PHYSICAL EVIDENCE HANDBOOK

August 2007

Denver: 690 Kipling Street, Denver, CO 80215
(303) 239-4303

Montrose: 301 S. Nevada Avenue, Montrose, CO 81401
(970) 249-8621

Pueblo: 3416 N. Elizabeth Street, Pueblo, CO 802008
(719) 253-3800

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CBI FORENSIC LABORATORY

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PREFACE

The Colorado Bureau of Investigation (CBI) is available to assist law enforcement agencies throughout the state when requested. This Handbook is an aid to officers, which shows the proper method of evidence handling and preferred packaging methods for submitting evidence to the CBI. This Handbook is not intended to be an addition to a library, but rather a frequently utilized reference source.

Frequently the first step in the analysis is ensuring the proper identification, collection and preservation of evidence from a crime scene prior to its arrival at a CBI laboratory facility. A trained criminalist may not be immediately available to assist the first responding officer at the scene. The first officer on the scene may not only have the responsibility of securing the crime scene, but also for collecting evidence in a manner that is admissible in a court of law.

The Physical Evidence Handbook is designed to provide law enforcement agencies with a tool to help in the collection of crime scene evidence. By using the suggestions in this Handbook, law enforcement personnel will have guidelines to assist in decisions regarding crime scene processing. The proper gathering, marking, and submission of evidence are major areas that impact a criminal investigation. Adhering to the guidelines in this Handbook will assist the CBI in providing complete, accurate, and timely evaluation of the submitted evidence.

CBI experts are available to assist law enforcement agencies when the need arises. All of the CBI laboratories have 24-hour crime scene response teams that can provide valuable services in critical situations. A listing of CBI contacts and their phone numbers is included in this Handbook. Working as a partner with law enforcement agencies in the state, the CBI strives to bring the citizens of Colorado the highest quality of service.

Robert Cantwell, Director

Colorado Bureau of Investigation

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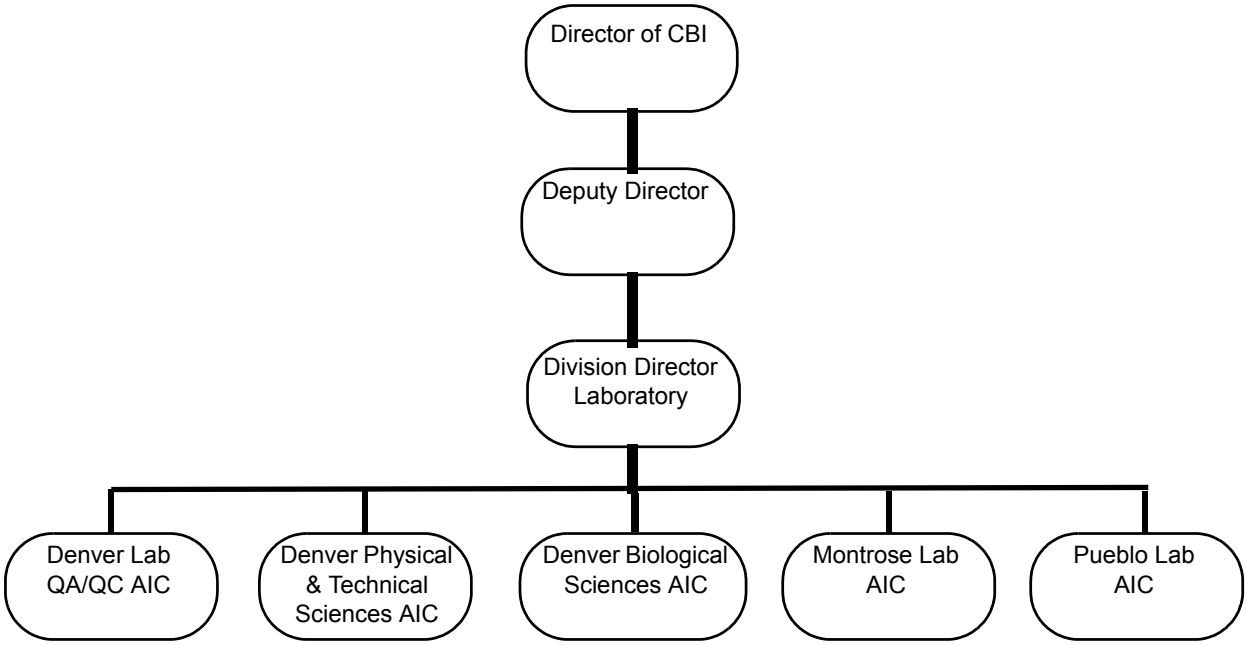

Denver: 690 Kipling Street, Denver, CO 80215 (303) 239-4303
Montrose: 301 S. Nevada Avenue, Montrose, CO 81401 (970) 249-8621
Pueblo: 3416 N. Elizabeth Street, Pueblo, CO 82008 (719) 542-1133

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ACKNOWLEDGMENT

****

The following staff has been instrumental in compiling, writing, and reviewing the information contained in this Handbook.

Peter B. Mang
Deputy Director

Ronald Arndt
Agent-in-Charge
Biological Sciences

Barry Miller
Agent-in-Charge
Physical & Technical Sciences Section

Chet Ubowski
Agent-in-Charge
Quality Assurance Manager

Gerry Palomino
Agent-in-Charge
Pueblo Laboratory

Kevin Humphreys
Agent-in-Charge
Montrose Laboratory

Denver Laboratory Agents & Staff
690 Kipling St. Suite 4000, Denver, CO 80125-5844

Chris Andrist
Jackie Bailey
Jacqui Battles
Amy Beatty
Sarah Brown
Ronald Carscallen
Joe Clayton
June Collins
Susie Coppolino
Scott Cromwell
Carol Crowe
Laurel Farrell
Sally Grew
Tom Griffin
Greg Hake
Alan Hammond
George Herrera
Dale Higashi
Mara Jauch
Bryan Jordan
Kristy Kadash
Sarah Lewis
Rosalind Lima
Kathleen Lobato
Jeff Marmaro
Amy Miller
Sheri Murphy
Scott Pratt
Collin Reese
Wendy Robertson
Gentry Roth
Alex Rugh
Pam Schaner
Mary Schleicher
Don Sollars
Carrie Thor
Josh Ward
Yvonne M. Woods

Pueblo Regional Office Agents & Staff
3416 N. Elizabeth St., Pueblo, CO 81008

Melissa Atencio
Michelle Bobyn
Jake Book
Dave Dauenhauer
Janell Lyons
Timothy McKibbin
Chuck Reno
Barbara Ray
Becky Strub
Richard Swanson
Stephanie Trahey

Montrose Regional Office Agents & Staff
301 S. Nevada Ave., Montrose, CO 81401

Wayne Bryant
Arlene Hanger-Benge
Cynthia Kramer
Matthew Marvin
Sam Marso
Nichole McKinnon
Barry Shearer
Janel Smith
Shauna Steffan
Shawn West

Durango Annex Agents
160 Rock Point Drive, Unit B; Durango, CO 81301

Eric Thornton

Greeley Annex Agents
P.O. Box 410; Greeley, CO 80632

Larry Pederson
Matthew Saluto

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I. INTRODUCTION

The Colorado Bureau of Investigation was created in 1967 to assist all state and local law enforcement agencies and to conduct special investigations initiated by the Governor. The CBI provides four major categories of assistance:

Administration of Justice Computer Center
Colorado Crime Information Center
Field Operations/Investigative Services
Forensic Laboratory Services

The extents to which the above services are provided on any given case are determined by the requesting state and local agency. For example, a local agency may request the following:

A total investigation in a major crime.
Specific assistance in an investigation, e.g., interrogation, polygraph, composite drawing, crime scene processing, evidence analysis or other technical assistance.

All services provided by the CBI are provided free of charge to any Colorado law enforcement agency.

The purpose of the ***CBI Physical Evidence Handbook*** is to clearly define the kinds of physical evidence that can be processed at CBI Laboratories, and the necessary collection techniques and standards that must be followed when evidence is submitted to enable prompt and complete analysis and comparisons. This document is offered as a constructive and informative aid in the collection and processing of physical evidence in criminal cases.

We encourage attorneys as well as investigators to call the laboratory staff if they have any questions or do not completely understand the results received in a particular case. Direct communication with an examiner will often enable a more complete understanding of the results.

Important

The Garcia, Gomez, and Garries Court Rulings critically impact the examination of all physical evidence. For this reason we encourage <u>all law enforcement personnel</u> to make themselves aware of the effect these rulings have on evidence analysis.

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II. EVIDENCE SUBMISSION

When physical evidence of any kind is presented at the laboratory for processing, the following requirements apply.

A. CBI REQUEST FOR LABORATORY EXAMINATION FORM

This form includes pertinent case information, items being submitted, and the chain of custody. PLEASE CLEARLY PRINT NAMES OF ALL SUSPECTS AND/OR VICTIMS USING LAST NAME FIRST.

B. COVER LETTER

A cover letter or written explanation must accompany this submission form describing the pertinent facts of the case and examinations desired on each item.

1. A brief synopsis of the case details will inform the laboratory analyst of the circumstances surrounding the case. In addition, a copy of the case report is often helpful.
2. A listing of the analyses or comparisons desired for each submitted item should be explained.
3. Either in the cover letter or by verbal communication any special needs or requests should be made at the time of submission.
4. All evidence containers are to be sealed, marked as to their contents, initialed, and preferably dated by the individual collecting and sealing the container.

CBI Laboratory personnel MUST be notified if this evidence has been previously analyzed.

C. SUBMISSION OF EVIDENCE BY MAIL

The method shown below permits access to the cover letter and the CBI Request for Examination without breaking the inner seal. This allows the person examining the evidence to receive it in a sealed condition just as the sender packed it.

1. Pack evidence securely in box or envelope.
2. Seal and mark as evidence. Mark “LATENT” if it is to be processed for fingerprints.

3. Complete compliance with Parts A and B above. Place cover letter and all copies of CBI Request for Laboratory Examination in separate envelope and mark "INVOICE".
4. Attach invoice to outside of sealed box or envelope containing evidence.
5. Address to the CBI Laboratory serving your Colorado region.

   Denver
   CBI Laboratory
   690 Kipling Street, Suite 4000
   Denver, CO 80215-5844

   Montrose
   CBI Laboratory
   301 South Nevada Avenue
   Montrose, CO 81401

   Pueblo
   CBI Laboratory
   3416 North Elizabeth Street
   Pueblo, CO 81008
6. The evidence should be sent using an accountable parcel service, for example, United Parcel Service (UPS), Certified/Registered U.S. mail or Federal Express.

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III. EVIDENCE RETURN

A. CBI PACKETS

Following some laboratory examinations, some items of evidentiary value are placed in **packets** (e.g., hair/fiber, latent, trace, DNA, etc.). These packets are returned to your agency and should be accounted for and included in your case inventory. These packets are of evidentiary importance and may be needed for additional comparisons, examinations and court proceedings.

DNA and serology sample packets returned to your agency should be kept frozen until the final disposition of the case.

N O T E S

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IV. CRIMINALISTIC AND TRACE EVIDENCE

A. DRUGS AND CONTROLLED SUBSTANCES

1. Plant Material

   a. Purpose of Examination – Determine if a controlled substance is present. Within the State of Colorado it is not uncommon for police officers to confiscate controlled drugs in the form of plant material. The most prevalent types encountered are psilocybe mushrooms, peyote buttons and marijuana (plants or concentrate).

   b. Collection/packaging – Moist or growing plant material should be air-dried prior to laboratory submission, and then submitted in paper bags. If possible, the plant material should be left within its original container and appropriately identified. Bulky planters containing soil or culture media should not be submitted. When pipes are submitted, the bowls should be sealed and protected from loss of sample. Water within water pipes should be discarded prior to submission to prevent contamination. Each container should then be sealed. After sealing, each item should be identified with the officer's initials, case number, item number and date.

   c. Special Considerations – In circumstances involving large quantities of plant material, the investigator may:

      1). Photographically record, weigh, initial and randomly extract a sample from each specimen for submission to the laboratory,

      or

      2). Submit the entire quantity for laboratory examination.

   d. Analysis and Report – The laboratory report will reflect which drugs are present and the weight of each sample or exhibit. It is not possible to determine the geographical or botanical origin of any particular plant sample with the tests used at CBI.

2. Controlled Drugs

   a. The Colorado Bureau of Investigation makes use of a variety of chemical and instrumental tests to detect and positively identify the presence of controlled drugs. The items analyzed may be in the form of tablets, capsules, powders, liquids, and blotter paper. It is important for the submitting officer to be familiar with the types of examinations, which are available to him. Briefly, the types of tests will normally fall into one of the following groups.

      1). **Qualitative** – Results of laboratory testing will tell you what, if any, controlled drug is present within the sample.

2). **Quantitative** – Also referred to as purity, or percentage testing.

3). **Tampering** – This type of test is normally associated with the theft of pharmaceutical drugs within institutions and businesses. Laboratory testing will first confirm which drug, if any, is present, and then the concentration of that particular drug in the sample submitted. It is critical that in submissions of this type that an appropriate standard be submitted along with the evidence for comparison purposes. The CBI Laboratory will not supply these standards.

b. Collection/Packaging – Items of drug evidence should be individually packaged in leak-proof containers which may be plastic vials, plastic bags, envelopes, small cardboard boxes, or cardboard cylinders. Each container should then be sealed. After sealing, each item should be identified with the officer's initials, case number, item number and date.

NOTE: Be sure to call the Lab's attention to any items needing to be examined for fingerprints.

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c. Special Considerations – Laboratory testing policy.

1). The submitting agency should identify which items correspond to a particular suspect or common area.

2). In cases involving numerous items of evidence and numerous types of drugs, it is up to the discretion of the individual analyst as to how many items will actually be tested. If the analysis of an item is critical to your case, please advise the lab staff.

3). In cases involving residue quantities of drugs, it is very important to ensure that there will be enough to complete the testing necessary to positively identify the material. The amount of sample lost by improper packaging or by utilizing presumptive field test kits may make the difference between a positive laboratory report and one in which the insufficient quantity of material present does not allow for analysis. If ten tablets are seized from one individual, submit all ten tablets. Do not assume that because a tablet is large it will contain a large amount of controlled drug. Most pharmaceutical preparations contain a very small amount of controlled drug (1-5% by weight) within a complex matrix of binders and diluents. The laboratory analyst can only testify as to what he or she actually receives from the submitting agency. The only possible exception to this rule would be in cases involving excessively large quantities of contraband. The local agency's evidence custodian photographs, weighs and obtains samples from the evidence,

which will then be submitted to the CBI Laboratory. The responsibility for documentation and quantities then rests with the submitting agency.

4). Drug Field Test Kits – These kits are presumptive tests only. They do not serve as definitive proof of the presence of a specific drug in courts of law. These tests are subject to false negatives and positives. Many controlled drugs have no field tests at all. Use of the kits will help an officer in the acquisition of either arrest or search warrants. The use of the kit should be weighed versus the loss of sample in critical residue type quantity cases, as previously mentioned.

Do not submit used field test kits with the evidence. The kits are commonly made with extremely caustic chemicals, and if the kit were to leak, the evidence could easily be destroyed.

5). Quantitative or "Purity" Tests – Contact the laboratory for specific information concerning this type of testing.

d. Analysis and Report – The forensic laboratory will not normally attempt to identify uncontrolled drugs or diluents. The report for qualitative testing will state which controlled substance, if any, was detected, and reflect how much material was originally present when submitted. The amount will be expressed in either number count, grams or pounds (See Weight Conversion Table at the end of this section).

1). For quantitative testing in addition to the above-mentioned qualitative results, the results of the purity tests will be reported in percentages.

2). When analyses have been conducted on samples to determine if they have been tampered with, a report will be written reflecting whether the questioned samples have been altered or not.

Weight Conversion Table

1 ounce = 28.4 grams
1 pound = 453.6 grams
1 kilogram = 1,000 grams = 2.2 pounds
1 gram = 1,000 milligrams

3. Clandestine Laboratories

a. Purpose – Clandestine laboratories present unique and somewhat dangerous problems for the investigating officers. These laboratory operations vary from the simplest crude setup to the extremely sophisticated, high profit organizations. The problems encountered

also vary as to the safety of all concerned, which evidence is important to gather and how to collect it properly.

b. Special Considerations – The CBI Laboratory is not equipped to handle on scene response to clandestine labs, but its staff usually analyzes the evidence.

c. Scene information – The submitting agency should provide information including, but not limited to, how each item was labeled and stored, and description of any glassware set-ups. Photographs of the scene may be helpful.

d. Sampling – No more than 2 ounces (60 ml) of any liquid or liquid mixture should be submitted. In situations where there are solid/liquid mixtures, no more than 2 ounces of the liquid and no more than ¼ ounce (less than 10 grams) of the solid should be submitted. Each container should then be sealed. After sealing, each item should be identified with the officer's initials, case number, item number and date.

4. Alcohol Analyses

a. The CBI Laboratory provides the following types of alcohol testing.

1). Percentage/Proof – An analysis of a sample to determine the percentage of ethyl alcohol in solution.

2). Refill – A combination of tests are employed to assess whether a particular sample of liquor is as represented. A control sample of the particular liquor must be submitted with the evidence.

b. Packaging –In order for CBI to perform adequate and meaningful analyses, it is necessary that any alcohol samples submitted be packaged properly. The following are some suggested methods of packaging.

1). Beverage glasses containing liquids must be emptied into capped containers.

2). Samples should be packaged in capped plastic containers. However, any clean container that is leak-proof and capped is acceptable.

3). The minimum sample size acceptable is 25 milliliters, or approximately one fluid ounce.

4). All containers should be appropriately sealed and labeled with case number, officer's initials, time, date, and where obtained, including address and names if possible.

c. Analysis and Report

1). When analyses are conducted on samples such as beer, the result is expressed as a weight percentage.

2). When analyses are conducted on liquor, the result is expressed as a volume percentage and as its corresponding proof.

3). Analyses conducted in questionable refill cases will result in one of the following report statements.

i). Not refilled – laboratory analysis of the standard and the unknown indicate the two are consistent with each other.

ii). Refilled – laboratory analysis of the standard and the unknown indicate noticeable inconsistencies between the two for the unknown to be genuine as labeled.

iii). Indeterminate – laboratory analysis of the standard and unknown indicate the unknown to be genuine; however, the possibility that the unknown has been tampered with cannot be eliminated.

5. Toxicology

a. The CBI Laboratories analyze only solid dosage drug specimens, such as tablets, capsules and powders. No blood or urine drug specimens (toxicology) are examined. Call your regional CBI office if you have any questions.

B. MISCELLANEOUS EXAMINATIONS (CHEMISTRY)

1. Purpose – The CBI Laboratory is sometimes asked to perform analyses that involve non-routine types of samples. Examples may include cosmetics, oils, plastics, etc. These analyses are usually of a comparative nature.

2. Collection and Preservation

a. Collect a sample of the unknown material and package appropriately. Materials that appear to be of a nature that will be absorbed should be collected and packaged with non-absorbing containers. Liquids should be in leak-proof containers.

b. Collect any standards in the same fashion as the unknown.

c. Each container should then be sealed. After sealing, each item should be identified with the officer's initials, case number, item number and date.

3. Analysis and Report – The laboratory report will reflect:
   a. that unknown and standard were either similar or dissimilar or
   b. that the item was not suitable or was insufficient quantity for analysis.

C. FIRE DEBRIS

1. Purpose of the Examination
   a. To determine if any ignitable liquids are present. Items analyzed may include debris, liquids, and containers (empty or otherwise).
2. Collection and Preservation – The search for ignitable fluids and solid incendiaries in suspected arson cases should include a thorough examination of the entire fire scene. A qualified arson investigator who has received extensive classroom and practical training should conduct this search. The CBI will provide this type of support upon request.
   a. Evidence most likely to retain ignitable liquids would include absorbent material such as wood, soil and cloth.
      1). Since the primary laboratory analysis in such cases involves the detection of volatile organic compounds, evidence must be placed in airtight containers.

      The list that follows is in decreasing order of preference for arson evidence packaging.

         i). New, metal paint cans (lined or unlined). Rusting of the paint cans often occurs when fire debris is enclosed and lined cans will help lessen this occurrence.).

         ii). Glass vials with Teflon lined caps for liquid samples. Multiple layers of airtight packaging should be used for liquid samples. (For example: vial of suspected gasoline is sealed in a paint can or heat-sealed vapor bag.)

         iii). Heat-sealed “arson” bags specifically designed for fire debris. Simple plastic bags are not sufficient barrier to contain volatile substances.

         iv). Clean canning (or similar) glass jars with metal lids.

         v). Under no circumstances should evidence be submitted in a paper bag or coffee can with a plastic lid.

         vi). The evidence container (“arson” bags) should never be taped or stapled closed.

         vii). Containers with soil evidence should be refrigerated until they are submitted.

2). If possible, an unused container of the type the agency will be using on a regular basis should be submitted to see if there is any type of contamination in it from the manufacturing process.

NOTE: Objects placed in "arson" bags should not have sharp edges or points. Either bend over or remove nails, and protect pointed or sharp ends, etc. Each container should then be sealed. After sealing, each item should be identified with the officer's initials, case number, item number and date.

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3). If available, a crime scene sketch of where each sample was collected should also be submitted to the lab.

b. Controls and Standards – Regardless of the type of surface or material, unburned and apparently unaffected surfaces (control samples) corresponding to the types of surfaces and materials taken for detection of ignitable liquids should be collected and packaged identically to their counterparts. Care should be taken to avoid collecting a "control" from a low unburned spot where water and ignitable liquids may have settled. However, such a spot may be an ideal one from which to sample for an ignitable liquid. If a "standard" of suspected liquid ignitable liquid is available in a container or puddle (pool) at the scene, a small amount, up to 20 ml, should be submitted to the laboratory for analysis. The results of the analysis will be compared with the results of other items of evidence submitted. The CBI analyst may request submission of a particular commercial product purchased by the investigating agency. The 20 ml limit for submission of flammable liquids may be waived for this situation.

   Care must be taken to ensure the liquid sample does not contaminate other evidence. Therefore, multiple layers of airtight packaging should be used for liquid samples and these items should not be included in common packaging with other items of evidence.

c. Elimination Samples – If labeled containers of flammable liquids are present in the immediate area of a burn pattern and you wish to have these analyzed to possibly eliminate them as the ignitable liquid used, or volatile material detected, please indicate this fact in your cover letter, along with the items in their original containers. Please clearly indicate why standards, elimination samples and unknown liquids were collected, and which comparisons you would like to have done. The CBI will not accept more than 20 ml (approximately 1 tablespoon) of any (suspected) flammable.

