology, Henry C. Lee and R.E. Gaensslen, (1991), pages 82-83.

Technical Notes #1-2757, Lightning Powder Co.

9.6 STICKY-SIDE POWDER

9.6.1 BACKGROUND:

Processing adhesives on the sticky sides of tape and other items, such as labels, presents problems in processing. Traditional powders will not work (unless modified) because the adhesive properties cause the powder to obscure latent print deposits. Sticky-side powder is a liquid fingerprint detection method that produces gray-black developed latent prints when applied to adhesive surfaces. Sticky-side powder detects the fatty/oily and/or epithelial cells often left when handling adhesive surfaces.

9.6.2 SCOPE:

9.6.2.1 Sticky-side powder is used to process adhesives. Due to the color of the resulting latent print, sticky-side powder may be more appropriate for certain types of tapes than for others (ex. masking tape vs. electrical tape).

9.6.2.2 When the item to be processed contains both an adhesive side and a non-porous side, the non-porous side should be processed prior to the application of sticky-side powder.

9.6.2.3 Sticky-side powder can be used in two ways, the powder solution can be painted on, or the surface can be immersed in an aqueous solution containing the powder solution.

9.6.2.4 Surfaces that require other forensic examinations, such as trace or biology, should be carefully evaluated prior to processing to determine if this procedure will have an impact on subsequent examinations.

9.6.3 EQUIPMENT AND MATERIALS:

Small glass beaker
Stir rod
Soft brush (animal hair, paint brush, etc.)
Glass tray

9.6.4 REAGENTS:

Sticky-Side powder
Photo-Flo
Black Powder
Liqui-Nox detergent or equivalent
Tap or distilled water

Sticky-Side Powder Working Solution:

1. Mix a solution of water and Photo-Flo in a glass beaker in a 1:1 ratio.

2. Mix approximately equal amounts of sticky-side powder into the Photo-Flo solution to make a liquid that has the consistency of paint. Mix a volume suitable for the application at hand.

Sticky-Side Powder Equivalent Working Solution:

1. Measure out 0.5g of traditional black fingerprint powder and place in a glass beaker.
2. Add 1 ml of water.
3. Add 1 ml of Liqui-Nox or other equivalent detergent.
4. Thoroughly mix the liquid and fingerprint powder.

9.6.5 PROCEDURE:

9.6.5.1 The reagent is painted onto the adhesive surface with soft brush or the item may be submersed in the solution. When using the submersion method, ensure that the adhesive side is up as some agitation may be necessary.

9.6.5.2 Allow the reagent to remain on the surface for 10 to 20 seconds.

9.6.5.3 Rinse with water.

9.6.5.4 Examine the adhesive surface for latent prints. The surface may be reprocessed to improve contrast and/or make the latent print(s) darker.

9.6.5.5 Allow the surface to dry thoroughly.

9.6.5.6 Any suitable latent prints are marked and photographed or covered with a protective cover such as lifting tape or clear plastic.

9.6.6 ADDITIONAL INFORMATION:

9.6.6.1 Pre-mixed sticky-side powder has an indefinite shelf life. The working solution shall be mixed prior to each use.

9.6.6.2 Working solution may be rinsed down the drain or disposed of in the trash.

9.6.7 CONTROLS:

9.6.7.1 Testing of sticky-side powder is performed each day prior to use.

9.6.7.2 This test involves the making of a quality latent print on a test surface similar to the evidence being examined and following the processing procedure.

9.6.7.3 An analyst cannot proceed with the processing of the evidence until a control test bearing positive results (development of a gray-black print) has been carried out and documented in the laboratory case notes.

9.6.7.4 The area surrounding the intentionally deposited latent print shall serve as a negative control.

9.6.8 SAFETY:

When using sticky-side powder in the previously described manner,

there does not appear to be a significant health hazard. When using the powder in the dry form, precautions should be taken to prevent the powder from becoming airborne and possibly inhaled. Small amounts of sticky-side powder can be safely washed down the drain, while larger amounts should be collected in a suitable container for disposal.

9.6.9 REFERENCES:

Journal of Forensic Sciences, Vol. 44, No. 2, "Sticky-Side Powder: The Japanese Solution", Darren S. Burns, pages 133-138.

"Sticky-Side Powder", Technical Note, Lightning Powder Co., (April, 1994).

9.7 TAKING KNOWN EXEMPLARS (REFERENCE STANDARDS)

9.7.1 BACKGROUND:

Known exemplars (reference standards) is a term used to describe friction ridge impressions that are purposely made. These impressions may be made using a number of techniques, including, but not limited to, traditional ink, live scan, and powder/adhesive lift methods. The goal of the process is to produce legible impressions that are suitable for classification and/or comparison.

9.7.2 SCOPE:

9.7.2.1 The following techniques are used when analysts are called upon to take fingerprints of living and/or deceased persons. It is up to the analyst's discretion to determine the appropriate methods for the given circumstances.

9.7.2.2 The section on post-mortem fingerprinting does not signify that the procedures be mandated to the extent that it precludes the use of variations of the procedures or different procedures for recording impressions. Each case is unique as to its requirements and it is up to the analyst to determine the procedure appropriate for the given circumstances. The printer's task is to obtain usable prints; any reasonable technique that accomplishes this is acceptable.

9.7.3 EQUIPMENT AND MATERIALS:

Black printers ink
Brayer & inking plate
Porelon pad
Black fingerprint powder
Fiberglass brush
Identification cards
Adhesive lifts
Needle and syringe
Fingerprinting spoon
Protective apparel

9.7.4 REAGENTS:

Post-mortem injection solution (tissue builder, water, air etc.)

9.7.5 PROCEDURE 1 - KNOWN EXEMPLARS:

9.7.5.1 Insure that the area to be printed is dry and free of debris.

9.7.5.2 Inked Fingerprints

9.7.5.2.1 Place the fingerprint card in the cardholder.

9.7.5.2.2 Beginning with the right thumb, roll the thumb from nail-bed to nail-bed on an inking plate or Porelon pad. Roll the thumb in the same manor on the fingerprint card in the space marked "1. R. Thumb." Roll the thumb with even pressure to avoid smearing.

9.7.5.2.3 Continue this procedure for each finger ensuring the prints are placed in the corresponding box on the fingerprint card.

9.7.5.2.4 If a mistake is made, the analyst may affix an adhesive tab over the error and roll a new print or destroy the card.

9.7.5.2.5 Ink the right and left thumbs and place a plain impression in the corresponding box at the bottom of the fingerprint card. Repeat the procedure with the right and left four fingers simultaneously placing plain impressions in the corresponding boxes at the bottom of the fingerprint card.

9.7.5.2.6 If an amputation, deformity, or injury makes it impossible to print a finger, make a notation to that effect in the individual finger block.

9.7.5.3 Inked Palm Prints

9.7.5.3.1 Place a piece of white paper or palm print card around a cylindrical object (piece of pipe, cardboard tube etc.).

9.7.5.3.2 Using a brayer, apply a thin coat of ink to the palmer friction ridges from the wrist to the tips of the fingers.

9.7.5.3.3 Place the wrist of the inked palm on the paper and roll the cylinder back toward the subject while applying pressure to the palm. This method will produce quality ridge detail for the entire palmar surface, even hard to capture areas such as the medial and proximal phalanges and the center portion of the palm.

9.7.5.3.4 Individually ink and roll the thenar and hypothenar portions of the palm using the inking plate. The sides of the hand are placed on the inking plate at an approximate 45° angle and partially rolled to ink the correct portion of the palm. The same motion is then repeated to transfer the ink to the palm print sheet. These impressions may be placed on the same sheet if there is adequate room.

9.7.5.3.5 Repeat the above procedure for the other hand.

9.7.5.4 Complete Friction Ridge Exemplars.

9.7.5.4.1 Complete friction ridge exemplars are often referred to as major case prints. They consist of recordings of all friction ridge skin on the palmer surface of the hands and on occasion, the plantar portion of the feet. A

complete set of palmar major case prints includes a set of rolled fingerprints, palm prints, sides of palms, sides of fingers (full length), and finger tips.

9.7.5.4.2 These prints may be obtained through traditional inking methods or by using the black powder/adhesive lift method.

9.7.5.5 Black Powder/Adhesive Lift Method

9.7.5.5.1 Lightly powder the portion of friction ridge skin to be printed using a fiberglass brush and black powder.

9.7.5.5.2 Choose an adhesive lift of appropriate size and remove the backing.

9.7.5.5.3 Place the powder-processed skin onto the adhesive lift and ensure that it makes good contact.

9.7.5.5.4 Carefully remove the adhesive from the skin and smooth an acetate cover over the lift avoiding creases and air pockets.

9.7.5.6 All exemplars should be marked with the date, analyst's name, case number (if known) and subject's name (if known).

9.7.6 PROCEDURE 2 – POST-MORTEM EXEMPLARS:

9.7.6.1 Prints may be recovered from the deceased in the same manner as stated above. However, due to injury, decomposition or other circumstances, traditional methods may not yield satisfactory results.

9.7.6.2 Examine the remains to determine the appropriate method.

9.7.6.3 Clean the remains with a soft brush or cloth and warm water.

9.7.6.4 Dry the friction ridge areas to be printed.

9.7.6.5 Choose an appropriate post-mortem method. It is up to the analyst to determine the appropriate procedure for the given circumstances. The following are recommendations only:

9.7.6.5.1 Printing The Recently Deceased

9.7.6.5.1.1 If the body has been refrigerated, it is helpful to allow it to warm near room temperature prior to printing. This will reduce condensation that may interfere with the printing process.

9.7.6.5.1.2 If rigor mortis has set in, attempt to "break the rigor" by forcefully bending the joints back and forth.

9.7.6.5.1.3 If the fingers have begun to wrinkle due to decomposition or exposure, an attempt should be made to pull the skin tight while taking the impression.

9.7.6.5.1.4 If complete impressions still cannot be obtained, this condition may be corrected

through the use of a post mortem injection solution.

9.7.6.5.1.4.1 Fill a syringe with a post mortem injection solution.

9.7.6.5.1.4.2 Insert the needle just below the skin at the distal joint of the finger and into the distal phalanx area. Inject the solution until the pattern is rounded out. Care should be taken to prevent the needle from puncturing the skin after the initial insertion. If necessary, a string may be tied just above the site to prevent the solution from leaking out.

9.7.6.5.1.5 Print the finger as outlined in one of the above methods.

9.7.6.5.2 Printing Badly Decomposed or Macerated Remains

9.7.6.5.2.1 In cases of advanced decomposition or extended periods of water immersion, it is common for the epidermal layer of skin to separate from the dermis.

9.7.6.5.2.2 Wash and dry the friction ridge skin.

9.7.6.5.2.3 Attempt to photograph and/or record with ink or powder methods.

9.7.6.5.2.4 If the separated friction ridge skin is too fragile to work with, it may be cleansed, flattened under a piece of glass, and photographed.

9.7.6.5.2.5 Occasionally, a large portion of the epidermis separates in the form of an "epidermal glove." If this occurs, the skin may be placed on the analyst's gloved hand and the impressions recorded in a traditional fashion. It may be necessary to excise the skin from the underlying tissue if it is still partially attached.

9.7.6.5.2.6 If the epidermal layer is no longer available, it may still be possible to obtain usable prints by photographing the dermis and/or using the black powder lift method.

