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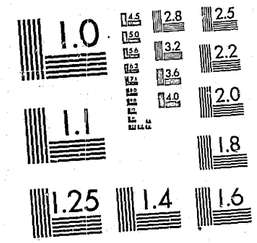

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10/4/82

National Institute of Justice
United States Department of Justice
Washington, D.C. 20531

MF-1

U.S. Department of Justice
Federal Bureau of Investigation

Handbook of Forensic Science

52492

HANDBOOK OF

FORENSIC SCIENCE

FEDERAL BUREAU OF INVESTIGATION

U.S. Department of Justice
National Institute of Justice

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U.S. Department of Justice

Federal Bureau of Investigation

Washington, D.C. 20535

Each day the modern crime laboratory attempts to discover new techniques of applying recent technological and scientific developments to aid the on-the-scene investigator in solving crime. The Handbook of Forensic Science seeks to familiarize the investigator with these techniques and to make known the capabilities and the limitations of the crime laboratory.

The value of properly collected physical evidence examined by trained scientists in the crime laboratory cannnot be overestimated. It is a vital element in our criminal justice system.

At crime scenes every law enforcement officer shares the responsibility of collecting as much pertinent physical evidence as possible. The objective of the handbook is to make available to law enforcement personnel a guide to legally accepted and practical procedures for collecting, preserving and handling physical evidence. It contains suggestions and is offered as a training aid for those in professional law enforcement.

It is hoped that this handbook will promote maximum use of physical evidence in our criminal justice system and encourage greater use of the crime laboratory to help solve today's law enforcement challenges.

Director
Federal Bureau of Investigation

NCJRS
FEB 5 1982
ACQUISITIONS

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PART I

INTRODUCTION

DEFINITIONS OF EVIDENCE

(1) That which is legally submitted to a competent tribunal as a means of ascertaining the truth of any alleged matter of fact under investigation before it.

(2) Anything which a suspect leaves at a crime scene or takes from the scene or which may be otherwise connected with the crime.

Terminology

"Physical," "real," "tangible," "laboratory," and "latent" are all adjectives to describe the types of evidence which the FBI Laboratory and Identification Divisions examine.

PURPOSE OF PHYSICAL EVIDENCE

A. Aids in the solution of the case because it can:

(1) Develop M.O.'s or show similar M.O.'s.

(2) Develop or identify suspects.

(3) Prove or disprove an alibi.

(4) Connect or eliminate suspects.

(5) Identify loot or contraband.

(6) Provide leads.

B. Proves an element of the offense, for example:

(1) Safe insulation, glass or building materials on suspect's clothing may prove entry.

(2) Stomach contents, bullets, residue at scene of fire, semen, blood, toolmarks may all prove elements of certain offenses.

(3) Safe insulation on tools may be sufficient to prove violation of possession of burglary tools statutes.

C. Proves theory of a case, for example:

(1) Footprints may show how many were at scene.

(2) Auto paint on clothing may show that a person was hit by car instead of otherwise injured.

NATURE OF PHYSICAL EVIDENCE

For the most part, physical evidence falls into two classifications:

Evidence With Individual Identifying Characteristics

This evidence can be positively identified as having come from a specific source or person if sufficient identifying characteristics, or sufficient microscopic or accidental markings are present. (Examples are: fingerprints, handwriting, bullets, toolmarks, shoe prints, pieces of glass where the broken edges can be matched, and wood where broken/cut surfaces can be matched.)

Evidence With Class Characteristics Only

This evidence, no matter how thoroughly examined, can only be placed into a class. A definite identification as to its source can never be made since there is the possibility of more than one source for the evidence found. (Examples are: soil, blood, hairs, fibers, single-layered paint from a safe or car, glass fragments too small to match broken edges, and toolmarks, shoe prints, or bullets, in those instances where the microscopic or accidental markings are insufficient for positive identification.)

A. It is desirable to have evidence that can be positively identified, but the value of evidence with class characteristics only should not be minimized. In cases involving evidence with class characteristics only, the following are desirable:

(1) A preponderance of such evidence.

(2) A preponderance of class characteristics within a single item of evidence, such as paint with many layers all matching or soil with foreign matter such as paint chips, odd seeds, and safe insulation.

(3) Elimination specimens, such as soil from where a suspect claims he was or where he claims a car was; soil from the surrounding areas to show that a variation does exist; and paint or other materials from a source mentioned in an alibi.

SERVICES OF FBI IDENTIFICATION DIVISION

A. Largest collection of fingerprint identification data in the world available to law enforcement agencies.

B. Will furnish standard forms, such as fingerprint cards, for submitting identification data.

C. Search of fingerprints:

(1) Arrest cards.

(2) Application cards (taken in compliance with Federal and state statutes.)