3. Special Considerations and Problems

   a. If latent fingerprint examinations are desired on items of evidence such as cans, bottles, etc., and these items contain a suspected ignitable liquid, one of two procedures should be followed.

      1). If the container can be capped, corked, or otherwise rendered leak-proof, and does not contain more than 20 ml of liquid, the object should first be placed into either a package which suspends the item in an upright position (see diagram below,), or a paper package and then placed into a plastic bag or other airtight and leak-proof container and sealed.

      2). If the actual container cannot be capped, safely transfer the liquid into a leak-proof, unbreakable container and seal. Be cautious of any ignition sources while handling suspected ignitable liquids. Then package the object for latent fingerprint processing into a paper container and then into a leak-proof container as explained above.

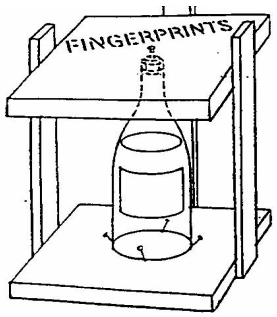

Figure IV-A

   b. The techniques used by the laboratories are designed to leave adequate sample for an independent analysis should the defense desire to have this done. However, the nature of the container may require that this re-examination be performed as soon as possible.

      1). Results will be reported using the ASTM ignitable liquid classification scheme. This includes the class of ignitable liquids found and examples in that class.

      2). If no ignitable liquid is detected, this will be stated in the report. This result does not preclude the possibility that those types of liquids were present at an earlier time.

4. Analysis and Report – The extent of the identification of the ignitable liquid is dependent upon the degree of ignitable liquid decomposition and type of material into which the suspected ignitable liquid has been absorbed.

D. EXPLOSIVES – CBI LABORATORIES DO NOT CURRENTLY WORK EXPLOSIVE CASES.

1. Explosive Devices and Bombs
   a. Purpose of the Examination – To conduct examinations on suspected explosives, explosive residues, and device components/fragments in order to determine the chemical and/or mechanical components.
   b. Collection and Preservation – Bomb scene processing requires the service of specialists trained in the field. Such specialists are necessary due to the possible presence of secondary devices, the mass destruction commonly found at such scenes and the requirement for special equipment.
   c. The following are specialized techniques required beyond normal crime processing.
      1). The minimum size of the crime scene is determined by finding the greatest distance that debris has been projected from the seat of the explosion.
      2). Productive areas for the recovery of explosive residues and bomb components are soft surfaces near the seat of the explosion.
      3). All materials, large and small, immediately adjacent to the bomb seat should be collected.
      4). Collect samples from the sides, bottom and beyond the loose soil in the bomb crater.
      5). When soil has been collected as evidence, be sure that at least one uncontaminated soil control sample is collected and placed in a separate, sealed container.
      6). Package the evidence in sealed, thick wall, “arson” bags or paint cans so as to retain the evidence in airtight containers. Protect plastic bags from sharp edges, such as pipe fragments or torn sheet metal that may be present in the debris.
      7). Each container should be sealed. After sealing, each item should be identified with the officer's initials, case number, item number and date.

d. Special Considerations

1). Preserve applicable evidence for latent fingerprint and tool-mark examinations.

2). Do not allow the unpackaged evidence to get wet as this may remove some of the explosive residues.

3). Clearly label all containers as to their nature (e.g., "explosive residues") and verbally advise everyone who receives this evidence in the laboratory.

4). No more than ≈1/4 ounce, (≤10 grams or approximately one-half the size of a five-stick package of gum).

5). Explosives cannot be sent through the mail.

6). Do not submit any explosive, such as black powder, dynamite, C-4, to any laboratory without previously informing the analyst who will be analyzing the evidence.

NOTE: Live blasting caps **SHOULD NEVER BE SUBMITTED** unless requested by the criminalist who will be working the evidence. A photograph of the blasting cap can be included in order to determine the type and manufacturer.

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e. Analysis and Report – The extent of the analysis and report is determined by the nature of the evidence submitted. Information derived from the analysis and examination of the evidence could consist of:

1). Manufacturer of detonating cord or safety fuse,

2). Date-plant-shift code on dynamite wrapper,

3). Identification of clock or battery components, and

4). Nature and type of explosive.

E. GLASS

1. Introduction

Glass is a supercooled liquid having, at ordinary temperatures, the properties of an amorphous brittle, rigid solid. It is a reasonably homogenous mixture of melted sand, however, the assorted added minerals and binders present in it make it a somewhat complicated material. It is this complexity that allows a forensic laboratory to identify it.

As with paint, glass is comparatively analyzed by testing a known to an unknown. Characteristics considered in glass analysis are color, thickness, density and refractive index. Laboratories having the capabilities of a scanning electron microscope can even perform elemental composition on glass fragments.

Although glass as classified has a brittle, rigid solid, it does have elasticity, causing it to bend slightly away from any point of force, as shown in . When the perpetrator of a forced entry uses an instrument of some type to break a window, the glass particles shower toward the direction of force at least 10 feet or more, so checking the clothing and hair of suspects should not be overlooked. See . The suspect should undress while standing on a piece of clean white paper to recover any trace evidence.

2. Typical Glass Fragmentation Patterns

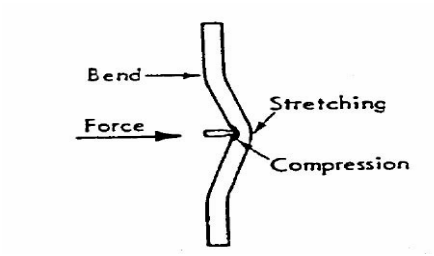

Figure IV-B

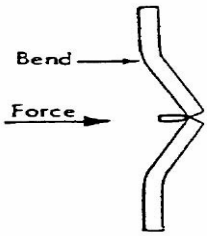

Figure IV-C

3. Purpose of Analysis
   a. Physical Match – This examination will enable the analyst to place a questioned piece or pieces of glass physically into a known source (similar to a puzzle-fitting procedure), and to conclude that they are both from a common, unique origin. The technique may be applied to windows, headlights, bottles, etc.
   b. Common Origin – Testing of this type allows the examiner to determine if glass recovered from a suspect or his/her belongings possesses the same physical and chemical properties of glass collected by the investigator from a known source. If they do possess these same characteristics, it is possible that they had a common origin or source.
   c. Direction of Impact – This examination will determine whether a pane of glass was broken from the inside or outside. This can be determined whether the object shattering the glass was a bullet or some other projectile, e.g., rock, bottle, hammer, etc. However, this is only possible

when enough glass pieces are submitted to determine radial or concentric fractures. See ***Figure IV-D*** and ***Collection of Glass for Analysis*** , ***Step 4.***

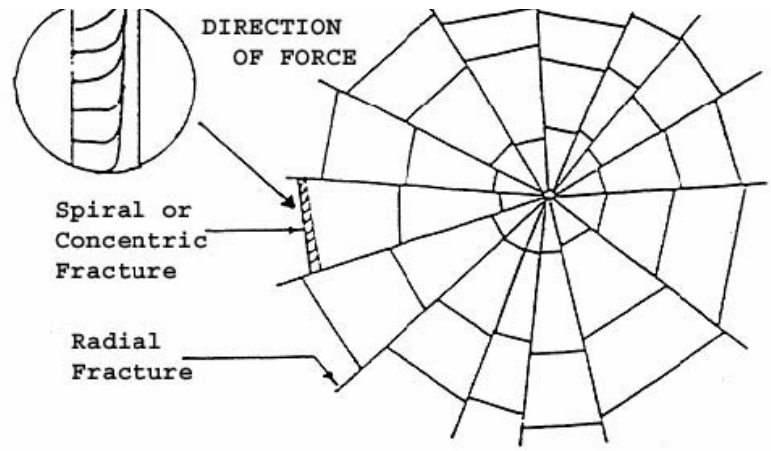

Figure IV-D

The concentric and radial fractures create pie-shaped areas with the narrow end of the glass piece being the one closest to the point of impact. Also, a side view shows that ridges form from these fractures, allowing the laboratory to determine direction of force.

d. Sequence of Impact – This observation can enable the laboratory analyst to determine the sequence or order of fractures occurring in a piece of glass. Determinations of this type are commonly found in shooting investigations. An example of this is shown in ***Figure IV-E.***

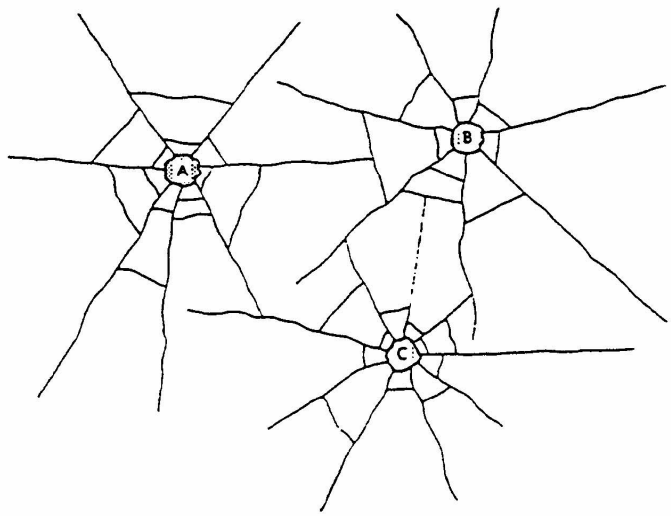

Figure IV-E

4. Collection of Glass for Analysis

   a. Photograph and dust glass pieces for latent fingerprints before submitting to the laboratory for analysis.

   b. Collect all appropriate standards.

      1). For a physical match collect all glass from the scene. This is especially true in cases involving broken headlights.

      2). To match glass from broken windows to fragments in suspect's clothing, collect random samples from various locations in the window.

      3). Bullet hole determination – The remaining glass must be fixed in the frame by taping, or some other means. Glass that has fallen from the frame must be collected and protected from further damage.

      4). Direction of force –Glass must be labeled as to:

         - Inside or outside surface and
         - As to whether crack is radial or concentric.

c. When collecting glass pieces from a door or window, label them as outside or inside.

d. Have your suspect undress over a large piece of paper and package separately each item of clothing suspected of having glass particles. This should be done using leak-proof paper bags.

e. Check hair and skin of suspect(s) and package any glass found in leak-proof containers.

f. Package glass controls in leak-proof containers such as plastic vials or cardboard mailing tubes.

g. Remember to properly seal and label all items submitted for analysis. Each item should be identified with the officer's initials, case number, item number and date.

5. Analysis and Report – The results obtained from glass analysis will state the following.

a. The samples are consistent with each other. Therefore, they may have a common origin.

b. The samples are not consistent with each other. Therefore, they could not have a common origin.

c. In some cases where the questioned glass pieces fit into a known glass source (puzzle-fitting), the report will read as follows: A physical match exists; the objects were at one time a single unit.

d. The direction of force that broke the glass originated from either inside, outside, or was not determinable.

e. The order of breaks in a piece of glass, as in , will be described as follows: Initial break B, followed by C, followed by A.

F. GUNSHOT RESIDUE ANALYSIS (PRIMER RESIDUE)

1. Purpose of Examination – Determine if a subject may have discharged a firearm, handled an object with primer residue on it, or may have been in the vicinity of a firearm discharge. This examination is done by determining the presence of particles characteristic of primer residue on a subject's hands or face.

a. In cases involving multiple subjects in close contact situations, analysis of the GSR kit(s) cannot at any time determine which subject discharged the firearm.

b. In cases involving multiple subjects in close contact situations, analyses of the GSR kit(s) cannot at any time determine the positions of each subject relative to the discharged firearm.

c. This analysis cannot determine muzzle-to-target distance.

2. Source and Types of Samples – Primer residues are those components that originate in the primer of a fired cartridge casing. The elements of interest are antimony (Sb), barium (Ba) and lead (Pb). These elements are found in most primer mixtures. Primer residue particles may be deposited on the hands or face of an individual who has discharged a firearm, was in the vicinity of a firearm when it was discharged (including victims), or handled an object with primer residue on it.

3. Collection and Preservation (General Information) – GSR particles may be removed by normal activity. Collection of primer residue from a subject must be done as soon as possible after the discharge of the firearm. The CBI Laboratory analyzes Scanning Electron Microscope (SEM) kits.

   a. The primer residue (GSR) collection should always be done before either the trace metal detection test (TMDT) is performed, or inked finger/palm prints are taken.

   b. It is of the utmost importance that care be taken not to introduce contamination to the stubs in the Scanning Electron Microscope (SEM) kits. The containers used for the stubs must be marked clearly so there is no mix-up of the samples. If the possibility of contamination has occurred, do not submit the affected stub.

   c. The CBI Laboratory will prepare the SEM stubs so that they can be analyzed. The methods used to prepare and analyze the samples are non-destructive so that re-testing by an independent laboratory can be done at a later date if so desired by the defense.

   d. The SEM stubs will be returned to the submitting agency upon completion of analysis.

4. Collection Procedure – Scanning Electron Microscope

   a. Remove all items from the SEM GSR kit. This should include: Instruction Sheet, Information Sheet, gloves, four plastic vials each containing one collection stub and one evidence sticker.

   b. Wash your hands thoroughly and/or use disposable plastic gloves before collection.

c. Carefully remove the cap from the vial labeled “Right Hand”. If a paper covering is present, remove it. (See .) Do not remove the metal stub from the vial base.

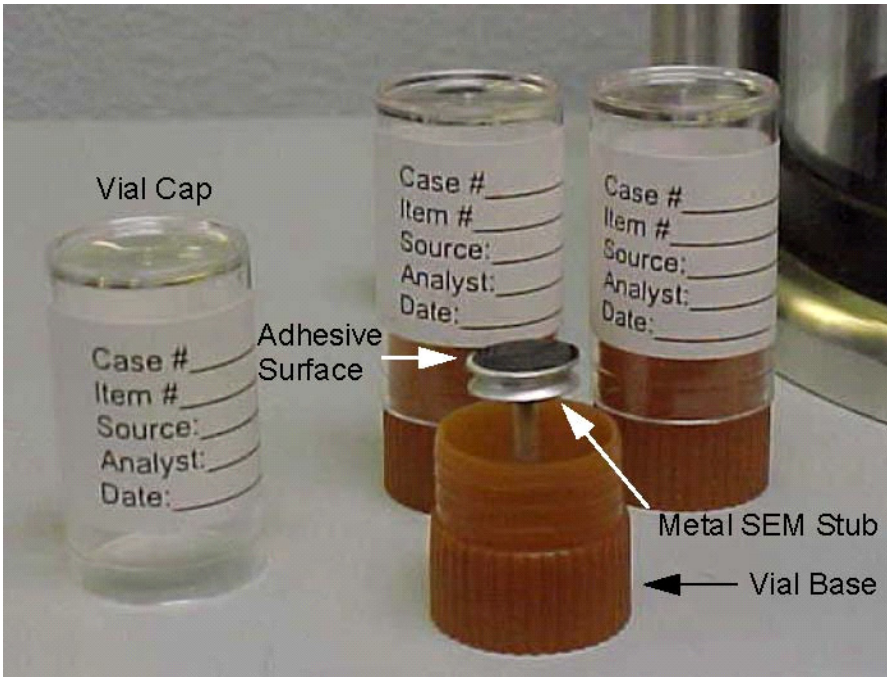

Figure IV-F

Figure IV-G

d. While holding the vial base lightly, press the collecting (sticky) surface of the stub onto the back of the subject's right hand until the area shown in has been covered. Then press the same collecting surface onto the palm of the subject's right hand until the area shown in has been covered.

Figure IV-H

Figure IV-I

e. After sampling the subject's right hand return the base, with the metal stub still in place, to the “Right Hand” vial.

f. Repeat the procedure described in (3)., (4). and (5). above using the metal stub in the vial marked “Left Hand”. Make sure to sample the areas corresponding to the left hand shown in and .

g. For collection from the face, proceed as in (3)., (4)., and (5). using the metal stub in the vial marked “Face”. Be sure to sample the area corresponding to .

h. Do not berak the seal on the vial marked control.

i. Fill out all information requested on the front of the Information Sheet.

j. Return the completed Information Sheet (see paragraph ***IV.F.5.b.*** below) and the three capped vials to the kit envelope. It may be useful to have the instruction sheet also returned into the envelope for testimony review.

k. Affix evidence seal over the envelope flap.

5. Special Considerations

   a. The type of materials used for the proper collection and preservation of primer residue samples are critical in preventing contamination.

      The Colorado Bureau of Investigation will not accept homemade kits for the scanning electron microscope. The commercially prepared SEM kits must meet the CBI's requirements for this type of kit. Failure to use the proper kit may result in CBI not analyzing the stubs. The following are guidelines for the SEM GSR kits:

      • Four stubs per kit (Right Hand, Left Hand, Face and Control),

      • Stubs mounted in the base of individual sample vials,

      • Plastic gloves, and

      • Information Sheet requesting the proper information.

   b. The primer residue (GSR) Information Sheet must be included in each SEM kit. Copies of the instruction and information sheets shown in ***XV.: APPENDIX A – GSR Information Sheet***, should be folded and placed in the kit. The CBI Laboratory will record the information from the Information Sheet and place it, along with the Instruction Sheet, back in the used kit; it will then be available to the officer for testimony should the evidence be introduced at trial.

   c. When a subject's hands are bloody, primer residue may still be collected. It is recommended that the bloody area be avoided as much as possible. The CBI Laboratory will make an attempt to analyze these samples. Please note the condition (bloody) of the subject's hands on the Information Sheet.

   d. When a subject's hands cannot be dabbed immediately they should be bagged to prevent loss of the primer residue. The preferred bags for containment are paper since they “breathe”. Under no conditions should you allow an individual whose hands are to be sampled the opportunity to wash or rub the (suspected) residue from his/her hands or face. Care should be taken to not contaminate the paper bags.

6. Analysis – The Colorado Bureau of Investigation Laboratory will perform the following.

   a. Analyze for primer residue on a subject's hands and face.

   b. Analyze for primer residue on a surface other than hands and face. This type of analysis is not routinely done and is handled on a case-by-case basis. It is recommended that the submitting agency package items separately and allow CBI staff to do the actual sampling.

   c. Any stubs generated by CBI will be returned with the item dabbed.

d. Primer residue can be collected off of surfaces such as automobiles by the investigating agency. For sampling advice, call your regional CBI office.

7. Analysis and Report

a. The report will state if the analysis disclosed any particles characteristic of primer residue.

G. PAINT

1. Purpose of Examination

a. Determine if paint recovered from a suspect's tools, clothing and/or property is consistent with paint recovered from a crime scene.

b. Determine if paint has been transferred between suspect and victim vehicles.

2. Collection

a. Collect all fresh broken edges where large flakes or chips of paint are missing. A physical match may be possible if the edges are carefully protected from further damage.

b. Collect all loose paint from all surfaces showing fresh damage.

c. When obtaining standards or transfer samples on surfaces such as car bumpers:

1). Tape a piece of paper below area to be sampled,

2). Chip the paint down to bare metal or wood (to ensure getting all layers), and

3). Prepare paper fold (see following example, ***Figure IV-J*** to keep all fragments in and place in envelope or box.

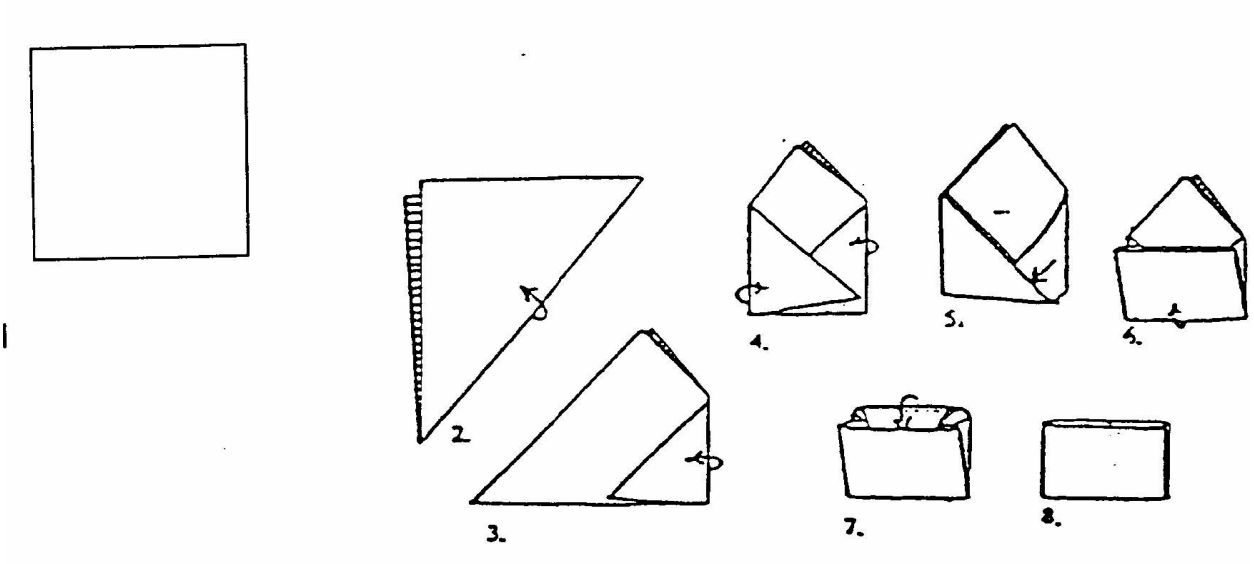

Figure IV-J

d. In hit-and-run cases involving a person injured or killed, carefully wrap each piece of clothing separately in paper to avoid losing any paint present. (If bloody, air-dry first on paper, then package as above, including paper with clothing to preserve any paint fragments which may have fallen off the clothing.)

e. In hit-and-run cases involving vehicles only

   1). Care must be taken to avoid cross contamination of paints from different vehicles when utilizing a common blade for mechanical removal of paint. The preferable procedure is to use separate tools.

   2). Collect standard from victim.

   3). Collect standard from suspect.

   4). Collect transfer onto victim.

   5). Collect transfer onto suspect.

f. When toolmarks exist on any damaged area, collect paint immediately adjacent to the marks. If multiple areas have been attacked, collect paint from each area.

3. Special Consideration – All paint, whether flake, chip, smear, transfer, or liquid should be handled with the following precautions.
   a. In cases where fractured edges can be physically matched, take special care in packaging these items.
   b. Place paint in containers that do not leak and label each item properly so everyone involved can identify the samples for court testimony.
   c. The following should not be performed in collecting paint.
      1). Do not use gummed tape to recover paint.
      2). Do not place paint fragments in large envelopes without first placing in paper fold.
   d. Under no circumstances should an attempt be made to match the tool to the toolmark by placing the tool in the paint at the crime scene.
   e. When transfers only are available, the analyst will collect, package and seal any paint present for future testing. It is suggested that this item remain in a sealed condition in the event the necessary controls become available for comparative analysis.
4. Analysis and Report – The results obtained from paint analysis will state the following.
   a. Whether the samples are or are not consistent with each other.
   b. A physical match is possible between the items. Physical matches consist of the comparisons between color, scratches, blemishes in the surface, paint layers, texture, and fractured edges that fit together. Under these conditions, the two specimens can be identified as having a common source.