9.7.6.5.3 Printing Mummified Remains

9.7.6.5.3.1 As the drying process occurs, friction ridge areas may become shrunken, hard, dry, and

deeply creased making fingerprinting via traditional means impossible.

9.7.6.5.3.2 Depending on the circumstances, an analyst may attempt traditional ink and/or powder lift methods, photography, casting, or re-hydration techniques.

9.7.6.5.3.2.1 See literature for re-hydration solutions.

9.7.6.5.3.2.2 If re-hydration is successful the tissue may be printed as outlined in one of the above methods.

9.7.6.5.4 Printing Burned Remains

9.7.6.5.4.1 Remove hardened and partially loosened skin by gently twisting.

9.7.6.5.4.2 Examine the underside of the skin for friction ridges.

9.7.6.5.4.3 Gently clean the skin using a soft brush and warm water.

9.7.6.5.4.4 Allow the skin to dry.

9.7.6.5.4.5 Photograph and/or attempt to ink, powder and lift, or cast.

9.7.6.6 Examine impressions as soon as they are obtained to ensure that adequate clear impressions have been obtained.

9.7.7 CONTROLS:
Not applicable

9.7.8 SAFETY:
All human tissue shall be treated as if infectious.

9.7.8.2 Gloves, eye protection, lab coat, and/or a protective disposable apron shall be worn at all times when working with any body parts.

9.7.8.3 Utensils shall be disposed of or cleaned and disinfected after use and surfaces will be disinfected.

9.7.9 REFERENCES:

Friction Ridge Skin, Comparison and Identification of Fingerprints, James F. Cowger, (1993) Chapter 2 *Taking Inked Prints*, pages 9-33,

The Science of Fingerprints, U.S. Department of Justice, F.B.I. Laboratory Division, (1984), pages 111-157.

Scotts Fingerprint Mechanics, Robert D. Olsen, SR (1977), pages 55-92.

10 CHEMICAL METHODS

10.1 AMIDO BLACK BLOOD PRINT PROCESSING

10.1.1 BACKGROUND:

Amido Black is also known as Amido Black 10B, Amido Black 12B, Napthol Blue Black, or Napthalene Black. Amido black is a dye that stains the protein portion of blood a blue-black color.

10.1.2 SCOPE:

10.1.2.1 Blood contaminated prints may be processed with amido black to detect faint deposits of friction ridge skin impressions. It is generally used on dried blood stains on non-porous surfaces, but has been successful in developing prints on some semi-porous and porous surfaces as well.

10.1.2.2 Amido black will not detect the normal constituents of latent prints and therefore must be used in the proper sequence with other latent processing methods.

10.1.2.3 The amido black process utilizes a working solution, a rinse solution, and a wash solution (distilled water). Blood must be fixed prior to the application of amido black (unless using methanol in the amido black working solution as a fixing agent) to prevent the liquid solutions used in the process from washing away some or all of the blood deposits.

10.1.2.4 Bloodstains must be carefully examined and evaluated to preclude destruction of potentially valuable evidence. Any samples to be used for the biological examination of blood deposits or trace analysis should be collected prior to enhancement. It is often necessary to coordinate with investigators and/or other laboratory sections (biology for example) to determine which procedures may provide the most valuable findings.

10.1.3 EQUIPMENT AND MATERIALS:

Balance, magnetic stirrer/stirring bar
Pipettes
Beakers
Graduated cylinder
Appropriately sized storage bottles
Squirt bottles

10.1.4 REAGENTS:

Amido Black
Glacial acetic acid
Methanol
Distilled water

Amido Black Working Solution:
1. Weigh out 3-5 grams of amido black and place in a clean, dry beaker.
2. Measure out 100 ml of acetic acid and add to the amido black.
3. Measure out 900 ml of methanol and add to the beaker containing the amido black and acetic acid.
4. Stir the solution with a magnetic stirrer for thirty minutes and transfer the solution to a clean storage bottle.

Amido Black Rinse Solution (de-stain):
1. Measure out 100 ml of acetic acid and pour into a clean, dry glass beaker.
2. Measure the 900 ml of methanol and add it to the beaker.
3. Stir the solution for two to three minutes and transfer the solution to a clean, dry storage bottle.

10.1.5 PROCEDURE:

10.1.5.1 Ensure that the evidence has a blood component by having presumptive blood testing performed.

10.1.5.2 Determine if samples for biology should be taken prior to processing.

10.1.5.3 Conduct control tests.

10.1.5.4 "Fix" impressions using heat, methanol, or super-glue. Blood can be fixed to an object by heating in a 100° centigrade oven for thirty minutes (restricted to non-heat sensitive objects). Methanol may be sprayed or pipetted over the item. The first amido black rise that contains methanol will suffice for this "fixing" rinse. Super-glue is an effective method for non-porous evidence as it will fix all possible latent prints not just those contaminated with blood.

10.1.5.5 Immerse the item in the amido black working solution for two to three minutes. Alternatively, the item may be sprayed or irrigated with the amido black working solution.

10.1.5.6 Immerse or irrigate the item with the de-stain rinse solution to remove the excess dye.

10.1.5.7 Resulting latent prints are a dark blue-black. The above process may be repeated to improve contrast.

10.1.5.8 Immerse or irrigate the surface with the distilled water wash (optional).

10.1.5.9 Allow the item to dry thoroughly.

10.1.5.10 Developed prints are evaluated to determine their suitability for comparison.

10.1.5.11 Prints deemed to be of value are marked and photographed.

10.1.6 ADDITIONAL INFORMATION:

10.1.6.1 Shelf life of the pre-mixed amido black, working solution, and de-stain is indefinite.

10.1.6.2 Excess reagent shall be collected, when possible, and placed in the hazardous waste container located in the fume hood.

10.1.7 CONTROLS:

10.1.7.1 Testing of amido black is performed each day prior to use.

10.1.7.2 Control tests are performed by the application of the reagent to a slide prepared with known blood. For safety reasons, analysts *will not* prepare friction ridge impressions made with blood. A smear will be applied to the slide instead.

10.1.7.3 An analyst shall not proceed with the processing of the evidence until a control test bearing positive results (known blood staining a blue-black color) has been carried out and documented in the laboratory case notes and on the control tests work sheet.

10.1.7.4 The area surrounding the intentionally deposited blood smear shall serve as a negative control.

10.1.8 SAFETY:

10.1.8.1 Gloves, lab coats, goggles, and respirators, (if there is a chance of the reagents becoming airborne) are worn when mixing or using Amido Black.

10.1.8.2 Glacial acetic acid is corrosive and extremely irritating to the eyes and respiratory system. Avoid breathing the vapors and use in a fume hood, with a respirator, or with adequate ventilation. Glacial Acetic Acid will cause burns if it comes in contact with skin.

10.1.8.3 Methanol is *flammable*. It needs to be handled carefully and non-permeable gloves worn during the mixing and use of Amido Black. Methanol is toxic in quantities as small as 30 ml and should not be allowed to come in contact with the skin, eyes, or mouth. It is possible for methanol to be absorbed through the skin. If methanol comes into contact with the eyes or mouth, the area should be flushed with generous amounts of water and a doctor may be consulted. Inhalation of methanol vapors should be kept at a minimum and the solution should be used in a well-ventilated area.

10.1.8.4 In addition, analysts must be aware of the biological hazards associated with blood and other body fluids and take extra precautions to protect themselves.

10.1.9 REFERENCES:

Manual of Fingerprint Development Techniques, British Home Office, (1998).

Journal of Forensic Identification, Vol. 45, No. 5 Sept/Oct 1995, "Superglue of Latent Shoe Prints in Blood Prior to Processing", pages 498-50.

Proceedings of the International Forensic Symposium on Latent Prints, "Enhance Latent Prints in Blood With New Staining Techniques", Paul Norkus and Kevin Noppinger, page 147.

10.2 CYANOACRYLATE ESTER

10.2.1 BACKGROUND:

Cyanoacrylate ester (CAE) also referred to as "superglue," is sold as a number of brands and in a number of viscosities. Items that are to be processed with CAE need to be exposed to an atmosphere rich in CAE fumes. This may be accomplished through the use of a traditional fuming chamber, superglue-fuming wand, or vacuum chamber.

10.2.2 SCOPE:

10.2.2.1 Fuming with cyanoacrylate esters (super-glue) is a process that is used to visualize latent print deposits on non-porous and some semi-porous objects. CAE processing also prepares the surface for the acceptance of powders and dye-stains that may enable further visualization of the latent prints.

10.2.2.2 When superglue vapors contact moisture and other components of friction ridge residue the cyanoacrylate ester polymerizes fixing the latents to the surface. This makes them more stable and less easily damaged.

10.2.2.3 The process is temperature, humidity, and pressure sensitive.

10.2.2.4 Objects that need additional forensic examinations such as trace or questioned document examinations should be carefully evaluated prior to processing to determine if this procedure will have an impact on subsequent examinations.

10.2.3 EQUIPMENT AND MATERIALS:

Relatively airtight container such as a tank or sealed plastic bag
Vacuum chamber
Superglue fuming wand
Cups/warm water (optional)
Low temperature heating element (optional)

10.2.4 REAGENTS:

Cyanoacrylate gel or liquid
One shot fuming kit or equivalent
Superglue cartridges

10.2.5 PROCEDURE 1 - TRADTIONAL FUMING CHAMBER:

10.2.5.1 Select the appropriately sized fuming chamber.

10.2.5.2 Place the surface to be processed in the chamber (suspend if possible).

10.2.5.3 Add control test.

10.2.5.4 Add humidity to the chamber via cups of hot water (larger chambers will require more cups, smaller chambers fewer).

10.2.5.5 Allow the chamber to warm (if necessary) and humidity to build (80 degrees Fahrenheit and 80 % humidity is optimal but satisfactory results may be obtained at varying temperatures and humidity levels).

10.2.5.6 Add the CAE source.

10.2.5.6.1 Hot Plate Method - plug in the hot plate and place in the chamber. Add an approximately 2-3 cm in diameter pool of liquid superglue to a disposable aluminum dish and place on the hot plate.

10.2.5.6.2 Gel Packet Method - open and add one or more foil CAE gel packets (dependent on size of chamber, fuming rate, and analyst's preference) to the chamber. Once the gel is exposed to the air, the CAE will begin to vaporize at a controlled rate.

10.2.5.6.3 "ONE-SHOT" fuming kits - place the "activator solution" in the jar provided. Add the "activator canister" to the solution. Empty the CAE on to the top of the "activator canister." This method is generally reserved for crime scene response.

10.2.5.7 Secure the door to the chamber.

10.2.5.8 Fuming times will vary by the size of the chamber, the properties of the cyanoacrylate being used, the amount of heat and humidity, and the properties of the evidence being fumed. Control test should be carefully monitored by the analyst to prevent over or under fuming. Proper development is achieved when ridge characteristics on the control turn slightly white in color and begin to show good contrast. In the event of under fuming, the item may be re-fumed.

10.2.5.9 When development is complete evacuate the CAE fumes and remove the CAE source from the chamber.

10.2.5.10 Remove the item from the chamber and examine for comparable ridge detail.

10.2.5.11 Prints may be marked and photographed at this point, but are more commonly further enhanced with powders or dyes prior to preservation.