H. SOIL

1. Introduction – The purpose of soil analysis is to compare samples from the crime scene with any samples found on a suspect or their belongings.
2. Soil is the upper layer of earth or loose surface material. This can encompass all minerals, insects, vegetable matter, and city debris such as grass, insulating material, dust, etc. Although soil is considered one of the most complex areas of physical evidence to analyze, it is extremely useful as an investigative aid in establishing the fact of whether or not a person and their possessions had been at a certain place.
3. Collection – Careful packaging must be initially employed to prevent contamination or loss of sample and to ensure the most meaningful interpretation of the data obtained. Soil can be detected on shoes,

clothing, tools, vehicles (both inside and out), and any other items or areas where contact or interaction of soil took place.

a. Package clothing separately in leak-proof paper bags. If wet, air-dry first, then package. Do not remove soil from clothing.

b. Wrap the tool with the soil adhering to it or contain just the soil to avoid loss or cross contamination with other items.

c. Only after all necessary photographs and measurements have been taken should soil samples be collected from the area where a shoeprint, tire track, body impression, etc. have been noted.

d. Several soil controls should be taken at the crime scene in at least four directions up to 25 feet from the main site as well as from other likely areas with similar soil characteristics.

e. Obtain soil samples of approximately one handful or two tablespoons for controls and place in airtight vials or containers.

f. Properly label all controls and items of clothing, especially if more than one area or suspect is involved.

g. Collect all alibi soil, if mentioned by suspect. (That soil mentioned as being from a source other than the scene). Package and label properly.

h. Submit sketch of area and mark where controls were taken.

4. Special Considerations – Samples should be taken from the surface no deeper than shoes or tires would depress the soil. Samples taken too deeply will introduce unwanted variations. Example: Soil removed from a shoeprint would consist of a sample only 1/2 to 1 inch deep.

5. Analysis and Report – Caution must be maintained in writing the results of soil testing because of its complexity. However, keeping in mind that the analyses are comparative, a statement relating three possibilities can be obtained. First, the soils are consistent with each other; second, the soils are not consistent with each other; and third, a possibility exists that the soils are from a similar source, however due to some detectable differences, a stronger opinion cannot be rendered.

I. VEHICLE LIGHTS

1. Purpose – It is often important for the traffic investigator to know whether or not the lights of a vehicle were on or off at the time of an accident. The laboratory is usually able to ascertain this condition by microscopic examination of the light, its filaments, supports, and surfaces, whether they are broken or unbroken.

2. Collection
   a. All headlights should be collected, labeled, and submitted individually in either plastic bags or leak-proof paper bags.
      1). Labeling for each light should include case number, officer's initials, date and time collected, and a brief description as to where it was recovered (left outside, right inside, etc.).
      2). A copy of the accident report should accompany the submission.
   b. Submit other vehicle lights, such as tail, brake or running lights in order to attempt to determine the light's illumination status. Labeling should include, in addition to (1).(a). above, the exact position of the bulb in the socket. Use a marking pen to label the top as well as the driver or passenger sides.
   c. In instances where the light envelopes have been completely shattered, extra care, caution and effort should be exercised by the investigator in searching for, collecting, and packaging of any remaining filaments or filament posts. These can be placed in plastic vials or canisters that have been thoroughly labeled with the source, case number, date and officer's initials.
3. Analysis and Report – The results obtained from the examinations will state:
   a. whether the lights were on or off at the time of the accident; or
   b. in instances where no bulbs are broken and the filaments show insufficient distortion, no determination will be possible.

N O T E S

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V. LATENT FINGERPRINTS

A. PURPOSE

1. Latent prints are a positive form of identification. The finger, palm, and footprints of no two individuals are the same. The friction ridge skin found on the fingers, palms, and feet begins to form in the third to fourth month of gestation. These friction ridges will remain constant, changing only in size, from the time they are formed until decomposition of the skin after death, barring any type of scarring or injury.

   Due to the uniqueness and permanence of fingerprints, an individual can be positively placed at a crime scene or can be positively connected with a piece of physical evidence.

   Latent prints are extremely important evidence and should never be overlooked in processing a crime scene or physical evidence.

2. In regard to fingerprints, the Colorado Bureau of Investigation Laboratory will provide the following services.

   a. Examine and process items of evidence submitted for latent prints.

   b. Examine latent print lifts and natural size photographs submitted by the requesting agency or those developed in the CBI Laboratory to determine their suitability for comparison.

   c. Compare latent prints suitable for comparison with known prints submitted with the case.

   d. Compare latent prints suitable for comparison with known prints in the CBI fingerprint database.

   e. Conduct latent examinations on a rush basis if requested and meets rush criteria. Please state the reason for the rush and request only when necessary.

   f. Examine hands of deceased individuals to obtain identifiable known prints, either to identify the deceased or to compare with latent prints.

      (Laboratory personnel may respond to assist in identification of any unknown deceased.)

   g. Examinations will not be made on evidence that has been examined by another fingerprint examiner prior to submitting to the CBI Laboratory unless specifically requested by the submitting agency **AND** written acknowledgement from the District Attorney and the original examiner. The scope of these examinations includes processing, evaluations, comparisons, written reports, and court testimony.

h. Enter and search latent prints of suitable quality through the AFIS database.

B. SPECIAL CONSIDERATIONS

1. Types Of Crime Scene Prints

   a. Plastic Impressions: A three-dimensional reproduction of the friction ridge skin present on an object that is pliable or capable of being molded, such as putty, wax, caulking, etc.

   b. Patent (visible/contaminated) Impressions: Impressions made when friction skin comes into contact with a foreign substance, such as paint, tar, blood, etc. When the friction ridge skin containing this material comes in contact with a receptive surface, it will leave a visible impression of that foreign substance on the surface.

   c. Dust Impressions: Impressions made when the friction ridge skin comes in contact with fine dust on an item, and upon lifting the finger, it removes the dust, leaving behind a negative impression in the dust.

   d. Latent Prints: A hidden image, composed of perspiration (sweat) or oils, which require some type of processing to make visible.

2. How Fingerprints Are Deposited

   a. The perspiration exuded by the sweat pores, oil from other parts of the body, or foreign substances may be present on the hands or fingers. This material will adhere to friction ridge skin, and when the ridges come in contact with an object, portions of that material will be transferred to the surface, leaving a reproduction of the friction ridges behind.

   b. In order for the latent print to be of value, there must be enough individual ridge characteristics present to make a comparison. If the ridge skin is covered with an excessive amount of material, all of the skin area may be recorded, not just the ridges. Also, if too much pressure is applied, the skin will be flattened out, recording the valley or depressed areas and not making the ridge detail distinctive enough for comparison. Another problem may occur when movement occurs when the friction ridge skin is in contact with the surface. The detail in the ridges may be unclear and the print is not suitable for comparison.

   c. Contrary to popular belief, people do not leave fingerprints every time they touch something. There must be some material on the ridges in order for that transfer to take place. If the friction ridge skin is dry and free of foreign substances, no print will be left.

3. Fingerprinting Of Deceased Persons

   Inked fingerprints and palm prints should be taken from the deceased in all death investigations. These may be important later to establish positive identification, elimination, or to place the victim with the suspect.

   a. CBI personnel will respond to assist the local agency if difficulty is encountered in obtaining acceptable inked prints, or in the case of multiple victims.

   b. The hands of the victim may be submitted to the laboratory for processing. Do not cut off individual fingers, but submit both entire hands. The coroner or medical examiner should remove the hands. The hands should be frozen or kept on ice and delivered to the laboratory as soon as possible.

C. PACKAGING EVIDENCE FOR LATENT PROCESSING

1. Nonporous Objects: Latent prints on nonporous objects, such as glass or metal can, actually sit on the surface of the item and can be easily lost or wiped away. Package the item so that the surface to be processed does not come in contact with the packaging material. DO NOT USE PLASTIC BAGS FOR NONPOROUS OBJECTS. The best method is to secure the object in a cardboard box so the surface to be processed is not disturbed. Any packing material that conforms to the shape of the object or is placed against it may destroy the latent prints. If the nonporous item of evidence has been in water and will rust if taken out, package it in a sealed, watertight container and submerge it in the water from which it came. If the item will not rust it can be air dried and packaged in a normal manner as listed above.

   Do not process a nonporous item and then submit the item before lifting any developed latent prints, unless the developed latent prints are protected (i.e. placing tape over the developed latent prints).

2. Porous Objects: Porous items, such as paper, cardboard, and unfinished wood, may be placed in a plastic or paper bag. The reason for this is that the latents are actually absorbed into the item. If the porous item of evidence has been wet, make sure that the laboratory staff is aware of that fact, as this will determine the type of processing that needs to be conducted on that particular piece of evidence. Also, if the porous item of evidence has been wet, make sure that it has air dried thoroughly prior to packaging.

   Prior to packaging any evidence to be submitted to the CBI Laboratory for latent print processing, make sure that all liquid is removed from cans or bottles. The container should be clearly marked, “To Be Processed for Latent Prints.” In addition, each container should be sealed, and each item

should be identified with the officer's initials, case number, item number, and date.

D. CONTROLS - SUBMISSION OF INKED PRINTS FOR COMPARISON

1. There are a large number of latent prints developed that are from palm or finger joint areas. Inked fingerprints and palm prints should be submitted with each case. Major case prints include all of the friction ridge detail present on the hand. Major case prints, or at least palm prints, should be taken on all arrests for serious crimes, in addition to the inked fingerprint card.
2. Inked fingerprints should be completely rolled from one side of the finger to the other and as clear as possible for comparison purposes. If a condition exists that makes printing difficult, it may help to take and submit more than one fingerprint card so that the best one may be used.
3. Most facsimile or photocopy machine copies of fingerprint cards are not clear enough for comparison. Therefore, it is always best to have the original fingerprint card and palm prints when available.
4. Live Scan fingerprint cards do not record detail as well as inked impressions therefore whenever possible the original inked impressions of the fingers and palms should be submitted.

E. PROCESSING WITH POWDERS

1. Developing Latent Prints With Powder (For Nonporous Surfaces)

   Preliminary examination of smooth, nonporous surfaces.

   a. A strong light source held at an oblique angle will sometimes render latent prints visible on certain surfaces, i.e. metal, glass, etc…
   b. Do not apply powder to a surface where moisture is present.
   c. Recreate the scene to determine the areas most likely to have been touched by the suspect(s). Remember while working on the crime scene reconstruction, do not touch or move anything.
   d. Do not use fingerprint powder on plastic impressions, dust impressions, or patent (visible) impressions.
   e. Application of Fingerprint Powder.

      Use good quality black or bichromatic commercially manufactured fingerprint powder. Do not use cheaper grade chalk base powder that may cloud the background and has the tendency to smear the latent print. Use the fingerprint powder that will give a sharp contrast with the background.

Use a different good quality fingerprint brush for each color of fingerprint powder.

1). Application of Powders.

i). Pour a small amount of powder onto a piece of paper or a disposable dish. Never dip the brush directly into the stock bottle.

ii). Dip the fingerprint brush into the powder.

iii). Tap the brush lightly to remove any excess powder.

iv). Brush the surface in a circular motion until a latent print starts to appear.

v). At the appearance of a latent print, stop.

vi). If the latent is still too light and indistinct, more powder can be applied. However, care must be taken not to apply so much powder that details are obscured or that the ridges are brushed off the surface by the action of the brush.

vii). If there is an excess of powder on the latent print, a clean brush may be used to carefully "dress" the print by removing excess powder following the ridge flow.

2. Things to avoid when processing with powder.

a. Never develop latent prints and then package the evidence to be submitted to the laboratory without first lifting, protecting, or photographing the print. A developed latent print can easily be destroyed.

b. Never exhale on the surface to add moisture to the latent prints. This could cause contamination issues if DNA is requested.

c. Be careful not to over powder or over brush the latent print. This may lead to an unidentifiable latent print. (Refer to ***V.E.1.e.1).v)/vi)***.)

3. Lifting latent prints developed in powder.

a. If in doubt about lifting a latent print, take a scaled photograph prior to any attempt to lift it.

b. Use a good quality clear or frosted fingerprint tape.

c. Select black or white lift card to use as a backing for the latent lift.

d. Slowly and in a continuous motion, unroll a strip of clear lifting tape, making sure that it is approximately one inch longer than the developed latent print, and leave one end of the tape on the roll.

e. Place the end of the tape one-half to one inch from the developed latent print.

f. Holding the roll of tape in the other hand, smooth the tape over the latent print with your free hand. Do this slowly and evenly to avoid air bubbles and wrinkles.

g. Make sure the tape makes complete, full contact with the powdered impression. Rub the tape carefully onto the surface to make sure the adhesive on the tape will pick up all of the area in the latent print. If this is not done, "fish eye" (small air bubbles) distortion may occur when small particles of dust, sand or foreign material prevent an area from being lifted.

h. Slowly remove the tape, starting with the loose end and working toward the end attached to the roll. Do this in a continuous motion, not a jerking motion that will cause striations in the tape.

i. Using the proper contrasting lift card, apply the tape to the card.

j. With the card on a sturdy smooth surface, such as a table, place about one-fourth inch of tape on the end of the table at the end of the lift card. This enables one hand to be free while holding the tape tight with the other. With the free hand, smooth the tape onto the backing.

k. Each latent lift should be placed on a separate lift card.

l. Properly mark the latent lift card. On the back of the lift card, the following information should be placed.

   1). The date lifted.

   2). Case number.

   3). Location or address of occurrence.

   4). Location or orientation on the object or area of scene where the latent was obtained.

   5). Initials of individual developing and lifting the latent.

   6). Cross-out any prints left on the lift by the officer.

m. Try multiple lifts – In many cases the subsequent lifts will be better for comparison. Mark the lifts as being a duplicate or "2nd, 3rd , lift" etc.

F. PROCESSING WITH CHEMICALS

1. Chemicals are used primarily on porous surfaces such as paper, cardboard, unfinished wood, etc.

   a. Chemical processing is normally done in the laboratory.

b. Collect and preserve items for chemical processing and submit them to the laboratory.

2. The three chemicals commonly used to develop latent prints: iodine, ninhydrin, and silver nitrate.

   All of the three above chemicals may be used on one item of evidence; however, they must be used in this proper sequence.

   a. Iodine
   b. Ninhydrin
   c. Silver Nitrate

3. Iodine

   a. Reacts with oils, which absorb the iodine vapors and become stained in orange-brown color.
   b. The developed latent will fade and must be photographed.
   c. This method is nondestructive and will not harm documents.
   d. Iodine is not effective if the latents are very old.
   e. Iodine can be applied by:

      1). iodine fuming gun

      or

      2). iodettes (placed in a ziplock bag with the document and shaken).

4. Ninhydrin

   a. Reacts with amino acids secreted from the body in perspiration, which produces a purple color.
   b. Use a chemical fuming hood and rubber gloves when applying.
   c. Apply by spraying or dipping the specimen into the solution.
   d. Allow the specimen to air-dry.
   e. Development

      1). By leave at room temperature for 24-48 hours.
      2). By using a drying oven.
      3). By using a steam iron.

   f. Take a photograph of the developed latent or scan the image into the computer at 1000ppi or better and save to a CD.
   g. Advantages

      1). The latent is semi-permanent.

2). Convenient to use.

3). Can be used to develop very old prints.

4). Can be bought premixed in aerosol cans.

h. Disadvantages

1). If buying Ninhydrin from a vendor premixed, make sure the date of mixture is included. The shelf life of Ninhydrin is approximately 1 year. (A control should always be used to test the chemical.)

2). Ninhydrin developed prints can be transitory in nature, meaning they can fade away. It is always best to capture the image by photography or scanning to prevent a loss of the image. If this technique is used in the field with the intention of submitting to the CBI Laboratory for comparisons, it is strongly recommended that one of the working fingerprint analysts at the CBI is informed of the evidence being previously processed with Ninhydrin.

i. Ninhydrin is the best to use if only one chemical method is used.

j. Avoid handling evidence processed with Ninhydrin with bare hands.

5. Silver Nitrate

a. Reacts with the sodium chloride present in perspiration to form a dark-brown latent print.

b. Application

1). Specimen can be dipped in the solution.

2). Apply with a brush.

c. Allow specimen to air-dry.

d. Expose to light after dry to develop any latent prints.

e. Do not over expose. Observe latents and cover them as soon as they develop to the proper contrast.

f. Photograph or scan the latent and use photographic print for comparison.

g. Preserve the latents on the object by placing the specimen in a lightproof container.

6. Crystal Violet

a. Stains the epithelial cells left behind on the adhesive surface of tape.

b. The developed latent will be stained purple, therefore, this technique can only be used on lighter colored tapes.

c. Application

1). Specimen should be dipped in the solution and left submerged for approximately 1 minute.

2). Photograph or scan the latent print and use photographic print for comparison.

d. "Sticky side powder" or "Wetwop" solutions are an alternative to crystal violet for examination of tapes.

G. CYANOACRYLATE ESTER (SUPER GLUE)

1. Super glue polymerizes to the moisture present in the latent print.
2. In addition to its use on routine objects, this technique can also be used to develop latent prints on porous and nonporous objects that, due to the nature of the surface, are difficult to process using powder or chemicals.
3. The developed friction ridges will be white in color.
4. Development.
   a. Specimen should be placed in an airtight chamber.
   b. Super glue is put in an aluminum dish inside the chamber and heated to a temperature of between 100-120º C. Be careful not to overheat the super glue because of the toxicity of the fumes.
   c. A "control" non-evidence item should be placed in the chamber to monitor the development of latents.
   d. Adding a cup of warm water (adding moisture) will assist in the development of friction ridges through rehydration.
   e. Development should take approximately 30 minutes, but could take longer due to a lack of moisture. Always monitor the progression of the evidence by checking on the control.
5. Once complete the latent can be further developed with fingerprint powder or dye stain, and then lifted, photographed, or captured.

H. ANALYSIS AND REPORT

1. At the conclusion of the examination the latent print examiner will state the findings in a written report, which will be sent out to the investigating officer over the computer terminal. This report will reflect if any latent prints were found or developed, if they were of value for comparison purposes, to which inked fingerprint cards the latents were compared, and whether identifications or eliminations were effected.

2. If requested, the latent print examiner will testify to his/her findings in a court of law. It is requested, however, that an examiner's written report be used in preliminary hearings.

N O T E S

VI. FIREARMS

Forensic firearms examination, in a broad definition, is the examination of any firearm, ammunition component, or object(s) in the path of a fired projectile(s) for the purpose of revealing facts that will assist in the investigation of a crime or accident.

A. PURPOSE OF EXAMINATION

1. To determine the caliber of fired ammunition.
2. To determine the firing weapon type from fired bullets and/or cartridge cases.
3. To determine whether fired bullets and cartridge cases were fired in or from a specific firearm.
4. To determine the approximate muzzle-to-item distance based on gunpowder patterns found on items with bullet holes present.
5. To determine if a specific firearm functions as it was originally designed.

B. COLLECTION AND PRESERVATION

1. Firearms Found At The Crime Scene

   Before collecting the firearm(s), the following steps should be taken.

   a. Photograph the firearm to show overall location as well as close up for identification purposes. Close-up photograph should show serial number if possible.
   b. Include exact location on sketch.
   c. Sketch and make notations listing the serial number, name, model, and caliber of the firearm, and its condition (for example: loaded or unloaded, safety on or off, hammer cocked, etc.).
   d. If the weapon is loaded, it should be unloaded before submission to the laboratory.

NOTE: Loaded firearm(s) should NOT be sent to the CBI Laboratory.

If for some reason the firearm cannot be unloaded, then it is the responsibility of the submitting agency to notify the CBI Laboratory of the date and time they will be arriving at the laboratory.

e. If the firearm is to be processed for latent fingerprints, extreme caution must be taken not to contaminate or destroy possible latent fingerprints.

f. If the firearm is to be submitted to the CBI laboratory for serology examination at a later date, it should not be taken to the autopsy.

2. Unloading A Revolver

a. Scribe a line on the cylinder on each side of the top strap prior to opening or removing the cylinder.

b. Then open the cylinder, and before removing the cartridges, make a diagram. See ''Figure VI-A"

Table VII-1

Chamber Position	Condition	Bullet type and Headstamp
1	Fired	W-W
2	Fired	RP
3	Fired	FC
4	Misfired	W-W SWC*
5	Loaded	W-W SJHP*
6	Loaded	RP
		Lead RN

Type Headstamp

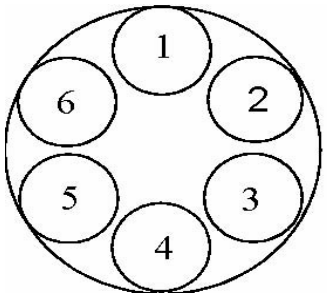

Figure VI-A

* See abbreviations in ***XVII.: APPENDIX C – Firearms Abbreviations.***

Note cylinder rotation - clockwise (CW), counter clockwise (CCW)

c. Unload each chamber and package each cartridge case in a crush proof container. On the outside of each container mark the number of the chamber from which it was obtained, along with date, time, and officer identification mark.

d. Package the revolver in cardboard box or other hard sided container. **Never place any object in the barrel of a firearm for any reason.**

e. It is not necessary to mark the firearm or cartridge casing. It is preferable to mark the sealed container/packaging. If the firearm and/ or cartridges must be marked prior to packaging, they may be marked in the following areas.

1). Revolvers

i). Underneath the top strap.

ii). On the frame inside the crane hinge.

iii). The frame beneath the cylinder.

iv). The frame under the grip.

2). Cartridges

i). Fired cartridge cases should be scribed inside the mouth.

ii). Unfired cartridges should be marked with an indelible felt-tipped marking pen along the case.

iii). Never mark the base of fired or unfired cartridges.

NOTE: When possible mark the proximal container rather than the item of evidence.

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3. Unloading A Semi-Automatic Pistol

a. Photograph the firearm to show overall location, and close up for identification. Close-up photograph should show serial number if possible. If the firearm is to be processed for latent fingerprints and trace DNA, extreme caution must be taken not to contaminate or destroy possible latent fingerprints.

b. Remove the magazine. It is not necessary to remove the live rounds from the magazine. This can be done at a later time in the laboratory.

Package the magazine in a suitable container and mark the container appropriately. The magazine can be included in the box with the pistol if magazine is packaged in a manner that does not allow the items to be in contact. <u>Be sure it is submitted with the pistol</u>.

c. Remove the live round from the chamber and package in an appropriate container.

d. If the firearm must be marked prior to packaging, it may be marked in the following places.