10.2.6 PROCEDURE 2 – SUPER GLUE FUMING WAND METHOD

10.2.6.1 In a fume hood or other well ventilated area, place a superglue cartridge over the end of the fuming wand. Select cartridge size dependent upon amount and size of evidence.

10.2.6.2 Set control level to high and ignite the fuming wand. Fumes should be visible once the wand is hot, approximately 1-2 minutes.

10.2.6.3 Lower the heat level if desired.

10.2.6.4 Conduct a control test.

10.2.6.5 Fume the item by holding the fuming wand approximately 4-8 inches away. Fumes from the wand will rise so it is best to direct the fumes below your item if possible or deflect the fumes toward your item. Do not hold the wand too close or in the same area too long as damage and/or over development may occur.

10.2.6.6 Turn the fuming wand off and allow the unit to cool completely prior to removing cartridges or repackaging.

10.2.6.7 Examine item for comparable ridge detail.

10.2.6.8 Prints may be marked and photographed at this point, but are more commonly further enhanced with powders or dyes prior to preservation.

10.2.7 PROCEDURE 3 - VACUUM CHAMBER METHOD

10.2.7.1 Place items of evidence and controls into the vacuum chamber. It is not necessary to unfold garbage bags or leave large amounts of space between the items. *Do not place pressurize items such as sealed cans, bottles etc. in the chamber as they may explode.*

10.2.7.2 Add the CAE source. Foil CAE gel packs are recommended (number is dependent on chamber size and space), but a small dish with liquid CAE may also be used.

10.2.7.3 Place the lid on the vacuum chamber and close the release valve.

10.2.7.4 Turn on the vacuum pump.

10.2.7.5 Open the Gas Ballast Valve about one half turn.

10.2.7.6 Open the Isolation Valve (up position). If necessary, press on the lid until the chamber begins to evacuate.

10.2.7.7 Close the Gas Ballast Valve.

10.2.7.8 Evacuate the chamber to approximately 25 inches of mercury as shown on the chamber gauge.

10.2.7.9 Close the Isolation Valve.

10.2.7.10 Open the Gas Ballast Valve, wait 2-3 seconds and turn off the pump.

10.2.7.11 Close the Gas Ballast Valve.

10.2.7.12 Leave the items under vacuum for at least 20 minutes. There is no danger of over fuming.

10.2.7.13 Evacuate the chamber by slowly opening the release valve.

10.2.7.14 Remove glue and evidence. Examine item for comparable ridge detail.

10.2.7.15 Prints may be marked and photographed at this point, but are more commonly further enhanced with powders or dyes prior to preservation.

10.2.8 ADDITIONAL INFORMATION:

10.2.8.1 In the event of over-fuming, it may be possible to use an adhesive lifting technique (tape, gel lifter etc.) to lift away heavy upper deposits, revealing underlying ridge detail.

10.2.8.2 The "foil packets" may be stored at room temperature and have a shelf life of six months to a year. Liquid CAE and cartridges may be stored at room temperature with an indefinite shelf life.

10.2.8.3 CAE may be disposed of in the trash.

10.2.8.4 Analysts shall read the manufactures operating instructions for the super glue fuming wand and vacuum chambers prior to operating this equipment.

10.2.9 CONTROLS:

10.2.9.1 Testing of CAE and processing are performed at the same time.

10.2.9.2 A quality test print is applied to a non-porous surface and put into the tank in an easily-monitored position with the questioned surface. Placing one's own fingerprints on a black latent lift card works well for this purpose.

10.2.9.3 When the development of the control test is complete, the questioned surface is also finished. Positive results are indicated by development of a white print.

10.2.9.4 The area surrounding the intentionally deposited latent print shall serve as a negative control.

10.2.9.5 Results of control tests shall be documented in the laboratory case notes.

10.2.10 SAFETY:

10.2.10.1 Super glue fuming should only be conducted in well-ventilated areas. Precautions should be taken to avoid inhaling or allowing the vapors to contact the eyes, as the vapors can be irritating to the eyes, nose, and throat. Persons wearing contact lenses should not open CAE chambers without taking proper precautions. Non-vented goggles should be worn.

10.2.10.2 Precautions include using relatively sealed CAE chambers and evacuating the fumes from the chambers prior to removal of the questioned and test surfaces.

10.2.10.3 Gloves should be worn to prevent the cyanoacrylate from contacting the skin. If liquid glue is allowed to contact the skin, adhesion may result. If the skin sticks together, immerse affected areas in warm water. This will loosen the skin so that it can be gently pulled apart.

10.2.11 REFERENCES:

"Methods of Latent Print Development", Henry C. Lee and R. E. Gaensslen, 1987 Proceedings of the International Symposium on Latent Prints, pages 15-23.

Advances in Fingerprint Technology, Henry C. Lee and R. E. Gaensslen, (1991).

Journal of Forensic Identification, Vol.46, No. 4 July/August, 1996; Vol. 46, No. 1 January/February, 1996.

Coleman Vacu-Print Instructions and Notes, Lightning Powder, (1995).

Manual of Fingerprint Development Techniques, British Home Office, Chapter 4, (1998).

10.3 1,8 Diazfluoren-9-one (DFO)

10.3.1 BACKGROUND:
1,8 Diazfluoren-9-one is an analogue of the ninhydrin molecule. DFO develops latent prints containing amino acids. Resulting prints must be excited with an alternate light source in order to be visualized.

10.3.2 SCOPE:
10.3.2.1 DFO is used to develop prints on porous surfaces such as paper and cardboard.
10.3.2.2 DFO will detect latent prints on porous surfaces that ninhydrin will not and the reverse is also true. It does not replace ninhydrin but is used addition to it.
10.3.2.3 DFO should be used after iodine and prior to ninhydrin or physical developer.
10.3.2.4 Surfaces that need other forensic examinations such as trace or questioned document examinations should be carefully evaluated prior to processing to determine if this procedure will have an impact on subsequent examinations.

10.3.3 EQUIPMENT AND MATERIALS:
Fume hood
Balance
Magnetic stirrer/stirring bar
Alternate light source/filtered goggles
Lab oven
Beaker
Graduated cylinder

10.3.4 REAGENTS:
DFO
Methanol
Ethyl acetate
Acetic acid
Petroleum ether

DFO Stock Solution:

1. In a fume hood, dissolve 0.5 gram of DFO powder in 100 ml of methanol. This may be facilitated by use of a magnetic stirrer.
2. Add 100 ml of ethyl acetate and mix thoroughly.
3. Add 20 ml of acetic acid.
4. Store stock solution in a dark brown glass or polypropylene bottle.

DFO Working Solution:

1. Add 220 ml of stock solution to 780 ml of petroleum ether.
2. Mix thoroughly.

If less working solution is desired, halve or quarter the stock solution and petroleum ether accordingly.

10.3.5 PROCEDURE:

10.3.5.1 Conduct control tests.

10.3.5.2 Pour a sufficient amount of the working solution into a glass tray.

10.3.5.3 Dip the evidence into the solution for ten seconds (DFO may also be painted on). Although it is possible to spray this solution, it is *not recommended* due to the health hazards involved and its inability to soak the specimen adequately.

10.3.5.4 Allow to dry for approximately three minutes.

10.3.5.5 Repeat 10.3.5.3 and 10.3.5.4.

10.3.5.6 Apply dry heat.

10.3.5.6.1 When using a heat/humidity chamber, the specimen should be heated for ten minutes at 100° C (212° F) with a dry heat.

10.3.5.6.2 A hair dryer or dry iron will work as an alternative to an oven. Place a thick towel or other protective material on the counter, followed by the evidence, and then a few paper towels. Apply dry heat to the surface for several minutes. A dry iron can be placed directly on top of the paper towels and used the same as when ironing clothes. One advantage to this method is that it is possible to stop heating and check the progress with an alternate light source. If the latent prints are not very bright, continue to heat. Added heating time may improve resulting print development.

10.3.5.7 DFO-developed latent prints may or may not be visible to the naked eye and should be viewed under an alternate light source. DFO fluoresces when illuminated with monochromatic light in the 485 nm to 510 nm range.

10.3.5.8 Developed prints are evaluated to determine their suitability for comparison.

10.3.5.9 Prints deemed to be of value are marked and photographed using the ALS and a filter on the camera (orange or red).

10.3.5.10 Faint latent prints may be made to fluoresce brighter with a second or third application of DFO. The second and third applications of DFO (if necessary) are performed in the same manner as the first.

10.3.6 ADDITIONAL INFORMATION:

10.3.6.1 Shelf life of pre-mixed DFO is indefinite. The shelf life of the DFO stock solution and working solution is six months.

10.3.6.2 Excess reagent shall be collected and placed in the hazardous waste container located in the fume hood.

10.3.7 CONTROLS:

10.3.7.1 Testing of DFO is performed each day prior to use.

10.3.7.2 This test involves the making of a quality latent print on a test surface similar to the evidence being examined and following the processing procedure.

10.3.7.3 The test is illuminated with an alternate light source as outlined in 8.1.

10.3.7.4 An analyst shall not proceed with the processing of the evidence until a control test bearing positive results (yellow-green fluorescence) has been carried out and documented in the laboratory case notes and on the control tests work sheet.

10.3.7.5 The area surrounding the intentionally deposited latent print shall serve as a negative control.

10.3.8 SAFETY:

10.3.8.1 DFO has not been fully investigated for potential health hazards but is thought to be similar to ninhydrin, which may act as an irritant. Gloves, lab coats, and safety glasses should be worn when mixing and using DFO. The application of the DFO working solution should be performed in a fume hood, well-ventilated area, or while wearing an air-purifying respirator equipped with an organic vapor cartridge.

10.3.8.2 Glacial acetic acid is *corrosive* and extremely irritating to the eyes and respiratory system. Avoid breathing the vapors and use in a fume hood or with adequate ventilation. Glacial acetic acid will cause burns if it comes in contact with skin.

10.3.8.3 Methanol needs to be handled carefully and non-permeable gloves worn during mixing and use. Methanol is toxic in quantities as small as 30 ml and should not be allowed to come in contact with the skin, eyes, or mouth. It is possible for methanol to be absorbed through the skin. If methanol comes into contact with the eyes or mouth, the area should be flushed with generous amounts of water and a doctor may be

consulted. Inhalation of methanol vapors should be kept at a minimum and the DFO should be used in a well-ventilated area.

10.3.9 REFERENCES:

Manual of Fingerprint Development Techniques, British Home Office, Chapter 4, (1998).

Technical Notes #1-0038, Lightning Powder Co., 1,8-Diazafluoren-9-One (DFO)

10.4 GENTIAN VIOLET

10.4.1 BACKGROUND:

Gentian Violet or Crystal Violet, is a biological stain used to dye epithelial cells and fatty components of latent print residues an intense purple color. Due to the toxic nature of this reagent, it should only be used in small quantities with the appropriate safety precautions observed.

10.4.2 SCOPE:

10.4.2.1 Gentian violet is a dye stain used in the laboratory to visualize latent print deposits on many types of adhesive surfaces.

10.4.2.2 Gentian violet may also be used on small non-porous surfaces contaminated with grease and oils. It is not suitable for water-soluble adhesives or porous surfaces.

10.4.2.3 Surfaces that need other forensic examinations such as biology or trace should be carefully evaluated prior to processing to determine if this procedure will have an impact on subsequent examinations.