1). On the barrel.

2). Inside the magazine well.

3). On the frame under the grip.

4). On the slide.

NOTE: For firearms found in unusual circumstances, such as under water or in snow, call the CBI Laboratory for advice.

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4. Bullets, Projectiles And Fragments Found At The Crime Scene

   a. These should be handled with great care to prevent damage to the fine striations.

   b. Each projectile or fragment should be wrapped in soft tissue paper and sealed in a pillbox, or suitable crushproof container. Do not package in cotton. It is preferable not to mark fired bullets/fragments prior to submission. Package individually.

   c. Fired bullets may be marked on the nose or base only. Caution should be exercised, as there may be impressions or foreign debris on the nose that may be of importance to your case.

   d. If a fired projectile is lodged in a wall or other object, such as a 2" x 4" stud, cut around the hole and package the material containing the projectile. Never try to dig the projectile out by probing through the entry hole. This may damage the projectile and make identification impossible.

   e. Shot pellets found at the scene should be collected and packaged in the same manner as bullets.

   f. Whenever shotguns are used in a crime, a search of the area should be conducted for shot shell wads. These wads come in various configurations. Example: plastic discs; fibrous wads both thin and thick; plastic shot cups that incorporate a plastic wad; cardboard disks.

   g. Shot patterns should be collected if at all possible. If this is not possible, photographs should be taken using an English or metric scale.

5. Bullets Recovered At Autopsy

   Bullets recovered during an autopsy, as well as from animals, should have trace evidence (hair, fibers, other debris) collected. The bullet may then be washed under cold water to remove blood and tissue. If blood remains on the bullet it can cause damage to the fine striae, sometimes to the point that a match is not possible. After the bullet(s) is/are dry, wrap in soft tissue paper and package in a pillbox and mark the box appropriately. Do not use metal forceps or other tools that may damage the bullet.

NOTE: If the victim was shot in an area of exposed skin such as the back or abdomen and powder residue or tattooing is present, color photographs should be taken of this area with a ruled scale showing in the photograph. Shotgun wounds to exposed skin should also be photographed in the same manner.

---

6. Fired Cartridge Case At The Scene
   a. Photograph for overall location and close up for identification, showing the headstamp on the cartridge base if possible.
   b. Include exact location in rough sketch.
   c. Each fired cartridge case should be wrapped in soft tissue paper and sealed in a pillbox or suitable crush-proof container.
   d. If the fired cartridge cases must be marked, mark only inside the mouth.
   e. NEVER MARK a cartridge case on the primer or base area, or on the sides.
7. Clothing For Gunpowder Pattern Testing
   a. Each item of clothing must be air-dried at room temperature and packaged separately. Air-dry by spreading on a flat surface with the bullet entrance side up, or hang on a plastic hanger.
   b. When dry, place cardboard or paper inside as shown in ***''Figure VI-B"***and button the garment. Cover in a manner that will put the bullet hole and the surrounding area between the two pieces of cardboard or paper.

      A piece of cardboard or paper should be placed in back of the shirt also.

      If item must be folded, fold only twice as shown by the broken lines in ***''Figure VI-D"***. Fold arms over the outside of the cardboard or paper; one in front and one in back.

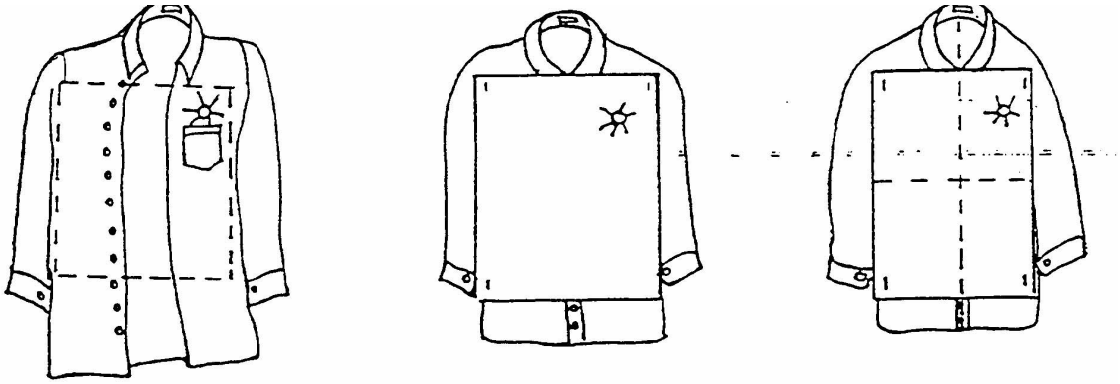

Figure VI-B **Figure VI-C** **Figure VI-D**

   c. After the garment is protected, seal the paper/garment in a paper bag. Never package items in plastic bags.

d. A letter of transmittal is requested advising pertinent facts as to the location of all wounds. A diagram showing the entrance and exit wounds would be very helpful. If possible, send a copy of the autopsy report.

e. When distance determination is requested, it is imperative that the suspect firearm and same type of ammunition be submitted so proximity tests can be conducted using the suspect firearm and same ammunition.

NOTE: All evidence containers are to be marked as to their contents, initialed and dated by the individual collecting, and the container sealed.

C. SPECIAL CONSIDERATIONS

1. Firearms

   a. All firearms are to be unloaded before being submitted to the CBI Laboratory for examination.

   b. If for some reason a particular firearm cannot be unloaded, it is the responsibility of the submitting agency to notify the laboratory as to the date and time they will be arriving so that the proper personnel will be on hand to unload the firearm.

   c. In unusual circumstances where firearms are found under water, in snow, etc., call the CBI Laboratory for advice before attempting to collect and preserve.

   d. All firearms must be packaged in a cardboard box or hard side container such as a gun case.

2. Ammunition

   Live ammunition found in the suspect weapon or loose at the crime scene should always be collected for the following reasons.

   a. The same brand, style, type, or caliber should be used in tests and may be no longer be manufactured or available. This submitted ammunition may be used to test-fire the firearm for bullet and cartridge case recovery, and for proximity testing in determining muzzle-to-garment distances.

   b. A positive match of fired bullets from the victim with test-fired bullets is sometimes impossible if the same manufacturer, bullet weight and type are not used in test-firings.

   c. Type, caliber, manufacturer and possible origin may be determined.

d. Upon request it may be possible to determine if a cartridge has been worked through the action of a particular firearm or the same firearm as other cartridge submissions.

3. Firearm Parts

   Any and all firearm parts found during a crime scene investigation should be collected for the following reasons.

   a. The reassembling of a firearm from the parts.

   b. The identification of a particular firearm type and possible manufacture.

   c. Whether or not all parts collected are from the same firearm.

4. CBI Laboratory Firearms Reference Collection

   This collection contains numerous handguns and shoulder firearms which are used for the following purposes.

   a. Location(s) of serial numbers.

   b. Replacing inoperable or missing parts so that the evidence firearm may be test fired.

   c. The identification of firearm parts.

NOTE: CBI accepts firearm donations from local law enforcement agencies. For information, contact the firearms section of the CBI office in your area.

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5. Submission Of Evidence

   a. Live Ammunition -Cannot be sent through the U.S. Mail, but can be shipped by other carriers, such as United Parcel Service (UPS), or Federal Express.

   b. Firearms - All firearms shipped or hand carried to the laboratory must be unloaded. They should be properly packaged and marked.

   c. A cover letter must accompany all evidence submitted for analysis. This letter should include a synopsis of the case and a list of the examinations required on each item of evidence.

6. Firearm Examination

   a. A mechanical functioning check is conducted to determine if the firearm functions as it was designed.

   b. Determination as to whether or not the weapon will malfunction or discharge without pulling the trigger.

7. Fired Bullets And Projectiles

   a. A fired bullet may be identified as having been fired from a particular weapon to the exclusion of all other weapons.

   b. From one fired bullet it may be possible to determine the caliber, weapon type, and the manufacturer.

   c. From two or more fired bullets it may be possible to determine the caliber, weapon type, the manufacturer(s), and whether or not they were fired from the same weapon.

   d. In some instances fired bullets are too deformed or partial to make any determination other than the fact that they are consistent with fired bullet material.

   e. Some fired bullets lack significant individual characteristics resulting in a conclusion similar to the following: "Due to a significant lack of individual characteristics, the fired bullet of Exhibit #1 can neither be identified nor eliminated as having been fired from the firearm of Exhibit #2."

   f. From shot pellets and shotgun slugs, the type and size of shot and gauge of the slug may be determined. Shot typically cannot be matched to a specific shotgun barrel.

   g. Wadding from a shot shell found in the victim or at the crime scene can help in determining the gauge of the shotgun used and, in some instances, the manufacturer of the shot shell.

8. Fired Cartridge Cases Or Shot Shells

   The identifying marks placed on fired cartridge cases or shot shells when fired are produced by the breech face, firing pin, extractor, ejector, and chamber.

   a. From one fired cartridge case or shot shell, it may be possible to determine the original manufacturer, caliber, and type of firearm used.

   b. From two or more fired cartridge cases or shot shells, it may be possible to determine the original manufacturer, caliber, type of firearm, and whether or not they were fired from the same firearm.

   c. Fired cartridge case/shot shell and suspect weapon.

      1). Based on matching firing pin impressions, breech face markings, and/or chamber marks it may be established whether or not it was fired in a specific firearm.

      2). Extractor, ejector, or other marks can only identify whether or not a cartridge, cartridge case, or shot shell has been worked through the action of a particular weapon.

d. On some occasions, due to a significant lack of individual characteristics, the fired cartridge case or shot shell can neither be identified nor eliminated as having been fired in a specific firearm.

9. Gunpowder Pattern Testing/Bullet Residue Testing

   a. Possible muzzle-to-garment distance range.

   b. Whether a particular hole in a garment (absent of gunpowder) is consistent with the passage of a bullet (lead or copper residue verification).

   c. Possible entrance and exit determinations.

N O T E S

VII. TOOLMARK EXAMINATION

Toolmark identifications are possible due to the fact that when two objects come into contact with each other the softer object will yield to the harder object, resulting in a mark or impression being produced upon the softer object's surface. During the contact of two surfaces, foreign debris can be transferred to each of the contacted surfaces. This can be in the form of paint, glass fragments, safe insulation, grease, etc. It is, therefore, important that both tools and toolmarks be protected from any further contamination.

A. PURPOSE OF EXAMINATION

1. To determine the type of tool that made a toolmark or impression.
2. To determine if a specific tool made a particular toolmark.
3. The examination of toolmarks on different objects to determine if they were made by the same tool.
4. The examination of fragments of tools to see if they can be physically matched with a particular tool.

B. COLLECTION AND PRESERVATION

1. Toolmarks - Collection
   a. Toolmarks found at the crime scene should be photographed and linear measurements taken and noted on the crime scene sketch.
   b. If at all possible collect the actual toolmark and submit it for examination.
   c. If it is impossible to remove the section of material containing a toolmark, then a cast should be made with a silicone rubber material. The probabilities of making a positive identification from a silicone rubber cast are less likely than with the actual object containing the toolmark.
   d. Never place a suspect tool against a toolmark for size determination. This can only damage the toolmark and invalidate any trace evidence analysis.
   e. On large items, such as vending machines, doorframes, doors, file cabinets, etc., photograph the overall object, and then take close-ups of the toolmarks. Finally, cut out those areas containing the toolmarks and submit them for examination along with the photographs showing the exact location and orientation of the toolmarks.
   f. Always collect known standards of paint, safe insulation, and other material that might appear as foreign deposits on tools. These known

standards should be collected in pillboxes or vials, never envelopes or on scotch tape. The containers should be labeled as standards collected for comparison with foreign debris that might be collected from the suspect tools. Seal and package items separate from the tool(s) to avoid cross contamination. The Chemistry Section of the laboratory performs these comparisons.

g. Submit only items of evidentiary value. It serves no useful purpose to determine that a tool left at a crime scene was used to attack an object, if no means exist of associating the suspect(s) with the tool(s).

h. The greater the elapsed time before a tool is recovered for comparison, the less likelihood there is of making a positive identification. This is because the individual characteristics of the cutting/scraping surfaces of tools change considerably through use and abuse.

2. Toolmarks – Packaging

   a. Never package tools and toolmark evidence in the same container. Microscopic trace evidence, such as paint or grease, safe insulation, etc., may be transferred or lost. This could also damage the fine striae in a toolmark.

   b. Remove any trace evidence that may become dislodged and lost during transit. Document these items appropriately and package separately.

   c. It is suggested that the object containing the toolmark be wrapped in paper and then placed in a suitable container. This will also serve to protect any foreign debris that might be adhering to the impressions.

3. Cut Pieces Of Wire

   a. Notations must be made as to which cut ends are evidence and which were cut by the investigator.

   b. Wrap each evidence cut end with paper to preserve any foreign debris that might be adhering to the cut end(s). Do not allow tape to come into direct contact with evidence cut end(s).

   c. Do not use evidence tools to cut wire for comparison or for control wire sample collection.

4. Tools

   a. If latent fingerprints are an important issue in your case, then the tool(s) should be collected and packaged in such a manner as to protect them from any abrasive action that could destroy ridge detail.

   b. The jaws and/or cutting blades of tools should be wrapped separately in tissue paper to protect the loss of any foreign debris that might be adhering to them.

NOTE: All evidence containers are to be sealed, marked as to their contents, initialed, and dated by the individual collecting and sealing the container.

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   c. Do not use evidence tools for any reason.

C. **SPECIAL CONSIDERATIONS**

1. Locations Of Toolmarks

   Toolmarks are most commonly found at the point of forced entry and exit, such as house and business burglaries. However, toolmarks can also be found in bone and cartilage from attacks by sharp or blunt instruments.

2. There are two primary types of toolmarks – “impressed” and “striated”.

   a. Impressed toolmarks are produced when a hard object is brought into contact with a softer object and there is no lateral movement between the objects at the moment of contact. The mark or marks produced are a negative image of the harder object. Some examples are: the impression of a hammerhead; the impression of a pry tool in a wood frame; or a stamped impression caused by a punch or other similar tool.

   b. Striated marks are produced when a hard surface is brought into contact with a softer surface with lateral movement between the surfaces at the moment of contact. The marks produced are a series of parallel striae. Some examples are: the cutting of lock shackles, chain or chain-link fence; pry marks found on metal door frames; scrape marks caused by the slippage of teeth-jawed tools such as pliers and wrenches. The striated toolmark is generally of more evidentiary value than the impressed toolmarks because striated toolmarks may be positively matched to a specific tool. Generally, it can only be determined that impressed toolmarks have class characteristics which would be consistent with a particular group of tools unless the tool displays significant individual damage.

3. The Following Information Should Be Submitted With Each Toolmark Case.
   a. Exact location from where evidence was obtained, and relationship to other surfaces.
   b. A simple sketch of where the submitted object was at the time of discovery will also aid the toolmark examiner.
   c. If the object is a length of wire or cable, then notations must be made as to which cut ends are evidence and which the investigator cut.
4. Photographs.

   Photographs are helpful in showing the location of the object containing the toolmark, but they are of no value for identification purposes.

D. **ANALYSIS AND REPORT**

1. Possible Laboratory Determinations
   a. Toolmark
      1). Size and type of tool used.
      2). Unusual aspects of the toolmark, if any.
      3). If the toolmark is of value for comparison purposes.
   b. Toolmark and Suspect Tool
      1). Microscopic and macroscopic examinations of the tool and toolmark for the presence of foreign deposits.
      2). Determination if the class characteristics of the tool are consistent with the toolmark.
      3). Did the submitted tool make the toolmark? This may be determined through microscopic comparisons of test-toolmark impressions with the evidence toolmarks.
   c. Two Toolmarks Each From Different Locations
      1). Did the same tool or different tools make the marks?
      2). Size and type of tool(s) used to make the marks.
   d. Tools
      1). Macroscopic and microscopic examinations for the presence of foreign debris that might relate a tool to a specific crime scene.

2. Possible Conclusions
   a. The submitted tool can be eliminated as having made a specific toolmark.
   b. The class characteristics are consistent, however, due to an insufficient amount of individual characteristics, the submitted tool can neither be identified nor eliminated as having made a specific toolmark.
   c. The submitted tool did make a specific toolmark.

N O T E S

VIII. SERIAL NUMBER RESTORATION

A. INTRODUCTION

The restoration of obliterated stamped markings usually is associated with attempts to identify stolen weapons, vehicles, tools, appliances, or other items with a stamped identification number. Restoration of obliterated markings on substances other than metal may be possible.

B. PURPOSE

1. To restore an identifying mark on an article.
2. To show that an identifying mark has been deliberately obliterated.

C. COLLECTION AND PRESERVATION

1. Photograph the area of the identifying mark in place.
2. If the item is too large to submit, attempt to remove the part or portion of the article containing the identifying mark.
3. Package the item containing the identifying mark so that no further damage is done to the mark area.

D. ANALYSIS AND REPORT

1. Results of the restoration attempt will be reported giving the complete identification mark, if possible.
2. If only partial restoration is possible, the numerals or marks restored will be reported.
3. The method of obliteration (drilling, heliarc, welding, or grinding) will be reported as such.

E. FIELD RESTORATION

See ***XVIII. APPENDIX D – Field Restorations***.

CBI FORENSIC LABORATORY

PHYSICAL EVIDENCE HANDBOOK, VERSION 5.1

AUGUST 2007

N O T E S

IX. SEROLOGY AND DNA

Biological analysis consists first of locating and identifying blood, semen, and saliva. Other biological samples such as fecal material, urine, or other DNA-containing tissues can also be recovered for further evaluation. Once stains are collected and submitted to the CBI Laboratory for identification, further testing may be performed to attempt to identify genetic information specific to a stain.

NOTE: CBI does not handle toxicology requests (blood alcohols, etc.

A. INVESTIGATIVE VALUE OF BODILY FLUIDS

1. Location of a Crime Scene - Identification of blood that matches the victim or semen matching the suspect can pinpoint the area for a crime scene search.
2. Determining the Possible Commission of a Crime - Occasionally, the finding of human blood on a highway, sidewalk, porch, or in a car is the first indication of a crime's occurrence.
3. Identifying the Weapon Used - The genetic typing of human blood identified on a club, knife, or hammer can be of considerable investigative and prosecutorial value.
4. Proving or Disproving a Suspect's Alibi – The indication of human blood on an item belonging to a suspect who claims it was animal blood can be of investigative value. The finding of animal blood can substantiate the claim of an innocent person.
5. Eliminating Suspects – If the human blood found on items belonging to a suspect does not match the victim, that individual may be eliminated as a suspect. Blood found on an item that matches the suspect can help to substantiate a suspect's claim of having a nosebleed or other injury. A suspect of sexual assault may not be the person of interest if the DNA from a seminal stain does not match that suspect.
6. Source of a Stain – DNA analysis may be performed on a stain and on a standard from an individual. A person may be excluded or included as having deposited a particular stain. This information may be used for a number of investigative purposes.

B. INFORMATION DETERMINABLE BY BODILY FLUIDS

1. Blood
   a. Chemical and immunological analyses are necessary to indicate blood. The appearance of blood can vary greatly depending on the age of stains and on other factors.
   b. Determination can be made as to whether the blood is of human or animal origin.
   c. A DNA profile can be developed by the CBI if the blood is human in origin.
2. Semen
   a. Chemical and immunological analyses can be used to indicate the stain as semen.
   b. Microscopic examination of the stains can be used to identify the stain as semen due to the presence of human sperm.
   c. A DNA profile can be developed by the CBI if the semen is human in origin.
3. Saliva
   a. Chemical analyses can be used to presumptively identify the stain as saliva.
   b. The CBI cannot positively identify the stain as saliva.
   c. DNA analysis can be attempted from any stain that might be saliva.
4. Urine and Fecal Material
   a. Chemical analyses can be used to presumptively identify urine and fecal stains.
   b. The CBI cannot positively identify stains as urine or fecal matter.
   c. DNA analysis can be attempted from these stains although it may be difficult to develop an interpretable profile.
5. Other Tissues and Stains
   a. The CBI cannot identify stains as vaginal fluid; however, ample DNA is usually present to develop a DNA profile.
   b. Many other stains or items may be analyzed in an attempt to develop a DNA profile. DNA analysis can be attempted on any item that is thought to have cells containing nuclear DNA material. Examples of these items include skin samples, body tissues, earrings, and eyeglasses.

c. Ownership of clothing items may be attempted through DNA analysis. This can be done on items such as hats or shirts.

d. If there are questions as to the likelihood of success from an item for DNA analysis, please contact your local CBI laboratory.

C. LOCATION AND TESTING OF BODILY FLUIDS AT A CRIME SCENE

NOTE: Not all possible stains or scenarios are covered. This is meant to be a general guide for assistance only.

1. Blood

   a. Visually look for any red-brown stains at the scene. Note that stains may range from pinkish shades to light to dark red-brown in color.

   b. Tests to preliminarily identify a stain as blood are available through several crime scene supply vendors. Please refer to those vendors for further information on their testing protocols. It is recommended to receive training prior to the use of presumptive tests. When conducting presumptive testing, do not consume either the entire sample or a significant portion of the sample.

   c. Reagents such as luminol may be used to locate latent bloodstains.

2. Semen

   a. Visually look for any white to yellow stains. Also note that semen stains can be almost brown in color. These stains may also have some crusting.

   b. An alternate light source may be used to locate semen stains. With the use of these devices and associated equipment, semen stains will typically fluoresce. Please refer to crime scene supply vendors for further information.

   c. After location of a possible stain, it may be presumptively tested for the presence of semen. Some tests are available from commercial crime scene supply vendors. It is recommended to receive training prior to the use of presumptive tests. When conducting presumptive testing, do not consume either the entire sample or a significant portion of the sample.

3. Saliva
   a. Visually, saliva stains can be difficult to locate. It is possible that some crusting or dried food bits may be visible in the stain.
   b. Saliva stains may fluoresce slightly when viewed with an alternate light source.
4. Urine
   a. Visually look for yellow stains.
   b. Urine stains may have an odor of ammonia although it is never recommended to directly smell any stain at a crime scene due to the possible presence of harmful substances.
   c. Urine stains may fluoresce slightly when viewed with an alternate light source.

D. DOCUMENTATION OF BODILY FLUID STAINS IN A CRIME SCENE

All bodily fluid stains or items with bodily fluid stains must be properly documented within a crime scene prior to collection.