10.4.3 EQUIPMENT AND MATERIALS:

Balance
Magnetic stirrer/stirring bar
Graduated cylinder
Glass beaker
Glass tray
Storage bottles

10.4.4 REAGENTS:

Gentian Violet or crystal violet
Distilled water

Gentian Violet Working Solution:

1. Weigh out 1 gram gentian violet.
2. Measure 1000 ml of distilled water and pour into glass beaker.
3. Slowly add the gentian violet.

4. Stir for approximately twenty-five minutes or until completely dissolved.

10.4.5 PROCEDURE:

10.4.5.1 Pour a sufficient quantity of working solution into a glass tray.

10.4.5.2 Conduct control tests.

10.4.5.3 Immerse the adhesive substrate into the working solution for 1-2 minutes.

10.4.5.4 Rinse with cool tap water. Developed latents will appear purple in color.

10.4.5.5 The above process may be repeated until optimal development of latents is achieved.

10.4.5.6 Developed prints are evaluated to determine their suitability for comparison.

10.4.5.7 Prints deemed to be of value are marked and may be photographed or lifted.

10.4.6 ADDITIONAL INFORMATION:

10.4.6.1 Shelf life of pre-mixed gentian violet and working solution are indefinite.

10.4.6.2 Excess reagent shall be collected and placed in the hazardous waste container located in the fume hood.

10.4.7 CONTROLS:

10.4.7.1 Testing of gentian violet is performed each day prior to use.

10.4.7.2 This test involves the making of a quality latent print on a test surface similar to the evidence being examined and following the processing procedure.

10.4.7.3 An analyst cannot proceed with the processing of the evidence until a control test bearing positive results (development of a purple print) has been carried out and documented in the laboratory case notes.

10.4.7.4 The area surrounding the intentionally deposited latent print shall serve as a negative control.

10.4.8 SAFETY:

10.4.8.1 Gentian violet/crystal violet is a suspected human carcinogen. It is known to effect the kidney, ureter, bladder, and thyroid of animals. It can be harmful if inhaled, and is irritating to the eyes and skin.

10.4.8.2 Gentian violet should not be used in large amounts.

10.4.8.3 A respirator should be used when working with the dry form. Gentian violet should be prepared and used in a fume hood or well-ventilated area. The analyst should wear a lab coat, heavy-duty (non-disposable) gloves, and safety glasses.

10.4.9 REFERENCES:

Chemical Formulas and Processing Guide for Developing Latent Prints, FBI, (1994).

Lightning Powder Technical Notes, "Crystal Violet," (2000).

Processing Guide for Developing Latent Prints, "Gentian Violet," USDJ/FBI, (2000).

10.5 NINHYDRIN

10.5.1 BACKGROUND:

Ninhydrin, triketohydrindene hydrate, reacts with the amino acids and proteins present in the latent print deposit to produce a characteristic purple color (Rhuemann's Purple). The combination of heat and humidity accelerates the reaction of the amino acids and ninhydrin.

10.5.2 SCOPE:

10.5.2.1 Ninhydrin is the most commonly used method for porous and semi-porous substrates. Excessive background discoloration may occur in substrates composed of a high plant or animal protein content (ex. leather and currency). It is it not effective on items that have been wet.

10.5.2.2 Ninhydrin processing should be performed after iodine and DFO processing and prior to physical developer.

10.5.2.3 Latent prints composed of blood can often be successfully darkened with the application of ninhydrin. This may be used on porous items as well as non-porous surfaces. To allow for further processing, non-porous surfaces should be processed with cyanoacrylate esters prior to the application of the ninhydrin reagent.

10.5.2.4 Surfaces that need other forensic examinations such as questioned document examinations should be carefully evaluated prior to processing to determine if this procedure will have an impact on subsequent examinations.

10.5.3 EQUIPMENT AND MATERIALS:

Balance
Magnetic stirrer/stirring bar
Beaker
Graduated cylinder
Glass trays
Brushes or tongs
Steam iron or heat/humidity chamber

10.5.4 REAGENTS:

N-Hexane
Acetic acid
2-propanol (isopropyl alcohol)
Ninhydrin crystals

Ninhydrin Stock Solution:

1. Place a one-liter beaker on the magnetic stirrer.
2. Add 300 ml of 2-propanol to the beaker.
3. Add 100 ml of acetic acid.
4. Place the stirring bar in the beaker and turn the stirrer on to a low level.
5. Add 50g of ninhydrin crystals to the solution. It may take up to two hours for the ninhydrin to dissolve.

Ninhydrin Working Solution:

1. Add 30ml of the ninhydrin stock solution to a one-liter beaker.
2. Fill the beaker to the 1-liter mark with N-Hexane.
3. Stir and clarify with 2-propanol as needed.
4. Upon standing in its storage container, some of the ninhydrin will "fall out of solution" causing a visible yellow layer at the bottom. Do not dip, brush, or spray items with this yellow layer.

10.5.5 PROCEDURE 1 - POROUS SUBSTRATES:

10.5.5.1 Conduct control tests.

10.5.5.2 Saturate the item with the ninhydrin working solution in a fume hood. Dipping is the preferred method, though brushing the solution on works well with large items. Spraying is the least desirable of the application options as this allows the solution to become airborne.

10.5.5.3 Allow the item to dry.

10.5.5.4 Expose the item to a warm (approximately 80°C) and humid atmosphere (approximately 65%-wet bulb temp.70°C for heat/humidity chamber). This can be accomplished in a heat/humidity chamber or with a hand held steam iron. The moving steam iron should remain approximately 1-2 inches above the surface, never being allowed to touch, as accidental contact will result in excessive discoloration.

10.5.5.5 Developed prints are evaluated to determine their suitability for comparison.

10.5.5.6 Prints deemed to be of value are marked and photographed as they may fade with time and may not be retrievable with reprocessing. It may be possible to increase the contrast between ninhydrin-developed prints and the substrate by black

and white photography utilizing a green camera filter or through digital enhancement.

10.5.5.7 It is recommended that the item be re-examined after approximately 24 hours to ensure that no additional latent prints have developed.

10.5.6 PROCEDURE 2 - BLOOD ENHANCEMENT:

10.5.6.1 Ensure that the evidence has a blood component by having presumptive blood testing performed.

10.5.6.2 Determine if samples for biology should be taken prior to processing.

10.5.6.3 Conduct control tests.

10.5.6.4 "Fix" impressions using heat or methanol.
Blood can be fixed to the object by heating in a 100° centigrade oven for one hour (restricted to non-heat sensitive objects). Heat fixing may ruin latent prints that are composed of normal latent print constituents. Methanol may be pipetted over the item and limited to the stain so that the remainder of the surface is unaffected. Three or four applications of methanol are needed to fix the stain. Failure to fix the stain does not always render a poorer quality latent print.

10.5.6.5 Apply the working solution to the stain and allow the item to remain at room temperature for approximately 48 hours. The ninhydrin will turn the protein component of the blood/serum stain a dark purple and may develop portions of the latent not previously seen.

10.5.6.6 Developed prints are evaluated to determine their suitability for comparison.

10.5.6.7 Prints deemed to be of value are marked and photographed as they may fade with time and may not be retrievable with reprocessing.

10.5.7 ADDITIONAL INFORMATION:

10.5.7.1 Shelf life of pre-mixed ninhydrin is indefinite. The shelf life of the ninhydrin stock solution and working solution is up to one year.

10.5.7.2 Excess reagent shall be collected and placed in the hazardous waste container located in the fume hood.

10.5.8 CONTROLS:

10.5.8.1 Testing of the ninhydrin working solution is performed each day prior to use.

10.5.8.2 This test involves the making of a quality latent print on a test surface similar to the evidence being examined and following the processing procedure.

10.5.8.3 An analyst cannot proceed with the processing of the evidence until a control test bearing positive results (development of a purple print) has been carried out and documented in the laboratory case notes.

10.5.8.4 The area surrounding the intentionally deposited latent print shall serve as a negative control.

10.5.9 SAFETY:

10.5.9.1 Gloves, lab coat, and eye protection shall be worn when using or mixing ninhydrin. Precautions should also be taken to avoid inhalation of the fumes.

10.5.9.2 The solvent used in the ninhydrin working solution, Hexane, is *extremely flammable* and the solution is to be used or mixed in a fume hood or in another well-ventilated area. Ensure that ninhydrin treated items are completely dry prior to exposing to the heat source.

10.5.9.3 Glacial acetic acid is *corrosive* and extremely irritating to the eyes and respiratory system. Avoid breathing the vapors and use in a fume hood or with adequate ventilation. Glacial acetic acid will cause burns if it comes in contact with skin.

10.5.9.4 2-Propanol, also known as Isopropyl Alcohol, is *flammable*. It is an irritant, and can be harmful if inhaled. Avoid breathing the vapors and use in a fume hood or with adequate ventilation.

10.5.10 REFERENCES:

Fingerprint Techniques, Andre A. Moenssens, (1971), pages 122-126.

Friction Ridge Skin, James F. Cowger, (1983), pages 96-98.

Processing Guide for Developing Latent Prints, FBI (2001).

Scott's Fingerprint Mechanics, Robert D. Olsen, (1978), pages 285-288.

10.6 PHYSICAL DEVELOPER (PD)

10.6.1 BACKGROUND:

Physical developer is a silver-based aqueous reagent that reacts with lipids, fats, oils, and waxes present in the fingerprint residue to form a silver-gray deposit.

10.6.2 SCOPE:

10.6.2.1 Physical developer is a method used for the development of latent prints on porous substrates. It is not suitable for non-porous surfaces.

10.6.2.2 This method is the final step in the sequential processing of porous items.

10.6.2.3 Physical developer is the only method to show adequate results on paper that has been wet, and has shown good results on paper currency.

10.6.2.4 Surfaces that need other forensic examinations such as body fluid, trace, or questioned document examinations should be carefully evaluated prior to processing to determine if this procedure will have an impact on subsequent examinations.

10.6.3 EQUIPMENT AND MATERIALS:

Graduated cylinder
Glass trays
Plastic tongs

10.6.4 REAGENTS:

Physical Developer Kit (parts A & B)

1. Any contamination may ruin the physical developer working solution. To avoid contamination use clean glassware rinsed with tap water, then with distilled water prior to beginning.
2. Add 5 ml of solution A (20% silver nitrate solution) to 90 ml of solution B (reductant solution) in a beaker.

3. Stir the working solution for approximately one minute with a clean glass/plastic stirring rod.
4. Do not mix the working solution until you are ready to use it as it does not have a very long shelf life once mixed.

10.6.5 PROCEDURE:

10.6.5.1 Arrange the glass trays in the stainless steel sink so that the evidence can be moved easily from one tray to another in the proper sequence.

10.6.5.2 Add the physical developer working solution to its dedicated glass tray.

10.6.5.3 Use plastic photographic tongs or plastic forceps without serrated edges to add or remove articles from PD solutions. Do not use metal tools.

10.6.5.4 Conduct control tests.

10.6.5.5 Immerse the item and gently rock the tray for approximately 5-15 minutes until friction ridge development is complete or adequate time has elapsed (analyst's discretion).

10.6.5.6 Remove the item from the physical developer working solution and place into a tray with running tap water. Rinse until the water runs clear.