1. Photography
   a. It is recommended to take photographs of every bodily fluid stain or item with a bodily fluid stain prior to collection.
   b. The following photographs should be taken:
      1). photographs that place the item in the crime scene,
      2). photographs that show the individual stain or item, and
      3). close-up photographs of the item or stain both with and without scale.
   c. All stained areas should be photographed with and without scale prior to removal from an item.
2. Diagram and Notes
   a. It is recommended that all bodily fluid stains and items with bodily fluid stains be diagrammed prior to collection.
   b. The location of bodily fluid stains and items with bodily fluid stains should be placed into a general diagram of a scene. It may be necessary to produce a “close-up” diagram of the scene for several stains.
   c. The location should be documented by measuring the distance from two different objects, such as a north and an east wall or the floor and the side of the door jamb.

d. The size of the stain or stain complex should be recorded.

e. All testing performed on a bodily fluid stain must be documented in the notes.

E. COLLECTION, MARKING AND PACKAGING OF BODILY FLUID STAINS

1. Collection

a. It is preferable to collect the entire item with a bodily fluid stain, if possible, for submittal for examination.

b. If the item is too large, the following techniques may be used, <u>in order of preference</u>.

1). Cut stains from item (e.g., wood, drywall, carpet).

2). Collect stain on swab or swatch.

i). Swab the stain from the item using a minimum amount of distilled water or saline solution (e.g., "Ocean") on cotton swabs or swatches. <u>Be sure to keep the stain as concentrated as possible.</u>

ii). Collect a swab from an unstained area next to each stain ("substrate sample").

iii). Collect one swab with only the collection reagent ("reagent blank") used for collection. One swab is adequate for the entire scene if the same collection reagent was used.

iv). Allow swabs/swatches to air-dry prior to packaging.

v). Do not store swabs/swatches in plastic bags or sealed plastic tubes.

3). Tape may be used to collect the stain if it is on a smooth, non-porous surface.

i). Place tape over the stain and rub the stain

ii). Affix the tape to piece of plastic (e.g., plastic bag) to protect it. It can then be easily removed and examined at the laboratory.

iii). Do not let the tape become stuck to itself.

4). If sample amount is heavy and there is no other alternative way to collect, flakes or scrapings may be collected from the dried stain. This method should be used only as a last resort when other methods listed cannot be utilized or in an instance where the evidence must be collected immediately due to possible loss and swabs or tape are not available.

i). Scrape crusts from surface with clean/new blade into a paper fold.

ii). Use mask or handle carefully to avoid inhalation of flakes.

iii). Seal the paper fold properly (do not encase the paper fold in tape). Place paper fold in envelope.

c. Clothing or Bed Linens

1). Each item should be packaged separately to maintain the integrity of any other trace evidence on the garment or linen. Items requiring trace examination should be wrapped separately in paper and placed into a paper bag and sealed.

2). For clothing worn by an individual, the person should undress on white paper. The white paper should also be submitted for possible trace evidence.

d. Wet or Moist Items

1). Moist stains and wet garments/linens must be air-dried at room temperature before wrapping and packaging to avoid putrefaction of the bodily fluid stains.

2). A dry cotton swab or swatch can be used to soak up a wet bodily fluid stain (i.e., from a pool of blood). These swabs/swatches must be allowed to dry at room temperature prior to sealing packaging.

3). Drying should be done by exposure to air in a secure and well-ventilated room. Items should not be exposed to direct sunlight or heat (no hair-dryers). Items should be separated from each other to avoid cross-contamination.

4). Note on packaging that items were wet at time of discovery and collection.

e. Liquids

1). If a liquid, such as toilet water, needs to be collected, collect an amount ample for analysis. Place in a sterile or clean leak-proof container, seal and refrigerate.

2. Identification or Marking of Items
   a. For clothing or bed linens, investigator's identifying marks should be directly on the fabric in ink, or an evidence tag, away from stained areas. They can also be placed on the packaging if location or damage of stains is an issue.
   b. Mark case information and location of collection on outside of container. If known, mark owner of item on packaging.
   c. The initials of the collector of the item should be marked on the package.
3. Packaging of Items with Bodily Fluid Stains
   a. Items should always be air-dried prior to packaging.
   b. Items for serological analysis should be packaged in paper. Packaging items include paper bags and envelopes.
   c. If the item is too large to be packaged in a paper bag, the item can be wrapped in paper. Alternatively, the location of the stain can be covered with paper and sealed.
   d. All evidence containers should be sealed. The initials of the person sealing the container and the date should be written across the seal so that half of writing is on tape and half is on the package.
4. Storage of Items
   a. All items with biological stains/evidence should be stored air-dried at room temperature.
   b. All liquid biological fluids, e.g. blood, must be refrigerated.
   c. Biological tissue samples must be kept frozen.

F. SEXUAL ASSAULT EVIDENCE KITS

1. Sexual assault evidence kits for the victim and/or suspect should be collected by qualified medical personnel.
2. Kits developed with the CBI and the Colorado Sexual Assault Nurse Examiners input for use within with the state of Colorado may be purchased from Sirchie.
3. The directions for the collection of sexual assault evidence are listed on the Colorado Sexual Assault Evidence kit packaging and within the kit itself.
4. Kits should be kept at room temperature until submittal to the laboratory.
5. Kits should be submitted to the laboratory as soon as possible.

G. BITE MARKS

Be certain to look for bite marks and "suck" marks in sexual assault, child abuse, and homicide cases.

Some guidelines for dealing properly with this type of evidence follows, however, if you are uncertain about any of the steps, please contact a forensic odontologist before dealing with the bite mark.

1. Collection and Preservation
   a. Photography
      1). Photograph general views of the bite mark to "place" it on the person.
      2). Photograph the bite mark initially without a scale.
      3). Photograph the bite mark using two scales (cm. is preferred) at right angles to each other (one on side of bite mark, one on bottom). Retain and submit actual scales used.
      4). Bite marks are usually on a curved surface. Take several photographs – one showing the center of the bite, another showing lower part, and another showing upper part. Mark accurately.
      5). Color photos are best. Black and white photos may be used if color is not available.
      6). In addition, infrared and ultraviolet light photos may be taken if available.
   b. Collection of Saliva
      1). Swab area for saliva.
      2). Do not swab impression itself. Swab the area in the center of the bite mark or around it.
      3). Use cotton-tipped applicator swabs moistened with distilled water.
      4). Air-dry all swabs.
      5). Place into paper envelope, label, and seal.
   c. Local Dentist
      1). Have the dentist examine the bite mark and write a very detailed and accurate description.
      2). Have the dentist make a "cast" of the bite mark impression, using low viscosity rubber or silicone based material. Back this with dental stone.

d. Submit photographs and "casts" to a forensic odontologist for examination. Models of the test of all subsequent suspects (or victim) will subsequently be requested.

2. Special Considerations and Precautions

   a. If a tissue specimen must be submitted, make sure an adequate area around the bite mark is excised.

   b. Put the tissue specimen in dry ice, not a fixative. Fixatives will cause shrinkage of the tissue.

   c. If a bite mark is an area where the victim could possibly have caused it themselves (in a struggle with an attacker), models of the victim's teeth may be necessary, as well as those of the suspect.

   d. If the services of a forensic odontologist are needed, please call the closest CBI laboratory for a reference.

   e. If DNA analysis is required on the swabs collected from the bite mark, standards will be required from both the person with the bite mark and the person who allegedly left the bite mark.

H. STANDARDS

1. Standards must be collected for DNA comparison. If there are named suspect(s) and victim(s), DNA analysis will not proceed without standards from the listed individuals.
2. Standards must be collected from all involved individuals, including but not limited to suspect(s), victim(s), and consensual sex partners.
3. It is recommended to collect four (4) buccal or oral swabs as standards from each person. These swabs should be air-dried prior to packaging in a white or manila envelope.
4. A blood standard may also be collected in a purple-topped (EDTA) vacutainer.
5. Mark case information and name of individual on each package. Have person who collected the sample(s) initial the package.
6. If a tube of blood is collected, protect it in Styrofoam, bubble wrap, or several layers of paper for insulation. Seal in a plastic bag to contain possible spills.
7. Liquid blood must be kept refrigerated (not frozen) and submitted to the laboratory as soon as possible.
8. If the person received a blood transfusion, submit a pre-transfused blood sample if possible (whole blood taken before transfusion – check with hospital).

I. GENERAL INFORMATION

1. Handle all items with gloves.
2. Do not talk, cough, or sneeze over items that will be examined for DNA material.
3. Handle all items with bodily fluid stains as potentially biohazardous items.
4. Never allow bodily fluid specimens to come into contact with a human body to avoid mixing of bodily fluid stains.
5. Never allow weapons that will be submitted to the laboratory for analysis into the autopsy suite.
6. If an item will require fingerprinting as well, handle it appropriately to avoid removal or smudging of possible prints.
7. Be aware of all other trace evidence (e.g., fingerprints, hairs, fibers, glass) when processing items for serological evidence. Handle all items gently (avoid shaking) to protect potential trace evidence.
8. Items for serological analysis should be kept cool until submittal to the laboratory. Items requiring both serology and fingerprint analyses must be kept at room temperature.
9. Submit all items to the laboratory for analysis as soon as possible.
10. It is not possible to positively identify a bodily fluid stain as coming from a particular person to the exclusion of all other individuals in the population. However, greater than 99.9% of the population can be excluded by current DNA technologies and it may be reported by the CBI that, to a reasonable degree of scientific certainty, a person is the source of the stain.
11. The race of the person from a bodily fluid stain cannot be ascertained with CBI DNA technologies. Sex may be determined with DNA analysis.
12. The age of a dried stain cannot be determined with current CBI technologies.

N O T E S

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X. HAIRS AND FIBERS

A. PURPOSE OF THE EXAMINATION

Hairs and fibers are among the most commonly recovered items of trace evidence encountered during the investigation of a contact crime such as rape, hit and run, assault, or homicide. These examinations are valuable in that they assist in the following areas.

1. Placing the suspect or victim at the scene of the crime.
    a. Interchange of hairs or fibers between the victim's and suspect's clothing in crimes such as rape, assault, and murder.
    b. Hairs or fibers from a suspect left at the scene of crime such as burglaries, armed robberies, and car thefts.
    c. Buttons with threads adhering to them, or ropes and other types of cordage may provide valuable links.
    d. Carpet fibers may be present on footwear or clothing of suspect or victim.
2. Identifying the weapon or the instrument of a crime - hairs or fibers on wrenches, knives, or clubs.
3. Identifying hit-and-run vehicles with hairs or fibers adhering to suspect automobile. In hit-and-run auto accidents it is not uncommon to find fabric imprints on the suspect vehicle.
4. Corroborating witness testimony. An eyewitness statement carries more impact when laboratory examination tends to corroborate an account of the happening, thus adding credence to the statement.

B. INFORMATION DETERMINED FROM AN EXAMINATION OF A HAIR

1. Whether Animal Or Human
    a. If animal, the genus, family, or species from which it originated (dog, cat, deer, cow, etc.) may be determined.
    b. If human, the race, body area, indications of forcible removal, damage, and alteration (bleaching or dyeing) may be determined.
    c. If similar or dissimilar to a known sample of hairs.
    d. Is good circumstantial evidence.
    e. Age and sex cannot be determined.

2. Information Determined From Fiber Examinations
   a. Identification of the type of fiber.
      1). Animal (e.g. wool).
      (2). Vegetable (e.g. cotton).
      (3). Synthetic (manufactured – e.g. polyester).
      (4). Mineral (e.g. glass).
   b. Determination as to whether or not questioned fibers are the same type and/or color and match in microscopic and chemical characteristics with those fibers of which a subject's garment is comprised.
   c. Is good circumstantial evidence.

C. THE COLLECTION AND PRESERVATION OF HAIRS AND FIBERS

1. The item to be examined for hairs and fibers should be initialed, carefully packaged to contain all adhering materials, and submitted to the laboratory. If this is not possible, remove the hairs and fibers that are visible (oblique lighting will sometimes help), place in a paper fold to contain the evidence, and place this container in an envelope. This envelope should be individually identified, sealed, initialed and then submitted to the laboratory.
2. If clothing worn by a victim or a suspect is thought to contain hairs or fibers, the garments should be removed from the person over paper to catch any loose hairs or fibers that may fall. The clothing should be initialed and placed in a bag, sealed, and identified. Each item should be packaged separately. For victims, especially of sex assaults, this will be done as part of their hospital examination.
3. When the analysis of fibers is pertinent to a crime investigation, a fiber standard (also referred to as a known sample) should be submitted. It is best if the entire item suspected as being the source of the fibers is submitted. When this is not possible, or practical, a cutting from the item may be taken. This sample cutting must represent all the fiber types present in the item. Typically, a 1-3 inch square piece will suffice. Place the cutting in a paper fold then place the paper fold in an envelope that is identifiable, sealed and initialed.
4. In cases where examination of items for hair may assist in the investigation, head and/or pubic hair standards (knowns) from each person involved should be submitted. Each standard should consist of 25 hand-pulled hairs representing all obvious hair types in that particular hair region. Place hairs in a paper fold, and then place the paper fold in an

envelope that is identifiable, sealed and initialed. Package standards from different body areas and from different individuals separately.

On rare occasion hairs from other body areas (face, arm, chest, etc.) may be informative. It should be noted that these comparisons have less evidentiary value than do the head and pubic hair comparisons. However, if such a comparison is requested, a standard consisting of approximately 25 hand-pulled hairs from that body region from all individuals involved is required.

5. When the comparison of animal hairs is requested, a hand-pulled standard of 50 hairs from the animal in question may be required. The standard should be representative of all obvious hair types from that animal (colors, guard hairs, lengths). Again, it should be noted that these comparisons have limited evidentiary value. Place hairs in a paper fold, and then place the paper fold in an envelope that is identified, sealed and initialed.

D. SPECIAL CONSIDERATIONS

1. There are three basic conclusions that may be derived through a microscopic examination and comparison of hairs.
   a. The hairs from the questioned source are similar in morphological characteristics to a given known sample and, therefore, could have come from the source of the known sample.
   b. The hairs from the questioned source are dissimilar to the hairs in the given known sample, and therefore, most likely did not come from that source; or,
   c. No conclusion could be reached as to whether or not the questioned hair specimen could have come from the source represented by the known sample.
2. Human hair of a probative nature will be evaluated for further comparison using DNA techniques.
   a. The CBI laboratory system currently offers nuclear DNA analysis. DNA of this type is found only on a hair that has sufficient nuclear material on its root.
   b. Any hair suitable for nuclear DNA analyses must fit the criteria for submission to the CBI's DNA section.
   c. Hairs that do not have a root, or the root does not have sufficient tissue associated with it may be analyzed using mitochondrial DNA analysis. This is a service not provided by the CBI, but which is available from the FBI and several private laboratories. Consideration should be given

by the submitting agency and their district attorney to this further analysis when case appropriate.

3. There are two basic results of a positive association between fibers:
   a. Microscopically similar
   b. Chemically similar

   One or both of these results may be reported, depending on the fiber type and the particular analyses that have been performed.

N O T E S

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XI. FOOTWEAR, TIRE TREAD, AND MISCELLANEOUS IMPRESSIONS, EXAMINATION AND COMPARISON

A. PURPOSE OF EXAMINATION OR COMPARISON

1. Examine crime scene impressions to determine suitability for comparison.
2. Determine if footwear belonging to the suspect was the source of the crime scene impressions.
3. Determine if tires from the suspect vehicle were the source of the crime scene impressions.
4. Determine if a known item, such as an item of clothing, was the source of a crime scene impression.

B. LOCATE, PRESERVE, AND COLLECT

1. Tracks

   Tracks are generally the most overlooked piece of evidence at the crime scene and therefore are usually damaged, or destroyed during the initial stages of responding personnel.

   a. Total security of the crime scene area must be obtained.
   b. Extend secured area beyond the outer perimeter of the crime scene.
2. Indoor Scenes

   Generally consist of combinations of three (3) types of shoe tracks.

   a. Dust tracks on the floor or furniture, etc.
   b. Residue tracks on the floor, door, or on any object within the structure.
   c. Latent (invisible) tracks on the floor or other surfaces.
3. Outdoor tracks
   a. Generally consist of tracks in the soil, snow, or residue tracks on the surface on an object.
4. Basic Preservation Methods

   There are four (4) basic preservation methods of shoe/tire tracks for any type of crime scene.

   a. The original item
   b. Photographs, negatives, and digitally captured images
   c. Lifts
   d. Casts

5. Original Item of Evidence

   The original item of evidence is any moveable object on which there may be a track impression.

   a. Photograph and sketch the item in the original location before picking up and collecting.

   b. Take care to protect the track impression during collection, transportation, and storage.

   c. Do not cover the track with transparent tape or plastic.

6. Photographs

   a. All tracks must be photographed before any other method is used to enhance or collect the impression. Digital cameras that are set to capture an image at 72ppi are not sufficient to capture footwear or tire track images.

   b. There are two (2) types of photographs of track impressions at a crime scene.

      1). General track photographs: photographs that show the tracks within the crime scene in relationship to the surroundings and direction of travel.

      2). Comparison track photographs: photographs of one track impression for comparison to the suspect's shoe/tire by a qualified expert.

   c. General scene track photographs.

      1). Four (4) corner method.

      2). Long distance, mid-range, close up.

   d. Comparison track photographs.

      1). Use a film formatted type of camera or a digital camera of 8 meg or better.

      2). Black and white film with lowest ASA as possible or a high-resolution digital camera.

      3). Mount camera on a tripod.

      4). Always include a thin, flat, rigid scale next to each track showing length and width.

      5). Fill viewfinder with track and scale, length to length. Fill the viewfinder of the digital camera to maximize the pixels.

      6). Focus, f-stop, and shutter speed are critical.

7). The light source is held to the side at a low oblique angle to the track.

8). Multiple exposures (3 to 4) must be made of the same track with the light source from different sides (4, 8, and 12 o'clock).

9). Submit all developed photographs, negatives, or CD of digital images, of tracks to the CBI Laboratory. Do not cut the negatives.

10). Photography steps may need to be repeated during processing, (i.e. snow wax, powdering, etc…)

7. Lifts – Latent, Dust, Or Residue Tracks

   a. Partial shoe tracks may be very difficult to locate at the scene.

   b. Darken the room and hold a flashlight at a low oblique angle to the surface, floor, door, etc.

   c. Lifting materials.

      1). Electrostatic dust lifter

      2). 4" wide fingerprint tape

      3). Clear adhesive lifters

      4). White or black gel lifters

      5). Silicone casts

   d. Fingerprint powder may develop latent tracks or enhance residue tracks.

8. Casts

   a. Tracks in the ground should be cast after completion of the appropriate photography.

   b. Dental gypsum material (dental stone) and Hydrocal, are the most current product being recommended nationwide.

   c. The CBI Laboratory uses "Denstone" or "Hydrocal" for casting and silicone casting in specific instances.

   d. Dental stone/Hydrocal can be obtained from crime scene suppliers or purchased in bulk 25#, 50#, 100# bags from any dental supply business.

      1). Approximately two (2) pounds of dental stone is put in an oversized (allow room for water and mixing) ziplock plastic bag and can be stored until needed.

      2). Add approximately 12 ounces (may vary +/-, depending on product) of water and knead mixture.

3). Kneading will take between one (1) to two (2) minutes.

4). The consistency of the mixture should be smooth like pancake batter without lumps as it is being poured into the track.

5). The mixture should be held just above the surface and poured next to the track to allow it to flow into and cover it.

6). No reinforcement material is needed for dental stone and Hydrocal casts.

7). Allow the cast to set undisturbed for at least 30 minutes (longer in colder weather) before picking up.

8). Do not remove any soil and/or attempt to clean the cast before sealing and submission to the Laboratory. Laboratory personnel will clean the cast as needed.

9). Write all identifying data on the back of the cast before picking up or etch information into the cast prior to completely drying (i.e. case number, direction, initials, date, etc.).

10). Put the cast, track side up, in a cardboard box (never a plastic bag) for transporting to the office.

11). Allow the casts to dry for at least a couple of days before sealing in a cardboard box (never plastic).

e. Silicone casting.

1). Used for rough areas (i.e. tile, plastic, etc.) where lifting tape may not be best.

2). Follow manufacturers directions for use.

f. Tracks in the snow should always be cast after comparison photography.

Casts of tracks in snow are difficult to obtain and require care and patience during the casting procedure.

1). “Snowprint-wax®” is one of the most current methods that may obtain a quality cast. The directions are on the can.

2). Re-photograph for comparison photos (may enhance).

3). Allow the wax to set up before pouring the dental stone mixture onto the track.

4). Allow the cast to set and the wax will adhere to the dental stone and will lift as one cast impression.

5). The wax impression will always remain somewhat soft and requires great care during transportation, handling, storage, sealing, and submission to the Laboratory.

C. COLLECTION AND SUBMISSION OF SHOES AND TIRES TO THE LABORATORY

For many crime scenes it may be necessary to obtain shoes for elimination from anyone who is known to have entered into the crime scene before the tracks were collected.

1. Seize shoes suspect is wearing.
2. During the execution of a search warrant, search for and seize all shoes that have the general sole pattern design observed at the crime scene. Do not stop the search just because one pair of shoes has been located.
3. Seal each pair of shoes in a paper bag, separately, that is being submitted to the laboratory. Send both the right and left shoe.
4. Identify each pair of shoes with its own item number, name of owner, date acquired, and where located.
5. Do not attempt to clean the soles or remove imbedded material before sealing and submission to the Laboratory (submit as they are).
6. Allow the shoes to dry naturally, if they are wet, before sealing and submission to the laboratory. NEVER place the footwear in plastic bags without allowing them to dry first.
7. Tires from the suspect's vehicle should be obtained with the authority of a search warrant.
8. Remove and seize all tires (on rim). Multiple crime scene tracks may have more than one pattern design.
9. Identify on the sidewall of the tire its location on the vehicle. (i.e. drivers side front, passenger side rear, etc…)
10. List each tire with its own item number and location on the Laboratory Submission Form.

D. ANALYSIS AND REPORT

1. Each track impression, be it a photograph, cast, lift, or impression must stand on its own without regard to other sources of information, including other track impressions.

2. The conclusions of the CBI Laboratory examiner will be decided entirely on what was transferred into the track impression and the quality of the preservation and collection procedures utilized at the crime scene.
3. Laboratory report results.
    a. Insufficient detail or quality for comparison.
    b. The shoe or tire did not make the track
    c. The shoe or tire could not be excluded as making the track.
    d. The shoe or tire could have made the track.
    e. The shoe or tire is highly probable as making the track.
    f. The shoe or tire did make the track.

N O T E S

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XII. FORENSIC DOCUMENT EXAMINATION

A. DOCUMENT EXAMINATION

1. Examinations Conducted

- Handwriting & Signatures
- Typewriters
- Computer Printers
- Commercial Printing
- Photocopiers
- Other Office Equipment (color copiers, facsimile, check writers, etc.)
- Alterations, Obliterations & Erasures
- Indented Writing
- Preservation & Reconstruction of Documents (charred, soiled, water-soaked etc.)
- Stamp Impressions
- Ink Analysis (non-destructive and partially destructive chemical analysis)
- Paper Analysis (limited)
- Physical Match (paper documents & other items)

NOTE: If you have a case containing unusual evidence, don't hesitate to contact an analyst. We may be able to assist you!