10.6.5.7 Dry completely.

10.6.5.8 Developed prints are evaluated to determine their suitability for comparison.

10.6.5.9 Prints deemed to be of value are marked and photographed.

10.6.6 ADDITIONAL INFORMATION:

10.6.6.1 Cleanliness is important in the physical developer method. A good deal of the instability in the earlier solutions was a result of laboratory equipment that was not spotless. Some contaminants, especially salts, will cause the silver nitrate in the solution to come out of suspension thus spoiling the physical developer solution and perhaps ruining the item being examined. It is important to keep the glassware spotless and rinsed with distilled or de-ionized water prior to use. When washing glassware, use detergent, not abrasive cleaners.

10.6.6.2 Physical developer will cause dark stains on many surfaces. Care must be taken to avoid spills in the laboratory. Full strength chlorine bleach will usually remove any stains from counter tops and floors, but the bleach may cause damage to fabrics stained with physical developer.

10.6.6.3 Shelf life for ready to use kit (un-mixed) is six months from date of purchase. The reagent shall be mixed upon each use.

10.6.6.4 Excess reagent shall be collected and placed in the hazardous waste container located in the fume hood.

10.6.7 CONTROLS:

10.6.7.1 Testing of physical developer is performed prior to each use.

10.6.7.2 This test involves the making of a quality (oil based) latent print on a test surface similar to the evidence being examined and following the processing procedure.

10.6.7.3 An analyst shall not proceed with the processing of the evidence until a control test bearing positive results (development of a silver-gray print) has been carried out and documented in the laboratory case notes and on the control tests work sheet.

10.6.7.4 The area surrounding the intentionally deposited latent print shall serve as a negative control.

10.6.8 SAFETY:

10.6.8.1 Physical developer should only be used in well-ventilated areas, as it is irritating to the respiratory tract. Standard laboratory protocol is followed for chemical handling.

10.6.9 REFERENCES:

Manual of Fingerprint Development Techniques, British Home Office, (1999), Chapter 4.

Advances in Fingerprint Technology, Henry C. Lee, R.E. Gaensslen, (1994), pages 79, 80, 81, 95, 112.

Technical Note #1-2730, Lightning Powder Co., (1993).

10.7 RHODAMINE 6G

10.7.1 BACKGROUND:

Rhodamine 6G does not actually develop the latent print. The ridge detail must have already been previously developed through the use of CAE.

10.7.2 SCOPE:

10.7.2.1 Rhodamine 6G is a dye-stain used to aid in the visualization of CAE developed latents on non-porous substrates.

10.7.2.2 Rhodamine 6G should be used after CAE and prior to powdering.

10.7.2.3 Surfaces that need other forensic examinations such as body fluid or trace examinations should be carefully evaluated prior to processing to determine if this procedure will have an impact on subsequent examinations.

10.7.3 EQUIPMENT AND MATERIALS:

Balance
Spatula
Beaker
Spray or rinse bottles
Glass tray
Alternate light source/filtered goggles

10.7.4 REAGENTS:

Rhodamine 6G powder
Methanol or distilled water

Rhodamine 6G Working Solution:

1. Measure out approximately 0.1 gram Rhodamine 6G (about the size of a BB) and add to the storage bottle.
2. Add approximately one liter of methanol OR distilled water depending on the carrier you wish to use.
3. Seal the bottle and agitate gently to mix.

4. Label the bottle with the type of carrier used (distilled water or methanol).

10.7.5 PROCEDURE:

10.7.5.1 Suspend the item to be processed over a glass collection tray.
10.7.5.2 Irrigate the working solution over the item.
10.7.5.3 Rinse with an appropriate solution (methanol or water dependent on the working solution).
10.7.5.4 Allow the item to dry completely.
10.7.5.5 View the item through an orange filter using an alternate light source set in the 450 - 525 nm range. Visualization of developed ridge detail is dependent upon the condition of the item and background interference.
10.7.5.6 Evaluate latent prints for comparable ridge detail.
10.7.5.7 Prints deemed to be of value are marked and photographed. Photography will require the aid of an orange filter on the camera and the use of an ALS.

10.7.6 ADDITIONAL INFORMATION:

10.7.6.1 The use of distilled water in lieu of methanol is useful when methanol may damage the item being processed, as may be the case with some lacquers, plastics, or tapes.
10.7.6.2 If there is concern over background staining, test a small area prior to processing the entire item.
10.7.6.3 The amount and strength of the dye-stain used is left to the analyst's discretion.
10.7.6.4 The pre-mixed Rhodamine 6G and the working solution have an indefinite shelf life when stored at room temperature.
10.7.6.5 Excess reagent shall be collected and placed in the hazardous waste container located in the fume hood.

10.7.7 CONTROL TESTS:

10.7.7.1 Testing of Rhodamine 6G is performed each day prior to use.
10.7.7.2 This test involves placing a drop of the Rhodamine 6G working solution on to a surface.
10.7.7.3 The test is illuminated with an alternate light source as outlined in the procedure section.
10.7.7.4 An analyst shall not proceed with the processing of the evidence until a control test bearing positive results (visible fluorescence) has been carried out and documented in the laboratory case notes and on the control tests work sheet.
10.7.7.5 The area surrounding the intentionally deposited working solution shall serve as a negative control.

10.7.8 SAFETY:

10.7.8.1 Rhodamine 6G is classified as a suspected animal carcinogen, but sufficient evidence of human carcinogenicity has not been established. Rhodamine 6G is thought to be relatively safe when exposure is at low levels. It should never be inhaled or allowed to get into the eyes or mouth, as it is an irritant. If this should occur, the eyes or mouth should be flushed with a generous amount of water and a doctor may be consulted.

10.7.8.2 Methanol is highly *flammable*. It needs to be handled carefully and non-permeable gloves worn during mixing and use of the stain. Methanol is toxic in quantities as small as 30 ml and should not be allowed to come in contact with the skin, eyes, or mouth. It is possible for methanol to be absorbed through the skin. If methanol comes into contact with the eyes or mouth, the area should be flushed with generous amounts of water and a doctor may be consulted. Inhalation of methanol vapors should be kept at a minimum and the stain should be used in a well-ventilated area.

10.7.9 REFERENCES:

An Introduction to Lasers, Forensic Lights and Fluorescent Fingerprint Detection Techniques, E. Roland Menzel, (1991), pages 42-44.

Manual of Fingerprint Development Techniques, British Home Office, (1998), chapter 4.

Chemical Formulas and Processing Guide for Developing Latent Prints, U.S. Department of Justice, F.B.I. Laboratory Division, (1994), pages 55-56.

Technical Notes #1-0041, Lightning Powder Co. Inc., pages 1-4.

10.8 SUDAN BLACK

10.8.1 BACKGROUND:

Sudan black B is a dye that stains fatty components to produce a blue-black image. It is considered to be a low-sensitivity method and contaminants such as grease are required as a target to which the reagent can bind.

10.8.2 SCOPE:

10.8.2.1 Sudan black is a dye-stain method used to develop friction ridge detail on non-porous waxy substrates and surfaces contaminated with grease, dried beverages, and foodstuffs. Sudan black will also enhance super-glue developed fingerprints.

10.8.2.2 Sudan black is not suitable for use on porous surfaces or dark colored items.

10.8.2.3 Surfaces that need other forensic examinations such as biology or trace should be carefully evaluated prior to processing to determine if this procedure will have an impact on subsequent examinations.

10.8.3 EQUIPMENT AND MATERIALS:

Beaker
Glass tray
Graduated cylinder
Balance
Spatula
Stirring rod
Glass bottle

10.8.4 REAGENTS:

Sudan Black B powder
Methanol
Distilled water

Sudan Black B Working Solution:

1. Place 15g of sudan black powder into a 2-liter glass beaker.
2. Add 1-liter of methanol and stir with a plastic stirring rod.
3. Add 500 ml of distilled water to the beaker and stir with the stirring rod. Some of the sudan black will not dissolve, but will remain as particulate matter. Pour the solution, including any solid matter, into a clean glass bottle with a tight-fitting screw top.

10.8.5 PROCEDURE:

10.8.5.1 Shake the container of sudan black working solution and pour a sufficient amount into a tray large enough to hold the item of evidence.

10.8.5.2 Soak the item for 2-3 minutes. For large items, irrigate the solution over the surface, catching the run off in a tray for reuse on the item.

10.8.5.3 Rinse the article in cool running tap water.

10.8.5.4 Allow the item to dry at room temperature.

10.8.5.5 Evaluate latent prints for comparable ridge detail.

10.8.5.6 Reprocessing can sometimes enhance faintly developed latent prints.

10.8.5.7 Prints deemed to be of value are marked and photographed. While it is possible to lift the prints with tape, the tape frequently does not lift the print sufficiently and prints that have been lifted have been known to bleed causing the image to blur. Therefore, it strongly recommended that prints be photographed prior to attempting to lift.

10.8.6 ADDITIONAL INFORMATION:

10.8.6.1 The pre-mixed sudan black and the working solution have an indefinite shelf life at room temperature.

10.8.6.2 Excess reagent shall be collected and placed in the hazardous waste container located in the fume hood.

10.8.7 CONTROL TESTS:

10.8.7.1 Testing of sudan black is performed prior to each use.

10.8.7.2 This test involves the making of a quality (oil based) latent print on a test surface similar to the evidence being examined and following the processing procedure.

10.8.7.3 An analyst can not proceed with the processing of the evidence until a control test bearing positive results (development of a blue-black print) has been carried out and documented in the laboratory case notes and on the control tests work sheet.

10.8.7.4 The area surrounding the intentionally deposited print shall serve as a negative control.

10.8.8 SAFETY:

10.8.8.1 The sudan black working solution contains methanol. Methanol is toxic in quantities as small as 30 ml and should not be allowed to come in contact with the skin, eyes, or mouth. It is possible for methanol to be absorbed through the skin. If methanol comes into contact with the eyes or mouth, the area should be flushed with generous amounts of water and a doctor may be consulted. Inhalation of methanol vapors should be kept at a minimum and the sudan black should be used in a well-ventilated area.

10.8.9 REFERENCES:

Manual of Fingerprint Development Techniques, British Home Office, Chapter 4, (1998).

Lightning Powder Technical Note No. 1-0034, "Sudan Black", (May, 1995).

10.9 TRADITIONAL FILM DEVELOPMENT (BLACK AND WHITE)

10.9.1 BACKGROUND:
The primary function of film is to record the image that is focused upon it by the lens of a camera. The recorded image is called a latent image because it is not visible on the film; exposed film cannot be visually distinguished from unexposed film. However, the film has changed physically during exposure and that change can be made visible if the film is treated chemically. The chemical treatment that causes the latent image to become a visible image is called development.

10.9.2 SCOPE:
Develop latent images on traditional black and white film.

10.9.3 EQUIPMENT AND MATERIALS:
Film reel
Development tank

10.9.4 REAGENTS:
Kodak D-76 Developer
Kodak Fixer
Perma Wash
Photo Flo

10.9.5 PROCEDURE:
10.9.5.1 Wind film onto reels, place in the developing tank, and secure the lid. Handle undeveloped film in total darkness (no safe light).
10.9.5.2 Fill tank with tap water (approximately 70° F). Firmly tap tank to dislodge air bubbles. Soak film one (1) minute. Empty tank.
10.9.5.3 Fill tank with pre-mixed Kodak D-76 Developer. Firmly tap tank to dislodge air bubbles. Provide initial agitation of the

development tank for 15-20 seconds. Agitate film frequently during development period. Develop film for fifteen to twenty (15-20) minutes. Return used D-76 developer to the developer storage container, using designated funnel.