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2. Handwriting & Signature Examination

a. Purpose

1). To identify or eliminate known writers.

2). To render testimony in the capacity of an expert witness.

NOTE: √ **Identifications DEPEND on the QUALITY & QUANTITY of the Questioned and Known writings.**

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b. Collection

1). Use tweezers or gloves and use care in handling questioned item(s).

2). Protect for Latent Prints and/or DNA, if appropriate.

3). Do not handle or fold. If folding is necessary, fold at pre-existing creases.

4). Handwriting exemplars can be obtained through two (2) sources:

- Request Samples - obtained by dictating the material to the subject
- Non-Request Samples - produced in the normal course of business

i). Request Samples, the dictated samples, should replicate the questioned document in the following areas.

(a.) Text (wording)

A's cannot be compared to G's
JONES cannot be compared to SMITH
Cursive handwriting cannot be compared to printing

(b.) Writing Instrument (i.e., ball point pen, fiber tip, roller ball, pencil)

(c.) Format of the Document (i.e., check, application form – spatial considerations)

(d.) Document Type (i.e., small plain torn robbery note, check, application form, etc.)

NOTE: If the questioned material is on lined paper, provide lined paper for the exemplars.

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(1). Get at least several specimens repeating each questioned writing/document.

- Signatures and Checks – 15 to 20 repetitions of the questioned text
- Extended writings – 5 to 10 repetitions of the text that is most pertinent to the case (or 2 –3 repetitions for multiple paged letters, etc.)

(2). Allow subject to complete one signature or exemplar per sheet of paper or form (do not obtain samples in list format (e.g. signatures on one page or 3- check exemplar forms on one page)

(3). Exemplar should be obtained from both the victim and suspect.

(4). Initial & Date each handwriting specimen the subject completes.

(5). If you suspect DISGUISE – get NON-REQUEST writings.

ii). Non- Request Samples

- A list of possible sources for non-request writing is attached.
- These specimens should contain the same writing style as the questioned writing, with similar letter and word combinations.

c. Preservation

1). The document should be maintained in a cool, dry storage area.

2). Avoid contact with liquids.

3). Do not expose to humidity, bright light, or unusual heat. Do not place this document in the trunk of a car during summertime.

4). Do not chemically process for latent fingerprints prior to document examination.

5). Do not add indentations by writing on top of the questioned document(s); (i.e., address of an agency on an envelope while the evidence is enclosed).

d. Packaging

1). Package questioned and known items separately with seals.

2). If possible, mark an inconspicuous area of the item. Otherwise, mark the packaging.

3). Identify item number and description on packaging prior to enclosing evidence. (Do not write on the packaging with the items enclosed.)

4). Clearly identify the documents to be examined for handwriting and/ or signatures on all transmittal forms.

5). If dry, use paper or plastic envelopes or bags. If the item is wet, contact the Forensic Document Section of the CBI Laboratory.

e. Analysis and Report

f. Identification

1). Highly Probable did/did not.

2). Probable did/did not.

3). Evidence to Suggest did/did not.

4). No Conclusion.

NOTE: A DETAILED EXPLANATION OF THESE OPINIONS IS ATTACHED.

REQUEST EXEMPLARS COVER SHEET

Writer's Name: _____

Date: _____ Location: _____

Witness: (☐ None) _____

Other(s) Present: (☐ None) _____

Position of Writer: _____

Writing Instrument Used: _____

Does writer normally wear glasses/contacts for reading and/or writing?

☐ Yes ☐ No If no, explain: _____

Is the writer taking medication drugs?

☐ Yes ☐ No If no, explain: _____

Is the writer in good/normal health?

☐ Yes ☐ No If no, explain: _____

Does the writer feel comfortable?

☐ Yes ☐ No If no, explain: _____

What hand does the subject normally write with:

☐ Right ☐ Left ☐ Ambidextrous ☐ Other: _____

Writing hand used to complete request exemplars:

☐ Right ☐ Left ☐ Ambidextrous ☐ Other: _____

Text presentation: ☐ Dictated ☐ Typed Information ☐ Other: _____

Exemplar: #	_____	Writing Began:	_____	Writing Completed:	_____
Exemplar: #	_____	Writing Began:	_____	Writing Completed:	_____
Exemplar: #	_____	Writing Began:	_____	Writing Completed:	_____
Exemplar: #	_____	Writing Began:	_____	Writing Completed:	_____
Exemplar: #	_____	Writing Began:	_____	Writing Completed:	_____
Exemplar: #	_____	Writing Began:	_____	Writing Completed:	_____
Exemplar: #	_____	Writing Began:	_____	Writing Completed:	_____

Notes/comments:

CBI FORENSIC LABORATORY

PHYSICAL EVIDENCE HANDBOOK, VERSION 5.1

AUGUST 2007

100 SOURCES NORMAL COURSE HANDWRITING SPECIMENS

1. Account books	52. Leases, real property
2. Affidavits	53. Letters
3. Assignments	54. Library card application
4. Autographs	55. Light company applications
5. Auto insurance policies	56. Life insurance applications
6. Auto License applications	57. Loan applications
7. Auto title certificates	58. Mail orders
8. Bank deposit slips	59. Manuscripts
9. Bank safe deposit entry slips	60. Marriage records
10. Bank withdrawal slips	61. Membership cards
11. Bank signature card	62. Memoranda of all kind
12. Bank statements, receipts for	63. Military papers
13. Bible entries	64. Mortgages
14. Bills of sale	65. Newspaper advertisement copy
15. Bonds	66. Occupational writings
16. Books, signatures of owner in	67. Package receipts
17. Building “after hours” registers	68. Partnerships
18. Business license applications	69. Partnership papers
19. Charity pledges	70. Pawn tickets
20. Check book stubs	71. Passports
21. Checks, including endorsements	72. Payroll receipts
22. Church pledges	73. Pension applications
23. Convention registration books	74. Permit application
24. Contracts	75. Petitions, referendum, etc.
25. Cooking recipes	76. Photograph albums
26. Corporation papers	77. Pleadings
27. Criminal records	78. Postal cards
28. Credit applications	79. Probate court papers
29. Credit cards	80. Promissory notes
30. Deeds	81. Property damage reports
31. Deeds of trust	82. Receipts for rent, etc.
32. Depositions	83. Registered mail return receipts
33. Diaries	84. Releases of mortgages
34. Dog license applications	85. Rental contracts for equipment
35. Drafts	86. Reports
36. Drive-it-yourself applications	87. Retail store sales slips
37. Drivers licenses and applications	88. School and college papers
38. Druggists’ poison registers	89. Social security cards and papers
39. Employment applications	90. Sport and game score cards
40. Envelopes	91. Stock certificates, endorsements
41. Fishing licenses	92. Surety bond applications
42. Funeral attendance registers	93. Tax estimates and returns
43. Gas service applications	94. Telegram copy
44. Gasoline mileage records	95. Telephone service applications
45. Gate records at defense plants	96. Time sheets
46. Greeting cards, Christmas, etc.	97. Traffic tickets
47. Hospital entry applications	98. Voting registration records
48. Hotel and motel guest registers	99. Water company service applications
49. Hunting license	100. Wills
50. Identification cards	101. Workman compensation paper
51. Inventories	

OPINIONS RENDERED

INDENTIFICATION

This is the highest degree of confidence expressed by document examiners in handwriting comparisons. The examiner has no reservations and is certain, based on evidence contained in the handwriting, that the writer of the known material actually wrote the writing in question.

HIGHLY PROBABLE (very probable)

The examiner is *virtually certain* that the questioned and known writings were written by the same individual, however some critical feature or quality is missing so that an identification cannot be reached.

PROBABLE

The evidence contained in the handwriting points rather strongly toward the questioned and known writings having been written by the same individual; however, it falls short of the 'virtually certain' degree of confidence.

INDICATIONS (evidence to suggest)

A body of writing has few features that are of significance for handwriting comparison purposes, however those features are in agreement with another body of writing.

NO CONCLUSION

This is an inconclusive opinion based on significantly limiting factors, such as disguise in the questioned and/or known writing or a lack of comparable writing. The examiner can neither identify nor eliminate the known writer from having prepared the questioned handwriting.

INDICATIONS DID NOT

This opinion carries the same weight as the Indications opinion above, however with indications that the known writer did not prepare the writing in question.

PROBABLE

This opinion carries the same weight as the Probable opinion above, however that it is probable the known writer did not prepare the writing in question.

HIGHLY PROBABLE

This opinion carries the same weight as the Highly Probable opinion above, however that it is highly probable the known writer did not prepare the writing in question.

ELIMINATION

This is the opposite of the Identification opinion above and is the highest degree of confidence expressed by the document examiner in handwriting comparisons. The examiner denotes no doubt in his/her opinion that the questioned and known writings were not written by the same individual.

These opinions were derived from the American Society for Testing and Material (ASTM) – E1658 (Standard Guide – Terminology for Expressing Conclusions of Forensic Document Examiners)

LEGAL CASE CITATIONS PERTAINING TO HANDWRITING EXEMPLARS

United States v. Blakney, 581 F.2d 1389, 1390 (10th Cir. 1978): A defendant may be required to provide a handwriting exemplar duplicating the text of the writing used in the offense.

Gilbert v. California, 388 U.S., 266-267 (1967): Handwriting exemplars submitted by a defendant are not considered self-incriminating.

United States v. Doe, 495 F.2d 436 (2nd Cir. 1968): Suspect compelled to complete sample money orders similar to those upon which the prosecution was based.

United States v. Robinson, 755 F2d 685 (8th Cir. 1987): Defendant compelled to provide handwriting sample with a backhand slant, which was not his normal writing style.

United States v. Campbell, 732 F.2d 1017, 1022 (1st Cir. 1984): The agent obtaining the handwriting from the suspect may dictate the text found in the questioned note.

United States v. Sumpter, 133 F.R.D. 580 (D. Neb. 1990): The defendant may be required to produce handwriting exemplars in which he is told to mimic writing contained in the communication. This includes completing the exemplars in handprinting, not handwriting.

Federal Rules of Evidence

Colorado Rules of Evidence

N O T E S

B. TYPEWRITER EXAMINATION

1. Purpose
   a. To identify or eliminate a specific machine or single element.
   b. To classify the questioned typewriting to a manufacturer type style.
   c. To examine the typewriter ribbon for the questioned text and possible physical match back to the questioned typewriting.
   d. To date the questioned typing.
2. Collection
   a. Use tweezers or gloves and use care in handling questioned item(s).
   b. Protect for Latent Prints and/or DNA, if appropriate.
   c. Do not handle or fold. If folding is necessary, fold at pre-existing creases.
   d. If the typewriter(s) can be located:
      1). The typewriter should be submitted for examination whenever possible.
      2). Collect all ribbons and elements in the vicinity of the typewriter (i.e. in drawers, trash bins etc.)
      3). Note the condition of the typewriter and associated equipment (elements)
      4). **DO NOT** attempt to use the typewriter or change the existing settings
   e. If the typewriter cannot be submitted, the investigator should call a Document Examination Analyst at CBI laboratory.
3. Preservation
   a. Use care in transporting the questioned typewriter to prevent damage (i.e. unnecessary vibration and exposure to water etc.).
   b. The document should be maintained in a cool, dry storage area.
   c. Avoid contact with liquids.
   d. Do not expose to humidity, bright light, or unusual heat. Do not place this document in the trunk of a car during summertime.

e. Do not chemically process for latent fingerprints prior to document examination.

f. Do not add indentations by writing on top of the questioned document(s), (i.e., address of an agency on an envelope while the evidence is enclosed).

4. Packaging

   a. Package questioned and known items separately with seals.

   b. If possible, mark an inconspicuous area of the item. Otherwise, mark the packaging.

   c. Identify item number and description on packaging prior to enclosing evidence. (Do not write on the packaging with the items enclosed.)

   d. Clearly identify the documents to be examined for typewriting on all transmittal forms.

   e. If dry, use paper envelopes or bags. Do not store in plastic or vinyl containers. If the item is wet, contact the Forensic Document Section of the CBI Laboratory.

5. Special Considerations

   a. Examination of the typewriter ribbon.

      1). The ribbon on the suspect machine may contain the written message on the questioned document.

      2). The typewritten text may be examined and compared to the ribbon content for physical matches and transferred fiber impressions.

   b. Dating of a document may be conducted by.

      1). Obtaining known specimens from files that cover a varied time span.

      2). Submitting the service repair schedule of the questioned typewriter.

6. Analysis and Report

   a. Identification.

   b. Highly Probable did/did not.

   c. Probable did/did not.

   d. Evidence to suggest did/did not.

   e. No conclusion.

   f. Elimination.

g. Consistent in class characteristics

h. Classification to a manufacturer's type style

A DETAILED EXPLANATION OF THE LEVELS OF OPINIONS IS LOCATED IN THE HANDWRITING SECTION, "OPINIONS RENDERED" on page 7.

C. COMPUTER PRINTER EXAMINATION

1. Purpose
   a. To identify or eliminate a specific printer.
   b. To classify the questioned type-print to a printer type and possible manufacturer.
2. Collection
   a. Use tweezers or gloves and use care in handling questioned item(s).
   b. Protect for Latent Prints and/or DNA, if appropriate.
   c. Do not handle or fold. If folding is necessary, fold at pre-existing creases.
   d. If the printer(s) can be located the following should be done.
      1). The printer(s) should be submitted for examination whenever possible.
      2). Note the condition of the printer and associated equipment (all hardware such as scanners and software etc.).
      3). **DO NOT** attempt to use the printer or change the existing settings.
      4). If the printer cannot be submitted the following should be done.
         i). Submit all questioned documents along with other printed documents within the vicinity of the computer equipment (i.e. known samples that may have been generated from the printer).
         ii). Contact the Forensic Document Section for further instructions.
3. Preservation
   a. Use care in transporting this evidence to prevent damage (i.e. unnecessary vibration and exposure to water etc.).
   b. The document should be maintained in a cool, dry storage area.
   c. Avoid contact with liquids.

d. Do not expose to humidity, bright light, or unusual heat. Do not place this document in the trunk of a car during summertime.

   Do not chemically process for latent fingerprints prior to document examination.

   Do not add indentations by writing on top of the questioned document(s), (i.e., address of an agency on an envelope while the evidence is enclosed).

4. Packaging
   a. Package questioned and known items separately with seals.
   b. If possible, mark an inconspicuous area of the item. Otherwise, mark the packaging.
   c. Identify item number and description on packaging prior to enclosing evidence. (Do not write on the packaging with the items enclosed.)
   d. Clearly identify the documents to be examined for computer printing on all transmittal forms.
   e. If dry, use paper envelopes or bags. Do not store in plastic or vinyl containers. If the item is wet, contact the Forensic Document Section of the CBI Laboratory.
5. Special Consideration
   a. Submit the CPU and mass storage devices for examination by the CBI Forensic Digital Evidence Analyst.
6. Analysis and Report
   a. Identification.
   b. Highly Probable did/did not.
   c. Probable did/did not.
   d. Evidence to suggest did/did not.
   e. No conclusion.
   f. Elimination.
   g. Consistent in class characteristics.
   h. Classification to a manufacturer's type style.

A DETAILED EXPLANATION OF THE LEVELS OF OPINIONS IS LOCATED IN THE HANDWRITING SECTION, "OPINIONS RENDERED" on page 7.

D. COMMERCIAL PRINTING EXAMINATION

1. Purpose
   a. To identify or eliminate printing equipment as preparing the questioned document(s).
   b. To identify or eliminate other printed documents as originating from the same source as the questioned document(s).
   c. To classify a specific printing process displayed on a document (i.e., offset lithography, flexography, screen printing, letterpress, intaglio, gravure).
2. Collection
   a. Use tweezers or gloves and use care in handling questioned item(s).
   b. Protect for Latent Prints and/or DNA, if appropriate.
   c. Do not handle or fold. If folding is necessary, fold at pre-existing creases.
   d. If the commercial printing equipment can be located do the following.
      1). Note the condition of all pieces of equipment.
      2). Collect all materials such as negatives and printed sheets in the vicinity of the equipment – items should be preserved in separate containers. Do not fold any items.
      3). Use care in transporting any machinery equipment (vibration and exposure to water etc.).
      4). If the commercial printing equipment cannot be located:
         i). submit all other evidence (questioned and known) and separate these items in suitable packaging.

NOTE: If you are unsure as to the type of evidence that needs to be collected, contact the Forensic Document Section for further instructions.

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3. Preservation
   a. Use care in transporting this evidence to prevent damage (i.e. unnecessary vibration and exposure to water etc.).
   b. The document should be maintained in a cool, dry storage area.
   c. Avoid contact with liquids.
   d. Do not expose to humidity, bright light, or unusual heat. Do not place this document in the trunk of a car during summertime.

e. Do not chemically process for latent fingerprints prior to document examination.

f. Do not add indentations by writing on top of the questioned document(s), (i.e., address of an agency on an envelope while the evidence is enclosed).

4. Packaging

a. Package questioned and known items separately with seals.

b. If possible, mark an inconspicuous area of the item. Otherwise, mark the packaging.

c. Identify item number and description on packaging prior to enclosing evidence. (Do not write on the packaging with the items enclosed.)

d. Clearly identify the documents to be examined for commercial printing processes on all transmittal forms.

e. If dry, use paper envelopes or bags. Do not store in plastic or vinyl containers. If wet, contact CBI laboratory staff.

5. Analysis and Report

a. Identification.

b. Highly Probable did/did not.

c. Probable did/did not.

d. Evidence to suggest did/did not.

e. No conclusion.

f. Elimination.

g. Consistent in class characteristics.

h. Classification of printing technology used to produce a particular document.

A DETAILED EXPLANATION OF THE LEVELS OF OPINIONS IS LOCATED IN THE HANDWRITING SECTION, “OPINIONS RENDERED” on page 7.

E. PHOTOCOPY EXAMINATION

1. Purpose

a. To identify or eliminate a specific photocopier.

b. To classify a photocopy with a photocopier manufacturer.

c. To relatively date a particular document that has been photocopied.

2. Collection
   a. Use tweezers or gloves and use care in handling questioned items.
   b. Protect for Latent Prints and/or DNA, if appropriate.
   c. Do not handle or fold. If folding is necessary, fold at pre-existing creases.
   d. Due to the continual influx of more sophisticated photocopier machines, it is recommended that the Forensic Document Section analysts be contacted for instruction in obtaining exemplars.
   e. If the photocopier can be located:
      1). When obtaining copies from the known machine, ENSURE you record the serial number and model identification information on each copy (place all markings on the back side of a photocopy).
      2). Note the condition of the machine and any settings before using the machine to obtain known samples.
      3). Obtain the service schedule of the suspect machine.
   f. If the photocopier cannot be located or if the questioned photocopies are dated:
      1). Obtain known samples from files or drawers. Ensure the dates of these files are as close to the date on the questioned document. Historical files will also assist in the dating of an 'undated' questioned document.
3. Preservation
   a. Use care in transporting this evidence to prevent damage (i.e. unnecessary vibration and exposure to water etc.).
   b. The document should be maintained in a cool, dry storage area.
   c. Avoid contact with liquids.
   d. Do not expose to humidity, bright light, or unusual heat. Do not place this document in the trunk of a car during summertime.
   e. Do not chemically process for latent fingerprints prior to document examination.
   f. Do not add indentations by writing on top of the questioned document(s), (i.e., address of an agency on an envelope while the evidence is enclosed).

4. Packaging
   a. Package questioned and known items separately with seals.
   b. If possible, mark an inconspicuous area of the item. Otherwise, mark the packaging.
   c. Identify item number and description on packaging prior to enclosing evidence. (Do not write on the packaging with the items enclosed.)
   d. Clearly identify the photocopied documents to be examined on all transmittal forms.
   e. If dry, use paper envelopes or bags. Do not store containers. If the item is wet, contact the Forensic Document Section of the CBI Laboratory.
5. Analysis and Report
   a. Identification.
   b. Highly Probable did/did not.
   c. Probable did/did not.
   d. Evidence to suggest did/did not.
   e. No conclusion.
   f. Elimination.
   g. Consistent in class characteristics.
   h. Classification of photocopier, make and model.

A DETAILED EXPLANATION OF THE LEVELS OF OPINIONS IS LOCATED IN THE HANDWRITING SECTION, “OPINIONS RENDERED” on page 7.

F. OTHER OFFICE EQUIPMENT EXAMINATIONS

1. Purpose
   a. To identify or eliminate a particular color copier machine, facsimile machine, checkwriter, or other office technology from having produced a questioned document or text.
   b. To classify a questioned document to a source.
2. Collection
   a. Use tweezers or gloves and use care in handling questioned item(s).
   b. Protect for Latent Prints and/or DNA, if appropriate.
   c. Do not handle or fold. If folding is necessary, fold at pre-existing creases.

d. If the machine (s) can be located:

   1). The known machines should be submitted for examination whenever possible.

   2). Note the condition of the equipment.

e. If the machine(s) can be located, but not submitted:

   1). Collect known samples that have been produced using the questioned machines (in files, drawers etc.).

   2). Contact the Forensic Document Section for further instructions on obtaining known samples.

f. If the machine(s) cannot be located:

   1). Submit the questioned item and any known samples that may have been collected. Package these items separately.

3. Preservation

   a. Use care in transporting this evidence to prevent damage (i.e. unnecessary vibration and exposure to water etc.).

   b. The document should be maintained in a cool, dry storage area.

   c. Avoid contact with liquids.

   d. Do not expose to humidity, bright light, or unusual heat. Do not place this document in the trunk of a car during summertime.

   e. Do not chemically process for latent fingerprints prior to document examination.

   f. Do not add indentations by writing on top of the questioned document(s), (i.e., address of an agency on an envelope while the evidence is enclosed).

4. Packaging

   a. Package questioned and known items separately with seals.

   b. If possible, mark an inconspicuous area of the item. Otherwise, mark the packaging.

   c. Identify item number and description on packaging prior to enclosing evidence. (Do not write on the packaging with the items enclosed.)

   d. Clearly identify the machine-generated documents to be examined on all transmittal forms.

   e. If dry, use paper envelopes or bags. Do not store containers. If the item is wet, contact the Forensic Document Section of the CBI Laboratory.

5. Analysis and Report
   a. Identification.
   b. Highly Probable did/did not.
   c. Probable did/did not.
   d. Evidence to suggest did/did not.
   e. No conclusion.
   f. Elimination.
   g. Consistent in class characteristics.
   h. Classification of photocopier make and model.