10.9.5.4 Rinse film with tap water (approximately 70° F) for two (2) minutes. Empty tank.

10.9.5.5 Fill tank with pre-mixed Kodak Fixer. Firmly tap tank to dislodge air bubbles. Agitate film frequently during fixing. Fix film for fifteen to twenty (15-20) minutes. Return fixer to the fixer storage container, using designated funnel.

10.9.5.6 Rinse film with running tap water (approximately 70° F) for a minimum of two (2) minutes, twenty to thirty (20-30) minutes if time allows. Empty tank. Film may be removed from tank at this point and examined.

10.9.5.7 Fill tank with Perma Wash, agitate and let stand for two (2) minutes. Perma Wash may be washed down the drain.

10.9.5.8 Rinse film with tap water (approximately 70° F) for two (2) minutes. Empty tank.

10.9.5.9 Fill tank with tap water (approximately 70° F), add two or three drops of Photo Flo and agitate. Photo Flo minimizes water/drying marks.

10.9.5.10 Remove film from reel, remove excess water from film, and hang till dry in a dust-free place.

10.9.6 ADDITIONAL INFORMATION:

10.9.6.1 Pre-mixed chemicals should be room temperature when used.

10.9.6.2 If negatives show a pink stain after fixing, the fixer may be near exhaustion or the fixing time was too short. If the stain is slight, it will not affect image stability or negative contrast. If the stain is pronounced and irregular over the film surface, re-fix the film in fresh fixer.

10.9.7 CONTROLS:

Not applicable

10.9.8 SAFETY:

Film development reagents may cause eye or skin irritation. If exposure occurs, rinse with generous amounts of water.

10.9.9 REFERENCES:

Police Photography, Larry S. Miller, pagers 27, 81-98.

Eastman Kodak Company, Kodak Professional D-76 Developer packaging. www.kodak.com/go/professional

Eastman Kodak Company, Kodak Professional Fixer packaging. www.kodak.com/go/professional

11 DIGITAL IMAGING PROCEDURE

11.1 BACKGROUND:
Latent print images are frequently captured, enhanced, and stored using digital devices. The intent of image enhancement is to make details of an image that are less visible more visible. Enhancement may be used to increase the contrast between the print and the substrate, reverse the color of the ridges, etc.

11.2 SCOPE:
This sets forth the Latent Print Section's procedures for the capture, storage, enhancement, and output of latent print digital images.

11.3 RESPONSIBILITIES:

11.3.1 Latent Section Supervisor

11.3.1.1 The Latent Section Supervisor shall act as the Digital Imaging System Administrator or appoint a Digital Imaging System Administrator.

11.3.1.2 The Latent Section Supervisor shall oversee and document the training of each new digital imaging system operator. This includes documenting competency testing.

11.3.1.3 The Latent Section Supervisor shall ensure access is limited to authorized users.

11.3.1.4 The Latent Section Supervisor or designee shall act as a liaison with CJIS and Foray technical staff on system maintenance, upgrades, and when technical difficulties arise.

11.3.1.5 The Latent Section Supervisor or designee shall be the only personnel authorized to delete images or cases entered into Digital Workplace or equivalent software.

11.3.2 Digital Imaging System Administrator

11.3.2.1 The Digital Imaging System Administrator shall update the Latent Print Section Digital Imaging System User's Manual.

11.3.2.2 The Digital Imaging System Administrator shall be responsible for system maintenance to include: tape back-ups, deletion of images/cases, archiving, etc.

11.3.2.3 The Digital Imaging System Administrator shall communicate system status to the supervisor and other system users.

11.3.3 Analysts

11.3.3.1 Analysts shall only use enhancement techniques that are supported by their training and/or experience.

11.3.3.2 Analysts shall maintain system security.

11.3.3.2.1 Network and/or program passwords are not to be distributed to unauthorized users. Operators may change their passwords as needed.

11.3.3.2.2 The external modem shall remain off unless technical support is being contacted.

11.3.3.3 Analysts shall fill out the Latent Section CD/DVD Log when filing or retrieving archived images from the vault.

11.4 DIGITAL IMAGE CAPTURE

11.4.1 All digital evidentiary latent print images shall be acquired through Digital Workplace or equivalent software.

11.4.2 Digital Workplace or equivalent software shall establish a chain of custody from the time of acquisition into the program.

11.4.3 Images shall be designated using a file name structure generated by Digital Workplace or equivalent software. [e.g. Digital Workplace designates images "Set# – ICD#.tif" where ICD equals the name given to an image at the time of capture by a particular device (i.e. Scanner, Camera, Film Scanner). The first image acquisition for a case may consist of one or more images, and shall be designated as Set0001. Subsequent acquisitions within the same case shall increase the 'set' number by 1 (e.g. Set0002, Set0003). The digital image capture device will assign a file name at the time of acquisition (e.g. 'umax1.tif' for the scanner). Once the images are acquired by Digital Workplace their file names will be preceded by the designated 'set' number (e.g. scanner image umax1.tif will become Set0001 – umax1.tif if it is in the first group of images acquired for a case, Set0002 – umax1.tif if it is in the second group of images acquired for a case, and so on.)]

11.4.4 Analysts shall use one of the following digital image capture devices to acquire images of the print(s) in question.

11.4.4.1 Flat Bed Scanner

11.4.4.2 Digital Camera

11.4.4.3 Digital Media (e.g. Thumb Drive, CD/DVD, etc.)

11.4.4.4 Film Scanner

11.4.4.5 Outside agencies may submit processed film for digital capture or digitally submit latent print images.

11.4.4.5.1 Images of latent prints should contain a scale.

11.4.4.5.2 It is preferred that existing images be submitted in a loss-less format such as '.tif' and at as high a resolution as possible.

11.4.5 All original close up images captured by latent section analysts shall contain a scale in centimeters.

11.4.6 Images shall be captured at the highest resolution practical for their intended use.

11.5 DIGITAL IMAGE ENHANCEMENT

11.5.1 All digital evidentiary images requiring enhancement shall be enhanced via Adobe PhotoShop (using a copy of the original image) through Digital Workplace or equivalent software.

11.5.2 Enhanced images will be designated using a file name structure generated by Digital Workplace or equivalent software. [Digital Workplace designates enhanced images by the addition of 'FAXXXX.tif' where XXXX represents the order in which the enhancement was created (e.g. The first enhancement of image 'Set0001 – umax1.tif' would be named 'Set0001 – umax1.tif – **FA0001.tif**', the next enhancement would be 'Set0001 – umax1.tif – **FA0002.tif**', and so on.) Enhancements of enhancements default to the next sequential FAXXXX number (e.g. The enhancement of image 'Set0001 – umax1.tif – **FA0001.tif**' would be named 'Set0001 – umax1.tif – **FA0002.tif**', the next enhancement, whether on 'Set0001 – umax1.tif – **FA0001.tif**' or 'Set0001 umax1.tif – **FA0002.tif**, would be 'Set0001 – umax1.tif – **FA0003.tif**', and so on)]

11.5.3 All enhancement history shall be recorded via Digital Workplace or equivalent software. (Digital Workplace utilizes meta data that may be viewed under the 'History' tab.)

11.5.4 At the conclusion of the examination, the analyst shall print a hard copy of the Digital Workplace or equivalent report and place it in the case file. Due to document size, the enhancement history for each image need not be included in the case file.

11.6 DIGITAL IMAGE STORAGE, ARCHIVAL, AND RETRIEVAL

11.6.1 All images, both original and enhanced, shall be temporarily stored on the digital imaging system hard drive until the examination is completed.

11.6.2 Once completed, the case's originating analyst shall make an entry in the Digital Imaging Notebook on the "Cases to be Archived" form. The entry shall contain the date entered, analyst's initials, and complete case number to be archived.

11.6.3 A tape backup shall be completed by the LPS Supervisor or Digital Imaging System Administrator no less than once a week, more often if needed.

11.6.4 Archiving of images shall be completed by the LPS Supervisor or Digital Imaging System Administrator on an as needed basis.

11.6.4.1 It is recommended that images be recorded on Write-once Compact Disk Recordable (CD-R) or DVD-R.

11.6.4.2 The CD/DVD along with a printed copy of listed contents shall be stored in the evidence vault. A printed copy of listed contents shall also be placed in the Archived Cases Log Book.

11.6.5 All CDs/DVDs shall be logged in and out of the vault using the "Latent Section CD/DVD Log" sheet. The log shall detail the CD/DVD title, date out/date returned, requesting analyst, and the person checking it in or out.

11.7 QUALITY CONTROL:

11.7.1 Performance checks shall be conducted on equipment as needed.

11.7.2 When a problem is noted with a particular piece of equipment, software program, etc., the Digital Imaging System Administrator and/or Latent Section Supervisor shall be notified.

11.7.3 If it is determined that the situation is persistent or cannot be easily rectified, an entry shall be made on the "Instrument Maintenance Log".

11.7.3.1 The log shall detail the date, the person making the entry, the piece of equipment/software involved, and relevant details of the situation.

11.7.4 Effected equipment/software shall be taken off line and all users notified.

11.7.5 If necessary, technical support shall be sought and/or the equipment repaired before being put back into operation.

11.7.6 Actions taken to repair or correct the problem shall be documented on the "Instrument Maintenance Log."

11.7.7 Image calibration shall be checked, as needed by comparing the scale in the printed image with a standard metric scale.

11.8 TRAINING

11.8.1 All analysts utilizing imaging technologies shall be trained and tested for competency in the standard operating procedures and the operation of the relevant imaging technologies.

11.8.2 Formal training may be modified at the discretion of the Latent Section Supervisor dependent upon previous training and/or experience.

11.8.3 Recommended formal training consists of:

11.8.3.1 Reviewing the ISP-FS Latent Print Section Digital Imaging Procedure.

11.8.3.2 Reviewing the Digital Workplace Quick Reference Guide or equivalent.

11.8.3.3 Reviewing the ISP Latent Print Section Digital Imaging User's Manual.

11.8.3.4 Review of relevant chapters of the Adobe Photoshop Users Manual and/or completion of a digital imaging course that utilizes Adobe Photoshop.

11.8.3.5 Satisfactory creation and digital processing of a mock-case using Digital Workplace and Adobe Photoshop software or equivalent software.

11.8.3.6 Satisfactory completion of a written test.

11.8.4 Continuing education shall be provided as courses become available through outside sources such as Foray, the FBI, etc.

11.8.5 Competency testing shall be repeated when significant changes in hardware or software are made.

11.9 REFERENCES:

International Association for Identification "Resolution 97-9."

Digital Workplace Quick Reference Guide

Scientific Working Group on Imaging Technologies (SWIGIT), "Definitions and Guidelines for the use of Digital Image Technologies in the Criminal Justice System," Version 2.3-June 6, 2002.

Scientific Working Group on Imaging Technologies (SWIGIT), "Recommendations and Guidelines for the Use of Digital Image Processing in the Criminal Justice System," Version 1.2-February 2001.

Scientific Working Group on Imaging Technologies (SWIGIT), "Guidelines and Recommendations for Training in Imaging Technologies in the Criminal Justice System," Version 1.2-December 6, 2001. *Forensic Science Communications,* April 2002-Volume 4-Number 2.

Scientific Working Group on Imaging Technologies (SWGIT), "Guidelines for Field Applications of Imaging Technologies in the Criminal Justice System," Version 2.3, December 6, 2001. *Forensic Science Communications,* April 2002-Volume 4-Number 2.

12 FRICTION RIDGE EXAMINATION METHODOLOGY

12.1 BACKGROUND:

12.1.1 Friction ridges are formed on the palmar portion of the hands and the plantar portion of the feet during fetal development.

12.1.2 The friction ridge arrangement is permanent throughout the life of the individual, barring trauma or disease.

12.1.3 Friction ridge skin is unique. No two areas of friction skin have ever been found to be duplicated between two individuals or within the same person.

12.1.4 An impression representative of the unique details of friction ridge skin may be transferred upon contact with a surface.

12.1.5 An impression containing a sufficient quantity and quality of detail may be individualized to or excluded from a particular source.

12.1.6 No scientific basis exists for requiring a pre-determined minimum number of friction ridge characteristics to be present in two impressions in order to establish a positive identification.

12.1.7 Individualization/Exclusion is supported by the theories of biological uniqueness and permanence, probability modeling, and empirical data gained through more than one hundred years of operational experience.

12.2 SCOPE:

Analysts shall apply the concepts of Analysis, Comparison, Evaluation, and Verification herein referred to as ACE-V methodology to all friction ridge impressions developed and preserved by the Latent Section or submitted by our customer agencies.

12.3 EQUIMPENT AND MATERIALS

Magnifiers
Pointers
Digital imaging system

12.4 PROCEDURE:

12.4.1 ANALYSIS is the assessment of a friction ridge impression to determine suitability for comparison.

12.4.1.1 The value of friction ridge impressions is assessed according the Quality and Quantity of detail they possess. Quality (clarity) and Quantity (amount) of detail may be influenced by

the anatomical source (finger, palm, etc.), condition of the friction ridge skin, type of matrix, deposition factors, substrate considerations, environmental factors, development mediums, and preservation methods.

12.4.1.1.1 Level One Detail consists of overall ridge flow and pattern configuration. Level one detail may include information enabling orientation and can be used to determine anatomical source (i.e., finger, palm, foot, etc.). Level one detail also includes general morphology (e.g., presence of incipient ridges, overall size). Level one detail cannot be used alone to individualize but may be used to exclude.

12.4.1.1.2 Level Two Detail consists of the individual ridge path, presence or absence of ridge path deviation (ending ridge, bifurcation and dot or continuous ridge), and ridge path morphology (e.g., size and shape). Level two detail is used in conjunction with level one detail to individualize or exclude.

12.4.1.1.3 Level Three Detail is confined to small shapes on individual ridges, relative pore positions, and other specific skin morphology (e.g., secondary creases, ridge breaks, etc.). Level three detail is used in conjunction with level one and two detail to individualize or exclude.

12.4.1.1.4 Other features associated with friction ridge skin (e.g., creases, scars, warts, paper cuts, blisters) may also be considered. These features may be permanent or temporary and exist as level one, two, or three detail. These other features may be used in conjunction with friction ridge detail to individualize or exclude.

12.4.1.2 Impressions deemed "of value" contain sufficient ridge detail to warrant a comparison in the opinion of the analyst. Impressions deemed "of value" proceed to the comparison step if there are known exemplars with which to compare and/or to AFIS once comparisons are completed or when there are no known exemplars with which to compare.

12.4.1.3 Impressions that do not contain sufficient detail to warrant a comparison in the opinion of the analyst are deemed to have "insufficient ridge detail" (IRD). This conclusion is noted as such in the case documentation.

12.4.1.4 Analysis of the unknown print also includes the selection of a suitable target area (core, delta, etc.) for use during comparison.

12.4.1.5 Analysis occurs independently of the Comparison, Evaluation and Verification steps of ACE-V.

12.4.2 COMPARISON is the side-by-side, back and forth, observation of friction ridge detail to determine weather the detail in two impressions is in agreement or disagreement.

12.4.2.1 The analyst systematically searches the known prints in an effort to exclude them and/or locate an impression that is consistent with the detail observed in the unknown print during analysis.

12.4.2.2 Comparison is based on similarity, sequence, and spatial relationship.

12.4.2.3 Comparison is carried out in an objective manner beginning with the unknown (or impression of poorest quality) and comparing to the known (or impression of better quality).

12.4.2.4 Requests for Fingerprint cards held by the Idaho State Police Bureau of Criminal Identification (BCI) shall proceed as outlined in Idaho State Police Procedure 11.02 section G.

12.4.2.4.1 The analyst shall make certified copies of the card(s) and/or scan the original card(s) into the digital imaging system. These copies/digital images shall be used for comparison purposes and the original cards returned to BCI.

12.4.2.5 The current national resolution standard for the transmission of 10-print images is approximately 500 ppi.

12.4.2.5.1 The following exemplars shall be considered to meet or exceed this standard and may be used for comparison purposes: original card, high quality certified photocopies, copies obtained from the FBI, AFIS archive printouts traceable to a single source, and digital images of original exemplars.

12.4.2.5.2 Faxed copies of known exemplars, non-certified, and/or poor quality photocopies do not meet comparison standards.

12.4.3 EVALUATION is the formulation of a conclusion based upon analysis and comparison of friction ridge impressions. Conclusions that may be reached are Individualization, Exclusion, or Inconclusive.

12.4.3.1 Individualization (Identification) is reached when both prints are in agreement and contain sufficient friction ridge detail in sequence having detectable uniqueness to eliminate all other possible donors.

12.4.3.1.1 Individualization shall be determined by a qualified analyst, applied to a common area in both impressions, based on quantity and quality of detail, contain no unexplainable discrepancies, and shall be reproducible.

12.4.3.1.2 No two prints will ever be exactly the same in *all* respects. Explainable differences are features that differ between a known and unknown print but can be

explained as a result of distortion, slippage, twisting, printing defects, overlapping prints, etc.

12.4.3.2 Exclusion is reached when the prints being compared are in disagreement or contain an unexplainable discrepancy.

12.4.3.2.1 Exclusions should not be made unless comparison is made to *all* friction ridge surfaces of a suspect including the plantar portion of the foot. Instead, the conclusion should be that the subject is excluded from having made an impression based on the available exemplars.

12.4.3.2.2 Exclusions shall be determined by a qualified analyst, applied to all comparable anatomical areas, be based on quantity and quality of the friction ridge detail, and be reproducible.

12.4.3.3 Inconclusive findings result from the absence of sufficient friction ridge details (lack of quantity or clarity) to effect a conclusion of individualization or exclusion. Inconclusive findings may also be attributed to the absence of a comparable area in the known exemplar.

12.4.3.3.1 Inconclusive conclusions shall not be construed as a statement of possible or probable identification as those conclusions are outside the acceptable limits of the science.

12.4.3.3.2 Inconclusive results shall be determined by a qualified analyst, be based on quantity and quality of the friction ridge detail, contain insufficient agreement or disagreement of the friction ridge details, and be reproducible.

12.4.4 VERIFICATION is the independent application of ACE methodology by another qualified analyst.

12.4.4.1 A qualified analyst shall verify all latent print comparisons and/or individualizations.

12.4.4.2 Analysts shall not verify any conclusions with which they are not comfortable. Comfort level is a function of training and experience.

12.4.4.3 Analysts are encouraged to work out differing conclusions through collaboration. If the conflict cannot be resolved, an International Association of Identification (IAI) certified examiner shall review the latent in question. If an individualization is effected, it shall be verified by an IAI Certified Examiner or the Latent Section Supervisor.

12.4.5 REFERENCES:

The Scientific Working Group on Friction Ridge Analysis, Study and Technology (SWGFAST) - *SWGFAST documents are officially published in the Journal of Forensic Identification*, 2006.

Fingerprint Whorld, Vol. 26, No. 101, July 2000, "Scientific Comparison and Identification of Fingerprint Evidence", pages 95-106. *Pat A. Wertheim.*

Journal of Forensic Identification, Vol. 41, No. 1, Jan/Mar 1991, "Ridgeology," pages 16-64. *Davis R. Ashbaugh.*

13 AFIS SUBMISSIONS

13.1 The Automated Fingerprint Identification System (AFIS) is housed in the Idaho State Police Bureau of Criminal Identification (BCI) and is operated outside the scope of Forensic Services.

13.2 Latent prints of AFIS quality shall be forwarded to AFIS at the conclusion of comparison to available exemplars.

13.2.1 The analyst shall Fill out an "AFIS INQUIRY FORM" with duel information (originating agency/ISP FS, originating agency case number/ISP FS case number, etc.).

13.2.2. Attach the AFIS form to the evidence to be submitted to AFIS (one form per AFIS submission).

13.2.3 Submit evidence and form to the custody of a Forensic Evidence Specialist.

13.2.4 An AFIS technician will check the evidence out from Forensic Services .

13.3 Upon return of the AFIS form and evidence, the analyst shall proceed according to the findings on the "results" section of the AFIS form.

13.3.1 If latents were "of no value for AFIS inquiry," they are reported as such in the case report.

13.3.2 If "no hit" was made, the analyst shall report out the number of latents searched in the case report.

13.3.3 In the event of an AFIS "HIT," candidate comparisons shall proceed as outlined in method 11 Friction Ridge Examination. The analyst shall report out the number of latents searched and resulting hits in the case report.

14 CASE WORK DOCUMENTATION AND REPORT WRITING

14.1 Case work documentation and report writing will be according to ISPFS Quality Manual, Section 5.10 Reporting The Results.

14.2 Documentation shall be to the extent that another qualified analyst would be able to determine each examination activity conducted, their sequence, results of the activities, and any conclusions reached.

14.2.1 As each development method is completed it is noted in sequence on the EXAMINATION WORKSHEET and the evidence is visually examined for the presence of comparable ridge detail.

14.2.2 When comparable ridge detail is observed, it should be preserved prior to additional processing.

14.2.2.1 Comparable ridge detail may be photographed upon initial examination, as additional detail develops, after a specific method, and/or prior to a subsequent method.

14.2.2.1.1 Latent print photographs/images and/or case documentation shall include a scale, unique case identifier, date, analyst's initials, impression source (description or source identifier), and significant information about the orientation and/or position of the latent print on the object through description and/or diagram.

14.2.2.2 Prints developed via powder processing may be lifted in lieu of photography.

14.2.2.2.1 Latent print lifts shall contain the unique case identifier, date, analyst's initials, impression source (description or source identifier), and significant information about the orientation and/or position of the latent print on the object through description and/or diagram.

14.2.3 Latent print examination documentation shall include which prints were analyzed, compared, evaluated, and the conclusions reached.

14.2.3.1 Each latent impression analyzed shall have an individualizing alpha and/or numeric designation.

14.2.3.2 The comparison value of each impression will be noted.

14.2.3.3 Latent impression documentation may also include, at the analyst's discretion, the anatomic source of the impression

(finger tip, palm, etc.), pattern if discernable (L-slant loop, whorl, etc.) and level of clarity (1,2, 3).

14.2.3.4 Analysts shall document to whom the latents were compared, the results of those comparisons, and the identify of the verifier.