DETAILED EXPLANATION OF THE LEVELS OF OPINIONS IS LOCATED IN THE HANDWRITING SECTION, “OPINIONS RENDERED” on page 7.

G. ALTERATION, OBLITERATION & ERASURE EXAMINATIONS

1. Purpose
   a. To determine the presence or absence of an alteration, obliteration, or erasure.
   b. To decipher any concealed or overwritten information on the document.
   c. To identify the origin of the obliterated communication.
   d. To determine and evaluate methods of manipulation including additions, overwriting, ‘cut and paste’, chemical or mechanical erasures, and obliteration using inks and/or correcting fluids.
2. Collection
   a. Use tweezers or gloves and use care in handling questioned item(s).
   b. Protect for Latent Prints and/or DNA, if appropriate.
   c. Do not handle or fold. If folding is necessary, fold at pre-existing creases.
3. Preservation
   a. The document should be maintained in a cool, dry storage area.
   b. Avoid contact with liquids.
   c. Do not expose to humidity, bright light, or unusual heat. Do not place this document in the trunk of a car during summertime.

d. Do not chemically process for latent fingerprints prior to document examination.

e. Do not add indentations by writing on top of the questioned document(s); (i.e., address of an agency on an envelope while the evidence is enclosed).

4. Packaging

a. Package questioned and known items separately with seals.

b. If possible, mark an inconspicuous area of the item. Otherwise, mark the packaging.

c. Identify item number and description on packaging.

d. Clearly identify the documents to be examined for alterations, obliterations, or erasures on all transmittal forms.

e. If dry, use paper or plastic envelopes or bags. If the item is wet, contact Forensic Document Section of the CBI Laboratory.

5. Special Considerations

The usual examination process is nondestructive to the document. If destructive tests on the questioned document are necessary to decipher underwriting, permission to conduct this test will be obtained from the investigating officer and/or prosecuting attorney prior to the examination.

6. Analysis and Report

a. Identification of alteration, obliteration, and/or erasure, and any deciphered original information that was subjected to change.

b. No conclusion.

c. Negative results.

H. INDENTED WRITING EXAMINATION

1. Purpose

a. To decipher and/or recover the indented writing.

b. To identify the origin of the writing on the questioned document.

c. To determine the sequence of pages.

d. To determine alterations and/or insertions.

2. Collection

a. Submit any pads, blotters, sheets of paper, or other substance that may have been indented by a writing instrument.

b. Use tweezers or gloves and use care in handling the questioned item(s).

c. Protect for Latent Prints and/or DNA, if appropriate.

d. Do not handle or fold. If folding is necessary, fold at pre-existing creases.

3. Preservation

a. The document should be maintained in a cool, dry storage area.

b. Avoid contact with liquids.

c. Do not expose to humidity, bright light, or unusual heat. Do not place this document in the trunk of a car during summertime.

d. Do not chemically process for latent fingerprints prior to document examination.

e. Do not add indentations by writing on top of the questioned document(s); (i.e., address of an agency on an envelope while the evidence is enclosed).

4. Packaging

a. Package questioned and known items separately with seals.

b. Package the questioned items between two layers of cardboard.

c. Write on the packaging prior to enclosing the questioned items.

d. Use paper or plastic envelopes or bags.

e. Do not staple or paperclip the questioned items.

f. Clearly identify the documents to be examined for indented writing on all transmittal forms.

5. Special Considerations

Handwriting comparisons may be conducted on recovered indented writings of sufficient quality.

6. Analysis and Report

a. Identification of complete or partial decipherment of indented writing, where applicable.

b. No conclusion.

c. Negative results.

I. PRESERVATION AND RESTORATION OF DOCUMENTS (CHARRED, SOILED, ETC.)

1. Purpose
   a. Attempt to restore and stabilize a document so that information on the document can be made visible and possibly deciphered. These documents may be submitted flat, folded, or in a tight mass.
   b. To decipher the information on a document deteriorated through contact with liquids, moisture, or other foreign substances.
   c. To determine the origin, author, or machine that produced the information on the damaged document.
2. Collection

   The original container holding the damaged documents should be used to transport the items whenever possible. If not, handle minimally using tweezers or gloves and use care in handling the questioned item(s).

NOTE: Due to the fragility of the evidence, the collection and preservation of damaged material must be handled with extreme care or disintegration of this type of document will occur.

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3. Preservation
   a. Do not attempt to separate layers or masses of paper. Submit the items in their existing condition.
   b. If items are wet, do not attempt to dry. Refrigerate the items to prevent the growth of mold and/or mildew. Submit the documents in their current state to the laboratory as soon as possible.
4. Packaging
   a. The original container holding the damaged or charred documents should be used to transport the items whenever possible. Otherwise, a box lined with cotton will suffice.
   b. An information sheet explaining what was damaged or burned may be helpful in separating various segments into logical order.
   c. Identify item number and description on packaging.
   d. If possible, mark an inconspicuous area of the item. Otherwise, markings on the packaging will suffice.

e. Package questioned and known items separately with seals.

f. Clearly identify the documents to be examined and preserved on all transmittal forms.

5. Special Considerations

If the recovered information has sufficient quality, an opinion may be rendered concerning questioned handwriting or machine generated text.

6. Analysis and Report

a. Identification of recovered results.

b. No conclusion.

c. Negative results.

J. STAMP (CACHET) IMPRESSIONS

1. Purpose

a. To classify the type, purpose, and nature of an impression.

b. To identify or eliminate a particular stamp or impression.

2. Collection

a. Use tweezers or gloves and use care in handling the questioned item(s).

b. Protect for Latent Prints and/or DNA, if appropriate.

c. Do not handle or fold. If folding is necessary, fold at pre-existing creases.

d. If the Known Stamp(s) can be located:

1). They should be submitted for examination whenever possible.

2). Regardless, known samples should be collected prior to transport in the event of additional damage occurring during the move.

3). Note the condition of the questioned items and known stamp(s).

4). Use care in transporting the stamp(s) to prevent damage (i.e., exposure to sharp objects, foreign debris, liquids, etc.).

e. If the Known Stamp(s) are located, but cannot be submitted:

1). Obtain multiple samples on similar paper stock using light, medium, and heavy pressure with varying stamping angles.

2). Record how samples were obtained.

f. If the Known Stamp(s) cannot be located:

   1). Obtain known standards from files that are contemporaneous to the date of the questioned document.

3. Preservation

   a. The document should be maintained in a cool, dry storage area.

   b. Avoid contact with liquids.

   c. Do not expose to humidity, bright light, or unusual heat. Do not place this document in the trunk of a car during summertime.

   d. Do not chemically process for latent fingerprints prior to document examination.

   e. Do not add indentations by writing on top of the questioned document(s); (i.e., address of an agency on an envelope while the evidence is enclosed).

4. Packaging

   a. Package questioned and known items separately with seals.

   b. Mark an inconspicuous area, such as in corner on reverse side.

   c. Write on the packaging prior to enclosing the questioned items.

   d. Use paper or plastic envelopes or bags.

   e. Do not staple or paperclip the questioned items.

   f. Clearly identify the documents to be examined for stamp impressions and the known specimens on all transmittal forms.

5. Analysis and Report

   a. Identification to a known source.

   b. Highly probable did/did not.

   c. Probable did/did not.

   d. Evidence to suggest did/did not.

   e. No conclusion.

   f. Elimination from a known source

   g. Consistent in class characteristics.

   h. Classification- process used to create impression.

A DETAILED EXPLANATION OF THE LEVELS OF OPINIONS IS LOCATED IN THE HANDWRITING SECTION, “OPINIONS RENDERED” on page 7.

K. INK EXAMINATION

1. Purpose
   a. To determine whether the ink from one entry on a document is consistent with other entries.
   b. To determine if two ink formulations contain the same chemical dye formulations.
   c. To eliminate a specific ink formulation.
   d. To relatively date an entry on a document, or to date the commercial entry of a specific ink formulation into the general economy. (Note: the U.S. Secret Service Laboratory in Washington, D.C. performs these examinations).
2. Collection
   a. Use tweezers or gloves and use care in handling the questioned item(s).
   b. Protect for Latent Prints and/or DNA, if appropriate.
   c. Do not handle or fold. If folding is necessary, fold at pre-existing creases.
   d. Writing instruments can be submitted and compared with questioned ink entries.
3. Preservation
   a. The document should be maintained in a cool, dry storage area.
   b. Avoid contact with liquids.
   c. Do not expose to humidity, bright light, or unusual heat. Do not place this document in the trunk of a car during summertime.
   d. Do not chemically process for latent fingerprints prior to document examination.
   e. Do not add indentations by writing on top of the questioned document(s); (i.e., address of an agency on an envelope while the evidence is enclosed).
4. Packaging
   a. Package questioned and known items separately with seals.
   b. Mark an inconspicuous area, such as in corner on reverse side.
   c. Write on the packaging prior to enclosing the questioned items.
   d. Use paper or plastic envelopes or bags.

e. Do not staple or paperclip the questioned items.

f. Clearly identify the documents to be examined for ink on all transmittal forms.

5. Special Considerations

The usual examination process is nondestructive to the document. If partially destructive tests are necessary, which require the removal of ink from the questioned document(s), permission to conduct this test will be obtained from the investigating officer and/or prosecuting attorney prior to the examination.

6. Analysis and Report

a. Same ink formulation.

b. Inconsistent.

c. No conclusion.

d. Insufficient.

e. Information concerning writing instrument(s).

L. PAPER ANALYSIS

1. Purpose

a. To establish a paper source or origin.

b. To determine the authenticity and possibly date of manufacture of paper.

c. To establish if two samples of paper were derived from a common source.

2. Collection

a. Use tweezers or gloves and use care in handling the questioned item(s).

b. Protect for Latent Prints and/or DNA, if appropriate.

c. Do not handle or fold. If folding is necessary, fold at pre-existing creases.

d. Multiple reference samples are necessary for comparison to the questioned item(s).

e. Contact the Forensic Document Section for further instructions on obtaining known samples.

3. Preservation
   a. The document should be maintained in a cool, dry storage area.
   b. Avoid contact with liquids.
   c. Do not expose to humidity, bright light, or unusual heat. Do not place this document in the trunk of a car during summertime.
   d. Do not chemically process for latent fingerprints prior to document examination.
   e. Do not add indentations by writing on top of the questioned document(s); (i.e., address of an agency on an envelope while the evidence is enclosed).
4. Packaging
   a. Package questioned and known items separately with seals.
   b. Package the questioned item(s) between two layers of cardboard.
   c. Mark an inconspicuous area, such as in corner on reverse side.
   d. Write on the packaging prior to enclosing the questioned items.
   e. Use paper or plastic envelopes or bags.
   f. Do not staple or paperclip the questioned items.
   g. Clearly identify the documents to be examined for paper on all transmittal forms.
5. Special Considerations

   A more detailed physical and chemical paper fiber analysis may be conducted at a forensic laboratory with the resources to perform such examinations.
6. Analysis and Report
   a. Identification.
   b. Highly probable did/did not.
   c. Probable did/did not.
   d. No Conclusion.
   e. Elimination.
   f. Consistent/inconsistent in class characteristics.

M. PHYSICAL MATCH

1. Purpose
   a. To associate two or more pieces or objects as originating from a common source.

NOTE: Due to the fragility of the evidence, the collection, preservation, and packaging of torn material must be handled with extreme care or disintegration of this type of evidence will occur.

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2. Collection
   a. Use tweezers or gloves and use care in handling the questioned item(s).
   b. Protect for Latent Prints and/or DNA, if appropriate.
   c. Do not handle or fold. If folding is necessary, fold at pre-existing creases.
   d. All torn or separated pieces should be submitted as possible sources.
3. Preservation
   a. Do not attempt to separate layers or masses of paper. Submit the items in their existing condition.
   b. The document should be maintained in a cool, dry storage area.
   c. Avoid contact with liquids.
   d. Do not expose to humidity, bright light, or unusual heat. Do not place this document in the trunk of a car during summertime.
   e. Do not chemically process for latent fingerprints prior to document examination.
   f. Do not add indentations by writing on top of the questioned document(s); (i.e., address of an agency on an envelope while the evidence is enclosed).
4. Packaging
   a. The nature of the evidence will dictate what type of packaging is suitable. Contact the Forensic Document Section for further instructions.
   b. Package questioned and known items separately with seals.
   c. Mark an inconspicuous area, such as in corner on reverse side.
   d. Write on the packaging prior to enclosing the questioned items.

e. Do not staple or paperclip the questioned items.

f. Clearly identify the documents to be examined for physical matches on all transmittal forms.

5. Special Considerations

   a. A physical match examination may be conducted on any type of material that exhibits random and non-reproducible fracture or separation.

   b. Typical physical match examinations include paper tears, note pads, and paper matches, but may include glass, plastics, metal or other material.

6. Analysis and Report

   a. Identification – Source or match identified as the one and only possible.

   b. Inclusive – Object(s)/item(s) could be probable source(s).

   c. Associative – Object(s)/item(s) could be a possible source(s) - class characteristics.

   d. No conclusion.

   e. Elimination – The objects did not originate from a common source.

N O T E S

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XIII. CRIME SCENE INVESTIGATION

Introduction - The Crime Scene Investigation Section of this laboratory manual is not intended to be an all-inclusive nor comprehensive guide to crime scene investigation. Consideration has been given to some of the areas that relate to the collection of evidence or to those areas where problems frequently occur.

An essential facet of criminal investigation is proper crime scene processing, including a thorough search for physical evidence and proper documentation of the scene. The importance of physical evidence and the scientific examination of this evidence cannot be overstated. Many believe every laboratory examination begins when the evidence is first contacted by a law enforcement officer. The actions that are done or not done at the crime scene often determine what laboratory tests can be done and what results can be obtained.

A. INITIAL ACTIONS OF OFFICERS AT THE CRIME SCENE

1. Apprehension of suspects present at the scene, detention and separation of possible witnesses, and any other preliminary assessments needed to ensure officer safety.
2. Aid to injured parties.
3. Protection of the crime scene and preservation of evidence.
    a. As soon as possible, the first officer on the scene should take precautions to protect as much of the immediate known crime scene as possible.
    b. As other officers come to assist, the perimeter of the area protected should be enlarged beyond the limits of the area considered to have the highest priority. This must be done as soon as possible to avoid contamination or destruction of evidence.
    c. The physical size of the area protected can and will be decreased as the investigation progresses. However, it is very difficult to effectively increase the area of protection once the initial phase of investigation has passed.
    d. In addition to establishing a perimeter around the scene, it is also necessary to restrict the movement of police officers and others inside the scene. Do not touch or move anything. (Exception to this rule may be: To aid an injured party; to apprehend a suspect; move an item of evidence to protect it from the elements, etc.).
    e. Common problems include premature moving or searching of bodies, touching surfaces that may yield latent prints or trace evidence and walking or driving in areas that may have shoe or tire impressions.

The primary objective of the crime scene investigation is to locate, note, collect, and preserve evidence that can lead to the identity of the offender(s); therefore, it is imperative that the scene be adequately preserved until a systematic and thorough investigation can be carried out.

B. PRELIMINARY INVESTIGATION

1. The Walk Through

   a. Walk in a location or pathway that is least likely to destroy any evidence. Once that pathway is established by the first officers on the scene, others following should use the same path, entering the scene only after obtaining permission from the individual in charge of the scene. Move slowly, examining the immediate area as you take each step.

   b. Don't be in a hurry!

   c. Limit your activities in this phase to surveying the scene.

   d. Determine the scope of the scene, and gather information to help plan the investigation.

   e. Locate readily visible evidence that may be perishable, and take steps to protect it, if necessary.

   f. Record your observations through notes, photography and/or sketching.

   g. Formulate a plan based on your observations of the scene. Develop a plan utilizing available personnel and other resources.

2. Systematic Approach

   The extent of the approach to the investigation is determined by factors such as available personnel, nature and location of the scene, size of the area to be searched, and type of crime.

   a. Organization

      1). Have one person in charge, and make everyone aware of this fact. Follow his/her direction.

      2). Make assignments and be sure they are carried out.

      3). Have a plan prior to any action.

b. Work as a team.

1). One person or team should be assigned to collect the evidence located in the search, and should also record its location.

2). One person or team should take all of the photographs.

3). Review the investigation before leaving the scene. Have a conference with all present to determine if everything possible was done.

4). Members of the "team" could include patrol officers, detectives, coroners, district attorneys, and crime scene investigators.

c. Consider the use of a checklist.

1). The checklist used may vary for different types of crimes.

2). It may be helpful for those who don't investigate crime scenes everyday, and for those types of crimes that occur infrequently.

C. RECORDING THE SCENE

Throughout the crime scene investigation, various methods are used to document the observations and actions of the investigators. The most commonly used are notes, photographs and sketches. Other methods include video and audio tape recordings. Each method has its particular application, and one should not be substituted for the other.

D. CRIME SCENE SEARCH

1. Consider the legality of the search prior to any action. If in doubt, contact the district attorney.
2. The search must be organized. One person must be in charge, and ensure that the search is conducted in a methodical and thorough manner.
3. The method used to search should be appropriate for that scene. It should be organized in such a manner that it provides maximum coverage of the search area while minimizing movement of people so that they are less likely to destroy evidence. The exact type of search "pattern" is not as important as organization and efficient use of available personnel.
4. Consider the transitory nature of the evidence. Any evidence that may be altered or destroyed by weather, time, witnesses, other officers, etc., should be given immediate attention.
5. If the investigation is taking place at night, wait and conduct the outdoor search during daylight when possible. Be sure to maintain some type of

actual physical security of the scene. In the case of a vehicle, this could be done by having it locked in a secured garage, or watched by officers.

6. In most cases you only have one opportunity to conduct a meaningful search. The first time through may either destroy trace evidence not collected or contaminate the scene by leaving additional irrelevant materials.
7. Search Patterns
   a. Spiral Search
      1). Inward Spiral
         i). Begin at the perimeter and work toward the center in a spiral.
         ii). This is a very effective method, especially when only one searcher is involved.
         iii). This method decreases the possibility of destroying evidence.
      2). Outward Spiral
         i). Begin at the focal point, or center of the scene, and work outward.

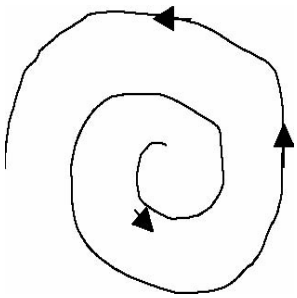

Figure XIII-A Outward Spiral

         ii). This would be effective for the searcher, however, you must be careful not to destroy evidence when entering the center of the scene before the search begins.
   b. Parallel Search (Also known as the Lane or Strip Search)

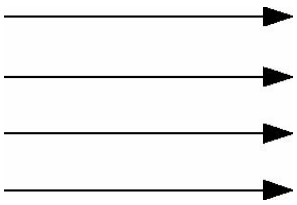

Figure XIII-B Parallel Search

1). In this method the searchers line up equidistant from each other (for example, arm's length) and proceed in parallel lanes, all at the same speed.

2). When an item of evidence is located, the entire line stops and individuals maintain their positions until the item is either tagged or photographed, measured, recorded, and collected.

3). The search then resumes, making sure that everyone proceeds at the same speed.

c. Grid Search

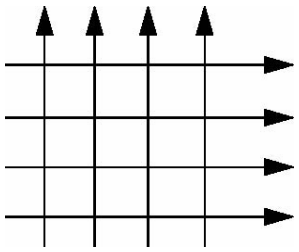

Figure XIII-C Grid Search

1). This is a modification of the parallel search that provides double coverage.

2). When the area has been covered with a parallel search, the searchers then go over the same area again at a right angle to the first search pattern.

3). This term also applies to dividing a scene into many smaller units.

d. Zone Search (also known as the Sector Search)

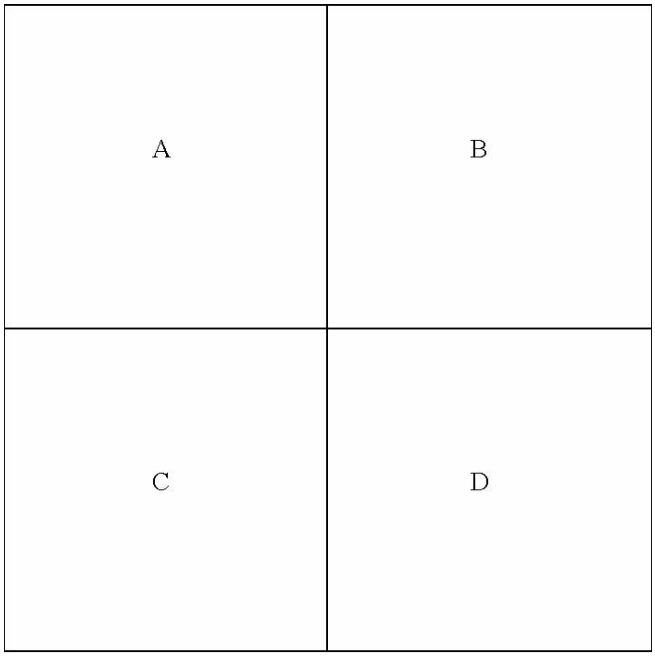

Figure XIII-D Zone Search Pattern

1). The scene is divided into areas or sectors.

2). Each individual is then assigned a specific area to search. When the search is completed, positions can be changed and the area re-searched by another individual.

3). A building may be divided into rooms, or a room may be divided into zones. A field may be divided into sections, or a vehicle may be divided into zones, as shown in ***Figure XIII-D: Zone Search Pattern***.

e. Vehicle Searches - The search of a vehicle must be planned and carried out as carefully and systematically as the indoor or outdoor crime scene. The nature of the case will determine how detailed the search should be. A preliminary examination of the trunk or cargo area and under the hood may be advisable from a safety standpoint.

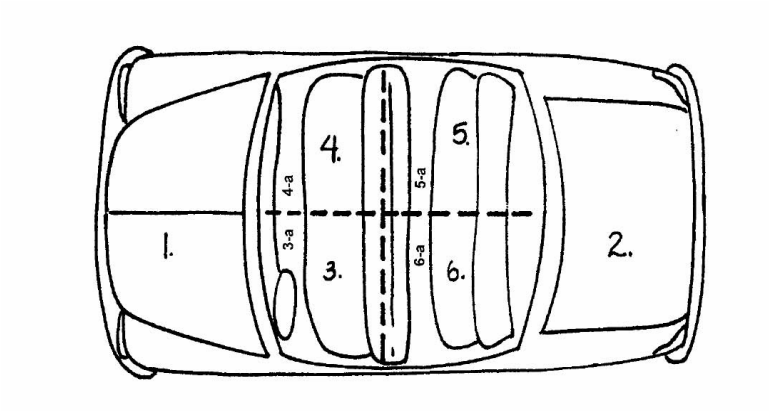

Figure XIII-E Vehicle Searches

1). Examining the undercarriage: Look on the undercarriage of the vehicle for hairs, fibers, blood, shoe impressions, etc., in cases such as vehicular homicide and hit-and-run.

2). Examining the exterior: Systematically search the exterior for evidence such as hairs, fibers, cloth impressions, damaged areas, or missing parts. The vehicle should then be processed for latent prints. As with any other search, evidence should be documented prior to collection.

3). Examining the interior:

i). Readily visible evidence (e.g., weapons, hairs/fibers, and items to be processed for latent fingerprints) should be recorded, photographed, and collected. Note the zone or location it was recovered from, such as shown in ***XIV-E: Vehicle Searches***

ii). Trace evidence may be collected using lint rollers, tape or an evidence vacuum with special filter attachment.

iii). Consider the need of using a forensic light source to examine the interior.

iv). After collecting trace evidence, process the interior for latent prints.

v). A search for hidden items in the interior can now be conducted. If possible, two different searchers should cover the same area.

vi). The trunk and area under the hood should also be thoroughly searched.

E. EVIDENCE COLLECTION

The necessary and appropriate evidence to be collected at the autopsy needs to be done in the presence of/or with the permission of the coroner, if the coroner or pathologist does not perform the collection himself or herself.

1. Document the body at the scene prior to any action. This documentation may include photography, sketching, etc.
2. Any readily visible trace evidence on the body should be removed at the scene prior to moving the body.
3. Paper bags should be placed over both of the victim's hands prior to moving the body. Consideration should be given to the same procedure for the victim's feet, if appropriate.
4. The body should be wrapped in a clean sheet at the scene to prevent contamination or loss of evidence. (This is up to the coroner's office.)
5. Examine the body at the mortuary or morgue before any clothing is disturbed, or the body is washed. Remove all trace evidence. Also examine the sheet used to transport the body if the sheet will not be collected as evidence.
   a. Photographs to be taken of the body include:
      1). Photograph the body at the morgue or mortuary prior to cleaning it up, or removing the clothing.
      2). Take photographs of the face and any other scars, marks, or tattoos that can be used for identification.
      3). Take photographs of any wounds with and without a scale prior to washing, and after cleaning.
   b. Remove visible trace evidence such as hairs, fibers, etc.
   c. Process the victim's hands for gunshot residue, if appropriate.
   d. Conduct a trace metal detection test, if appropriate.
   e. Take fingernail scrapings.

6. Collect the victim's clothing. Avoid unnecessary handling of clothing.
   a. Allow wet clothing to air-dry at room temperature.
   b. Wrap each piece separately in clean paper.
   c. It is better not to cut the clothing, however, if it must be cut to remove it from the body, do not cut through damaged areas, such as gunshot holes.
7. Use an anatomical outline to chart wounds, path of bullets, abrasions and injuries. (The Pathologist may do this.)
8. Collect Standards

   Inked fingerprints and palm prints.

   Blood (one tube with EDTA preservative).

   Hair (head, body, and pubic).

   Buccal swabs.

   Biological fluids on victim.
9. If appropriate for the type of case, request the collection of a Sexual Assault Evidence Kit.
10. Collect and properly package any evidence collected at the autopsy, such as bullets, pubic hair combing, latent fingerprints on skin, etc.

F. COLLECTION OF BLOODSTAIN PATTERN EVIDENCE AT THE CRIME SCENE

1. Purpose

   Crimes of violence frequently produce bloodstains that can be examined to assist in reconstruction of the events that happened to produce the bloodstain patterns found at the scene. If a number of stains, surfaces, and rooms are involved, the most productive place to conduct the examination is at the crime scene with the actual undisturbed surfaces. CBI Laboratory personnel will respond to such scenes if officially requested by the local agency, after being cleared by the Agent-in-Charge. From examinations of the evidence at the scene or the laboratory, some of the interpretations that may be possible are:

   a. The types of bloodstain patterns present.
   b. Directionality - the direction of travel of the blood at time of impact.
   c. Angularity - the angle at which the blood struck a surface.
   d. Determination of convergence and/or apparent areas of origin of bloodstains.

e. The distance or range between stains in an impact pattern and the source at time of impact.

f. The relative positions of individuals.

2. Collection And Preservation

Detailed sketches and color photographs should be employed for recording purposes and possible use in court. It will be beneficial to take large items such as furniture or wall sections into evidence if the examinations and interpretations are not done on scene. Such decisions should be made on a case-by-case basis, and the final authority to collect such large items rests with the requesting agency and the district attorney's office. If the bloodstain pattern is not too extensive, a combination of good sketching, color photographs, and removal of the actual surfaces or objects should all be submitted to the laboratory for examination.

a. Photographic documentation may be in either digital or film format. Regardless of which format is used, the greater the resolution of the recording medium, the better. Photographs may be submitted in print format or a digital device such as a CD. The traditional photographic series of overall, midrange, and close-up photographs should be used for each pattern and or section of pattern. Overall Photographs should demonstrate the correlation between the locations of each pattern.

b. All photos should be taken with the recording medium parallel to the surface (or pattern on the surface) being considered, with a measuring device. It may be useful to have a corresponding picture without a measuring device.

c. When actual objects are submitted, the packing procedures outlined should be followed.

d. If a surface needs to have a notation as to its orientation, top, side, etc., this should be done by use of a sketch, and carefully labeling the object.

e. Be certain to indicate any other testing or examination that is being requested in addition to the bloodstain pattern work. If biological work is to be done on the bloodstains, do not preserve the evidence by using any type of shellac coating or spray.

3. Special Considerations

In cases where Laboratory personnel will be asked to respond to a scene, the officer most familiar with the case should speak directly with the person who will be going to the scene. This will allow for the exchange of information and most efficient use of time and personnel.

4. Analysis And Report

   The final report will be a combination of noting the actual physical findings and the examiner's opinion of the interpretation of the physical findings.

N O T E S

CBI FORENSIC LABORATORY

PHYSICAL EVIDENCE HANDBOOK, VERSION 5.1

AUGUST 2007

APPENDIX

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XV. APPENDIX A – GSR INFORMATION SHEET

Colorado Bureau of Investigation
GUNSHOT RESIDUE ANALYSIS INFORMATION SHEET (Model)
(Fill out all information requested and return to kit envelope)

Collecting Agency Name:
Agency Case No.:
☐ Homicide ☐ Suicide ☐ Assault ☐ Other: _____
(Describe)

SHOOTING INFORMATION

Date and time shooting occurred: Date: _____ Time: _____ am /pm
Date and time shooting occurred: Date: _____ Time: _____ am /pm
Place (Example – in kitchen, parking lot, indoors, outdoors): _____
Type of firearm used: _____ Caliber: _____
Caliber of ammunition used: _____ Manufacturer of ammunition:* _____
Number of shots fired: _____
Note: if cartridge manufacturer is unknown, draw head stamp here:

Base of Cartridge

SUBJECT INFORMATION

Subject's Full Name: _____ DOB: _____
Subject is: ☐ Victim ☐ Suspect ☐ Witness ☐ Other: _____
Subject is: ☐ Living ☐ Dead
Subject is: ☐ Right-handed ☐ Left-handed ☐ Unknown
If the subject has any gunshot wounds, note the part(s) of the body affected: _____
Any debris and/or blood on subject's hands? ☐ Yes ☐ No
If yes, describe: _____
Has subject washed his/her hands or face since shooting? ☐ Yes ☐ No
Prior to GSR sampling, were subject's hands: ☐ Cuffed ☐ Bagged
Subject's occupation: _____
Subject's hobbies: _____
Brief description of subject's activity between the time of the shooting and the time the GSR stubs were taken: _____
Collecting officer's name: _____ Phone #: _____
(please print)

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XVI. APPENDIX B – FIREARMS TERMINOLOGY

The following is a partial listing of various firearms terms and their definitions. These are terms most frequently used in laboratory reports. They are terms that should be used in the preparation of requests for laboratory examinations.

1. Ammunition - One or more loaded cartridges consisting of a primed case, propellant, and with or without one or more projectiles. Also referred to as fixed or live ammunition.
2. Backstrap - The exposed metal strap at the rear of a pistol or revolver grip.
3. Barrel - That part of a firearm through which a projectile or shot charge travels propelled by powder gases, compressed air, or other like means. The barrel may be rifled or smooth.
4. Breech - The part of a firearm at the rear of the bore into which the cartridge or propellant is placed.
5. Breech Face - That part of the breech block or breech bolt which is against the head of the cartridge case or shot shell during firing.
6. Breech Face Markings - Negative impressions of the breech face of firearm reproduced on the head of the cartridge case at the time of firing.
7. Bullet - A nonspherical projectile for use in a rifled barrel.
8. Caliber – The diameter of the bore of the barrel of a firearm measured between the opposite lands.
9. Cartridge – A single unit of ammunition consisting of the case, primer and propellant with or without one or more projectiles. This also applies to shot shells.
10. Cartridge Case – The container for all other components that comprise a cartridge.
11. Chamber – The rear part of a barrel that has been formed to accept a specific cartridge. Revolver cylinders are multi-chambered.
12. Chamber Marks – Individual microscopic marks placed upon a cartridge case by the chamber wall as a result of any or all of the following: a) chamber, b) expansion, c) extraction.
13. Characteristics

    Class – measurable features of a specimen that indicate a restricted group source. They result from design factors and are therefore, determined prior to manufacture. In firearms identification, the primary class characteristics are:

    a. Number of land and grooves

b. Width of the lands and grooves

c. Direction of twist

d. Caliber (bore diameter)

Individual characteristics – imperfections or irregularities produced accidentally during manufacture or caused by use, abuse, corrosion, rust, or damage. They are unique to that object and distinguish it from all other objects.

14. Clip – A separate cartridge container used to reload rapidly the magazine of a firearm. Also called a stripper.

15. Cylinder – the rotating part of a revolver that contains chambers into which ammunition is inserted.

16. Ejection Marks – Toolmarks produced upon a cartridge, generally at or near the rim, from contact with the ejector.

17. Ejector – A portion of a firearm's mechanism that ejects or expels cartridges and/or cartridge cases from a firearm.

18. Ejector Marks – Toolmarks produced upon a cartridge or cartridge case on the head (base), generally at or near the rim from contact with the ejector.

19. Extractor – A mechanism for withdrawing the cartridge or cartridge case from a chamber.

20. Extractor Markings – Toolmarks produced upon a cartridge or cartridge case from contact with the extractor. These are always found on or ahead of the rim.

21. Firearm – An assembly of a barrel and action from which a projectile(s) is propelled by products of combustion.

22. Firing Pin – That part of a firearm mechanism that strikes the primer of a cartridge to initiate ignition.

23. Firing Pin Impression – The indentation in the primer of a center fire cartridge case or in the rim of a rim fire cartridge case caused when it is struck by the firing pin.

24. Function Testing – The examination of a firearm to determine if it functions as designed, if all safeties are operable, and if it is capable of firing a live round of ammunition.

25. Gauge – A term used in the identification of a smooth bore weapon (shotguns). This is determined by the number of lead balls of bore diameter that equal one pound.

26. Griess Test – A chemical test for the detection of nitrites. Used by a firearms examiner to develop patterns of gunpowder residues (nitrites) around bullet holes.
27. Grip – The handle of a handgun. In long guns (rifles and shotguns) that portion of the stock to the rear of the trigger. Also called the wrist.
28. Groove – The depressed areas in a rifled barrel.
29. Gunpowder Pattern – The spatial distribution of gunpowder residues deposited upon a surface.
30. Gunpowder Residues – Unburned gunpowder, partially burned gunpowder, and smoke from completely burned gunpowder.
31. Handgun – A firearm designed to be fired from the hand.
32. Headstamp – Numerals, letters and symbols stamped into the head of a cartridge case or shot shell to identify the original manufacturer, caliber, gauge, or give additional information.
33. Land – The raised portion between the grooves in a rifled barrel.
34. Land & Groove Impressions – The negative impressions on the bearing surface of a bullet caused by the rifling in the barrel from which it was fired.
35. Magazine – A container for cartridges that has a spring and follower to feed those cartridges in to the chamber of a firearm. The magazine may be detachable or an integral part of the firearm.
36. Muzzle – The end of a firearm barrel(s) from which the bullet or shot emerges.
37. Nitrite – A chemical component that is also the product of combustion of black and smokeless gunpowder.
38. Pistol – A handgun in which the chamber is part of the barrel. Roughly, all handguns with the exception of revolvers.
39. Proximity Testing – The test-firing of a particular weapon with a specific type of ammunition at various prescribed distances into some type of test target material.
40. Receiver – The basic unit of a firearm which house the firing and breech mechanisms and to which the barrel and stock are assembled.
41. Revolver – A firearm, usually a handgun, with a cylinder having several chambers so arranged as to rotate around an axis and be discharged successively by the same firing mechanism.
42. Rifle – A firearm having a rifled barrel and designed to be fired from the shoulder.

43. Rifling – Helical grooves in the bore of a firearm barrel to impart rotary motion to a projectile.
44. Safety – A device on a firearm generally designed to prevent accidental discharge.
45. Shot – Spherical pellets used in loading shot shells or cartridges.
46. Shotgun – A smooth bore shoulder firearm designed to fire shot shells containing numerous pellets, or sometimes a single projectile.
47. Shot Shell – A cartridge containing projectile(s) designed to be fired in a shotgun. The cartridge body may be metal, plastic, or paper.
48. Striker – A rod-like firing pin or a separate component that impinges on the firing pin.
49. Tattooing – A hemorrhagic pattern around a bullet hole in skin caused by the impact and/or imbedding of gunpowder particles. Also referred to as stippling.
50. Trigger Pull – The amount of force that must be applied to the trigger of a firearm to cause sear release. It is measured with hanging weights or an appropriate scale affixed to the approximate center of the trigger. This force (weight) is applied approximately parallel to the bore axis.

XVII. APPENDIX C – FIREARMS ABBREVIATIONS

FC	Federal Cartridge
FMC	Full metal case
FMJ	Full metal jacket
HP	Hollow point
JHP	Jacketed hollow point
JSP	Jacketed soft point
RN	Round nose
RP	Remington-Peters
SJHP	Semi-jacketed hollow point
SJSP	Semi-jacketed soft point
SWC	Semi-wad cutter
WC	Wad cutter
W-W	Winchester-Western
WIN	Winchester

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XVIII. APPENDIX D – FIELD RESTORATIONS

SCOPE

This manual will touch upon the restoration of the obliterated stamped markings on metal (both ferrous and nonferrous), leather, wood, and rubber. An attempt will be made to confine discussion to motor vehicles and associated components; however, items that may be recovered from such vehicles will be briefly touched upon. This manual will also provide for the collection and preservation of physical evidence.

The information contained herein is designed for the exclusive use of law enforcement personnel and should be treated as confidential information. Today's law enforcement officer should be aware that the criminal element has knowledge of many of the techniques presently used in the detection of crime, and is constantly endeavoring to develop counter measures on his own. In his attempt to obliterate a serial number, or other stamped marking on metal, he may not understand the complete problem he faces. This lack of understanding on his part often permits a successful conclusion to the investigation, as he has not been completely successful in the countermeasure he has employed. It certainly is not incumbent on the law enforcement officer to furnish information to the criminal that may permit him to successfully avoid apprehension for a crime he has committed.

GENERAL PROCEDURE

In all cases, the first step must be to examine the item's surface. This examination should be performed by examining the item under low magnification and by lighting the surface of the item from as many different angles as possible. It may become necessary to rotate either the light or the item to provide maximum lighting across the surface of the obliterated number. All markings noted at this stage should be recorded, indicating their relative position and size, as well as their shape. After this preliminary examination, the surface of the material should be smoothed; only a minimal amount of material being removed at first, and the object should be viewed again carefully. It might be wise to obtain black and white photographs of the object throughout the restoration attempt. A 35mm single lens reflex camera will be sufficient to obtain the needed photographs. (Photography will be touched on later in this manual).

Once the surface has been completely smoothed to as near a mirror finish as possible, with all scratches or gorges that have been initially visible removed, an appropriate reagent should be applied to the suspect surface. Any reagent used by the officer should always be at first diluted to produce a minimal effect, and then if the diluted solution fails to give a satisfactory result, then a more concentrated solution can be applied. The officer should remember that his solution will need a sufficient amount of time to produce results. In attempting a serial number restoration, the officer should remember the old

adage: “haste makes waste”. In restorations that involve hard rolled steel, several hours and often days are necessary to produce a readable restored number.

INTRODUCTION

When a die-stamped impression is placed onto an object, there is produced a permanent zone of compressed molecules in the object and immediately surround the image of the die. There is also produced, for a short distance below the penetration of the die, an area of compressed molecules in the metal. Numerous articles bear serial numbers placed on them by the manufacturer to assist in establishing ownership. Such articles include, but are not limited to the following:

Vehicles — Identifying numbers are placed on trucks, automobiles, tractors, construction equipment, motorcycles, and bicycles. Such numbers may be placed on the engine, the frame, or both. In some instances an additional (hidden) number may be placed on these items. The locations of these markings are contained in the Manual for Identification of Automobiles. This booklet is printed each year by the National Auto Theft Bureau and is distributed through its regional office.

Weapons – Most firearms manufactured or sold in the United States are required by law to bear a stamped serial number. Removal of such serial number is a federal and state offense. At the time of this writing, in the State of Colorado, it is a state offense to merely possess a weapon that has an altered or defaced serial number. Some weapons have, in addition to serial numbers in plain view, a hidden number. For example, Colt Firearms places a serial number on the inside of the side plate of most revolvers made by that company.

Watches – A watch usually has a serial number that is stamped and recorded by the manufacturer. The number is also recorded by retailers, pawnshops and repairmen. Such numbers usually appear either on the outside or the inside of the back of the watch. Sometimes an officer may have only a portion of a watch. He should examine this watch closely for minute numbers which have been placed either on the face of the watch or on the inside rings which are used to secure the watch to the main housing. An examination of any Timex faceplate will give you the make, model number, and year in which the watch was made.

Cameras and Binoculars – The more expensive makes and models of camera and binoculars bear serial numbers that have been stamped into them by the manufacturer. As a rule, the more expensive the item, the more carefully the records are kept.

Miscellaneous Numbered Articles – Household equipment and appliances, professional equipment, expensive matched sets of tools, and matched sets of sports equipment often bear traceable numbers. Also, these items may have the owner's name stamped in them in a monogrammed fashion.

Any time you are asked to do a serial number restoration, you should make an attempt to check the following for sources of information that may be helpful to you in your investigation:

Manufacturer
Retailer
City and state agencies
Pawnbrokers and jewelers
Repair shops
Insurance companies

THEORY

When using a chemical reagent, the chemical (etching solution) is applied to the metal surface after it has been thoroughly cleaned and polished. The compressed area reacts more quickly to the reagent than does the surrounding area; the contrast between the disturbed area and the normal area reveals the number.

RESTORATION TECHNIQUES

Electrolytic Polishing – This is a means whereby a direct electric current is used to accelerate the chemical etching method. One electrode is connected directly to the metal surface and the other to a wand containing a swab into which the etching solution has been saturated. The questioned area is then swabbed with the wand. This speeds up the etching process, acting in just the reverse of the electroplating process. A problem with the etching process is that it may be too rapid, and you may go past your number and lose it forever. Use the minimum amount of voltage to where the current just begins to flow through the article being restored.

Electroplating – This works just the opposite of the previously mentioned electrolytic polishing method. By the electroplating process, the surface is built up by additional layers of metal. Again, the disturbed area reacts to the process at different rates than the surrounding metal.

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XIX. APPENDIX E – GLOSSARY OF DOCUMENT TERMS

CHARACTERISTIC -	Any property or mark that distinguishes; in document examination it commonly refers to identifying details (class and individual).
CONCLUSION -	A scientific conclusion results from relating observed fact by logical, common sense reasoning in accordance with established rules or laws. The document examiner's conclusions are so derived.
DOCUMENT EXAMINER -	One who studies scientifically the details and elements of documents in order to identify their source or to discover other facts concerning them. Document examiners are often referred to as handwriting identification experts, but today the work has outgrown this title and involves problems other than merely the examination of handwriting.
EXAMINATION -	The act of making a close and critical study of any material; and with questioned documents is the process necessary to discover the facts about them. Various types of examinations are undertaken, including microscopic, visual, photographic, chemical, ultraviolet, and infrared.
EXEMPLAR -	A term used by some document examiners and attorneys to characterize known material.
EXPERT WITNESS -	A legal term used to describe a witness who by reason of his special training or experience is permitted to express an opinion regarding the issue or a certain aspect of the issue, which is involved in a court action. His purpose is to interpret technical information in his particular specialty in order to assist the court in administering justice.

GRAPHOANALYSIS -	A form of graphology commonly practiced in the United States. It has no relationship to handwriting identification.
INFRARED EXAMINATION -	The examination of documents employing invisible radiation beyond the red portion of the visible spectrum. Infrared radiation can be recorded on specially sensitized photographic emulsions or it can be converted by means of an electronic viewing device into visible light for an immediate study of evidence.
NATURAL VARIATION -	Normal or usual deviations found between repeated specimens of any individual's handwriting, or in the product of any typewriter or other record making machines.
QD CONCLUSIONS -	Document examiner's opinion in legal language. Actually, in court the examiner not only expresses an opinion but demonstrates the reason for arriving at it.
CURSIVE WRITING -	Writing in which the letters are, for the most part, joined together.
DISGUISED WRITING -	A writer may deliberately try to alter his/her usual writing habits in hopes of hiding his/her identity. The results, regardless of their effectiveness, are termed “disguised writing.”
FORGED SIGNATURE -	Involves the writing of a name as a signature by someone other than the person him-/herself, without his/her permission, often with some degree of imitation.
HABIT -	Any repeated element or detail that may serve to individualize writing.
HOLOGRAPHIC DOC. -	Any document completely written and signed by one person.

MODEL SIGNATURE -	A genuine signature which has been used to prepare an imitated or traced forgery.
NATURAL WRITING -	Any specimen of writing executed normally without an attempt to control or alter its identifying habits and its usual quality of execution.
PATCHING -	Retouching or going back over a defective portion of written stroke. Careful patching is a common defect in forgeries.
SPURIOUS SIGNATURE -	A fraudulent signature written naturally.
TRACED FORGERY -	Any fraudulent signature executed by actually following the outline of a genuine signature with a writing instrument. Such a signature may be produced with the aid of carbon paper by first tracing a carbon outline and then covering this with a suitable ink stroke, or the forgery may be traced from an outline made visible by light coming through the model signature and the fraudulent document.
TREMOR -	A writing weakness portrayed by irregular, shaky strokes.

Scientific Examination of Questioned Documents. Rev. ed. Ordway Hilton

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