14.2.3.4.1 Documentation of individualizations shall include an annotation in proximity to the latent that includes the date of the individualization, the initials of the analyst, the name of the person the impression was individualized to, and the area individualized (ex. finger #, palm etc.). The analyst shall also date and initial all exemplars used to effect the individualization(s).

14.2.3.4.2 The verifying analyst shall date and initial in proximity to the individualized impression(s) and on all exemplars used to effect the individualization(s).

14.2.3.4.3 Documentation of exclusions shall include, at a minimum, which impression(s) was excluded and the name of the person(s) the impression was excluded to.

14.2.3.4.4 Documentation of inconclusive findings shall include the reason(s) for the inconclusive finding. These reasons should be based on the complete exemplars and not the individual finger impressions on the exemplars (ex. latent lacks sufficient quantity/quality for individualization, exemplars smudged, over-inked/under-inked, incomplete exemplars, no exemplars (palms), tips not recorded, etc.).

14.2.4 The original or reproduction suitable for comparison of both the compared latent impressions and the known exemplars must be retained as part of the case record.

14.2.4.1 When the laboratory cannot ensure that the original latents or exemplars used and relied upon in the examination, will be maintained by the contributing agencies, the laboratory must maintain an image of the actual data.

14.2.4.1.1 Case documentation shall contain machine copies of all latent lift cards submitted by the customer. All latents deemed of value for comparison shall be preserved in the digital imaging system.

14.2.4.1.2 Latent lifts produced and retained in the laboratory do not need to be copied for the case file.

14.2.4.1.3 Case documentation shall contain originals or machine copies of all known exemplars used in the comparison. Known exemplars submitted by the

customer agency shall be copied prior to being returned. Copies must be suitable for comparison.

14.2.4.1.4 Exemplars used to effect an identification, shall be preserved in the digital imaging system prior to being returned.

14.3 The report shall be as clear and concise as possible, convey the analytical findings and conclusions, and will be supported by scientific procedures.

14.3.1 The report is generally divided into three sections: EVIDENCE DESCRIPTION, EXAMINATION, and CONCLUSION. The following are some basic report wording guidelines categorized according to where they would appear in the report. There may be situations that do not fit the examples given. Unique wording for these situations will be developed as the need arises.

14.3.1.1 EVIDENCE DESCRIPTION:
Item # (Agency Exh.) – brief description of packaging and evidence.

Evidence was signed and sealed when received.

14.3.1.2 EXAMINATION:
Use for non-porous processing:
Items # - was/were examined both visually and with an alternate light source. It was/They were then fumed with cyanoacrylate esters, chemically processed with rhodamine 6g fluorescing dye, re-examined with an alternate light source, and powder processed.

Use for porous processing:
Items # - was/were examined both visually and with an alternate light source. It was/They were then chemically processed with iodine, ninhydrin, etc.

Use for retained evidence:
Latent prints of comparison value were marked and preserved. Latent lift cards/photographic evidence is/are being retained by ISP Forensic Services.

Use for exam of latents:
Latent prints were examined for comparable ridge detail.

Use for comparison:
Latent prints of value were analyzed and compared to a fingerprint card/certified copy of a fingerprint card bearing the name , SID# .

Use for AFIS search:
latent print(s) was/were entered and searched through AFIS by the ISP Bureau of Criminal Identification.

Use for AFIS HIT:
latent print(s) was/were entered and searched through AFIS by the ISP Bureau of Criminal Identification where SID # , , was generated as a possible candidate.

14.3.1.3 CONCLUSION:

Use for items not processed:
Item # was not processed.

Use for no analysis:
Item # is being returned without analysis.

Use for no friction ridge detail present (NDP):
Items # - no latent prints were observed or developed.

Use for insufficient ridge detail:
Latent prints marked # / additional latent prints/Remaining latent prints do not contain a sufficient amount of clear ridge detail necessary for individualization (identification).

Use for individualization:
The latent print marked # has been positively individualized (identified) to the # finger ( ) of the fingerprint card bearing the name .

Use when official name who produced the exemplar is known:
The individualizations was/were effected using a fingerprint card/certified copy of a fingerprint card recorded by official's name/# of the agency name on date.

Use when the agency that produced the exemplar is known:
The individualizations was/were effected using a fingerprint card/certified copy of a fingerprint print card recorded by the agency name on date.

Use when all latents have been ID'd:
All latent prints of value have been identified.

Use for inconclusive:

The latent prints marked # is/are inconclusive to the available exemplars bearing the name . The inconclusive results is/are due to a lack of quantity/clarity in the latent impression, the exemplars being smudged, over-inked/under-inked, and/or incomplete impressions, no palms provided, tips not recorded, etc.

or

latent prints was/were inconclusive to the available exemplars bearing the name . The inconclusive results is/are due to a lack of quantity/clarity in the latent impression, the exemplars being smudged, over-inked/under-inked, and/or incomplete impressions, no palms provided, tips not recorded, etc.

Use for exclusion:
Based on the available exemplars, is excluded from being the source of the latent impression marked # .

or

The impressions marked # lacks sufficient detail for individualization, but displays enough information to eliminate as the source.

Use for no prints of AFIS quality:
No latent prints of AFIS quality exist in this case.

or

The impressions marked # are not of AFIS quality.

or

AFIS does not have the capability to search latent palm prints or finger joints.

Use for no prints on file:
No fingerprints were found to be on file for .

Use to request FPC or palms:
In order to complete the comparison portion of this examination, it is requested that a high quality set of fingerprints/palm prints etc. be submitted for .

Use to request MCPs:
In order to complete the comparison portion of this examination, it is requested that a quality set of major case prints (palms, full fingers, sides of fingers, finger tips, etc.) be submitted for .

Use to request victim/elimination prints:

It is requested that a quality set of victim/elimination fingerprints/palm prints/MCPs be submitted for .

Use with requests for exemplars:
Item(s) # should be resubmitted at that time.

Use for suspect at a later date:
If a suspect/an additional suspect is developed by your agency at a later date, a fingerprint card or the appropriate suspect information should be submitted for comparison.

14.3.1.4 **Use for field services reports:**
On , at a.m./p.m., I received a request from Title/Name to respond to a/an type of scene. I responded with Forensic Scientist at a.m./p.m. I/We made contact with Agency/Officer's Title/name who briefed me/us on the scene.
I/We powder processed numerous items of glassware etc. for latent prints. Quantity/type of evidence was/were turned over to .
I/We cleared the scene at a.m./p.m.

14.4 The case file shall be organized in the folder from front to back as follows:
Report;
Examination documentation packet (notes, exam worksheets, copies/forms, digital imaging reports);
AFIS packet;
Administrative documentation (copies of submission forms, communication logs, agency reports, etc.).

14.5 The verifying analyst shall perform the technical and administrative review on the case. In the event that the verifying analyst is unavailable, the section supervisor may perform the reviews.

Appendix A
Latent Section Instrument Maintenance

Manufacturer's instrument manuals designated with * are on file in the latent section.

ALS*
For ALS maintenance see method 8.1.

Balance*
Balance is checked monthly using a set of ASTM weights as reference. Intermediate checks shall be documented on the QC worksheet. The allowable deviation from the standard weights is 0.01g or 0.1%, whichever is greater (.01g deviation for the 0.10g & 1.00g and 0.1g for the 100g weights).
If the balance fails a monthly check, the check will be repeated. If the balance still fails, it will be taken out of service until it can be recalibrated or repaired. The balance shall be tagged indicating that it is out of service. Maintenance, service calls, etc. will be recorded in the maintenance log.
Balances and ASTM weights used for checks are calibrated yearly by an outside source.

CAE Fuming Chambers
Maintenance shall consist of cleaning the tanks as needed.

Cameras*
General maintenance consists of wiping camera bodies with a soft cloth, blowing off lenses and mirrors to remove dust or dirt, and then cleaning with a soft cloth or eyeglass cleaner.
If a camera malfunctions, it will be taken out of service until it can be repaired. The camera shall be tagged indicating that it is out of service. Maintenance, service, etc. will be recorded in the maintenance log.

Chemical Exhaust Hoods (commercially purchased hoods*)
All hoods are equipped with continuous flow monitoring devices. Capture velocity at the open face of the commercially purchased hoods is at least 100 feet/minute. Capture velocity at the open face of the sink hoods ranges between 75-100 feet/minute.
If a hood fails a monthly check, the check will be repeated. If the hood still fails, it will be taken out of service until it can be repaired. The hood shall be tagged indicating that it is out of service.
General maintenance consists of cleaning. Filters are changed regularly by building maintenance staff. Additional maintenance shall be conducted as needed and will be recorded in the maintenance log.

Eyewashes and showers*
Function shall be checked monthly and documented on the QC worksheet. The purpose of this check is to flush the lines, check for leaks, etc. The eyewashes and shower are also checked annually by building maintenance. Maintenance, service, etc. will be recorded in the maintenance log.

Heat/Humidity Chamber*
The float valve, wick, drain, water reservoir, and distilled water filter will be checked prior to each use and documented on the Instrument Maintenance Log. Refer to the manufacturer's instrument instruction manual for details. The afore mentioned maintenance need not be performed more than monthly.
When using the chamber for ninhydrin processing, the glass should be warm to the touch and condensation within the chamber should be visible.
When using the chamber for DFO, the glass should be warm to the touch and no condensation should be visible.
If the above specifications are not observed, refer to the manufacturer's instrument instruction manual section on preventive maintenance and faultfinding. If the problem cannot be resolved, the chamber will be taken out of service until it can be repaired. The chamber shall be tagged indicating that it is out of service.
Maintenance, service calls, etc. will be recorded in the maintenance log.

KSI*
For KSI maintenance see method 8.2.

Magnifying Glasses
Magnifying glasses should be cleaned regularly with a high quality lens cleaner and soft cloth. No caustic chemicals should be applied to the lens.

Powder Station Exhaust Vents
Filters are washed periodically and replaced annually by the building maintenance staff. Additional maintenance is performed as needed. Maintenance, service calls, etc. will be recorded in the maintenance log.

Appendix B
Latent Section Consumables

Consumable	Grade / or Approved Vendor
Aluminum tins	Commercially Available
Amido Black 10B	Commercially Available
Camphor Blocks	Commercially Available
Casting Mediums	Commercially Available
Cyanoacrylate	Commercially Available
Crystal Violet	Commercially Available
DFO	Commercially Available
D-ionized Water	Laboratory or commercial
Ethyl Acetate	ACS or Better
Fingerprint Powders	Commercially Available
Fingerprint lifting cards	Commercially Available
Fingerprint lifting mediums	Commercially Available
Glacial Acetic Acid	ACS or Better
Gloves (Nitrile)	Commercially Available
Heico Perma-wash	Laboratory or commercial
Iodine crystals	Commercially Available
Iodine guns	Commercially Available
Ink cartridges	Commercially Available
Isopropyl Alcohol (2-propanol)	ACS or Better
Kodak D-76 Developer	Kodak or equivalent
Kodak Photo Flo 200 Solution	Kodak or equivalent
Kodak Rapid Fixer	Kodak or equivalent
Liqui-Nox detergent	or equivalent
Methanol	ACS or Better
Molybdenum disulphide	Commercially Available
N-hexane (95%)	ACS or Better
Ninhydrin Crystals	ACS or Better
Photo paper	Commercially Available
Physical Developer Kit	Commercially Available
Rhodamine 6G	Commercially Available
Sudan Black	ACS or Better