(3) Deceased and amnesia victims.

(4) International exchange of fingerprint data.

D. Name checks to locate identification records.

E. Fugitive program:

(1) Wanted notices placed on fingerprint cards for law enforcement agencies.

(2) Records of fugitives furnished to agencies.

F. Latent print examinations.

(1) Will examine original evidence, lifts and photographs.

(2) Comparisons on cases made for indefinite period.

(3) Examinations and comparisons by highly trained experts.

(4) Expeditious service available.

(5) Technical assistance in special situations, such as kidnaping, hijacking cases and airline disasters.

(6) Latent print testimony.

(7) No restriction on prior examination of latent material by other fingerprint technicians.

G. Examination of fingers of deceased persons for possible identification.

H. Reference files in Latent Fingerprint Section:

(1) Single fingerprint file.

(2) National Unidentified Latent file.

I. Advanced Latent Fingerprint Schools.

J. Disaster Squad:

(1) Long experience in major disasters.

(2) Quick, positive identification.

K. Supplies of literature on identification matters.

SERVICES OF THE FBI LABORATORY AND THE TECHNICAL SERVICES DIVISION*

A. Capabilities in a wide range of forensic sciences:

(1) Document.

(2) Scientific Analysis.

(3) *Radio-engineering, Electronics.

B. Examination by highly trained scientists.

C. Full range of scientific equipment available.

D. Expeditious service, if needed.

E. Competent expert testimony.

F. Technical assistance in special situations, such as kidnaping cases, airline disasters, and photographic problems.

G. Standard reference files and collections:

(1) Typewriter standards.

(2) Automotive paint.

(3) Firearms.

(4) Hairs and fibers.

(5) Blood sera.

(6) Safe insulation.

(7) Shoe print.

(8) Tire tread.

(9) Watermark standards.

(10) Safety paper standards.

(11) Checkwriter standards.

(12) Office copier standards.

(13) National Motor Vehicle Certificate of Title File.

H. Files of questioned material:

(1) National Fraudulent Check File.

(2) Bank Robbery Note File.

(3) Anonymous Letter File.

(4) National Motor Vehicle Certificate of Title File.

(5) Pornographic Materials File.

FBI IDENTIFICATION DIVISION AND LABORATORY FACILITIES ARE AVAILABLE:

A. To all Federal agencies, U. S. Attorneys, military tribunals, in both civil and criminal matters.

B. To all duly constituted state, county and municipal law enforcement agencies in the United States in connection with their official criminal investigative matters only.

C. All Idenfification Division and Laboratory services, including the loan of their experts, if needed as expert witnesses, are rendered free of all cost to the contributing agency.

D. In offering these services, the following considerations are to be noted:

(1) Laboratory Division

As a general rule, examinations are not made by the FBI Laboratory if the evidence is subjected elsewhere to the same examination for the Prosecution. However, if the circumstances in a given instance are such that this restriction poses a significant obstacle to an orderly prosecution, these facts should be set forth in a request for waiver. Such requests will be evaluated on a case-by-case basis.

Additionally, in order to more effectively and efficiently utilize its resources, the Laboratory will not accept cases from other crime laboratories which have the capability of conducting the requested examination(s). In the event such requests are submitted to the FBI Laboratory, the evidence will be returned unopened and unexamined. Mitigating circumstances may warrant an exception to this policy.

(2) Identification Division

Because of the nature of the evidence submitted for fingerprint examination, the above-mentioned Laboratory restriction does not apply. Therefore, the Identification Division will examine fingerprint evidence even if it has been or will be subjected to examination by other fingerprint experts.

(3) Testimony

FBI experts will furnish testimony regarding evidence they have examined. In the interest of economy, however, their testimony should not be requested if it is to be duplicated by another Prosecution expert. It is realized that exceptions to this general policy may be required, in a given instance.

E. Detailed information relating to proper methods of handling specific types of evidence will be dealt with in the appropriate sections of this handbook.

PART II

CRIME SCENE SEARCH

A crime scene search is a planned, coordinated, legal search by competent law enforcement officials to locate physical evidence or witnesses to the crime under investigation. In order to be effective a crime scene search should include the steps outlined in the paragraphs below. However, they need not be done in exactly this order since each crime scene varies and may require a different approach. (Note: Additional information concerning a bombing crime scene search can be found later in this chapter.)

Protect the Crime Scene

Only persons who have a legitimate investigative interest should be allowed into the crime scene. This number should be kept to a minimum. Too many people in a crime scene can lead to evidence being moved or destroyed before its value as evidence is recognized.

Conduct a Preliminary Survey of the Crime Scene

This is the planning stage of the search. The plans should include:

A. Form objectives of the search - what is to be found.

B. Take special note of evidence that may be easily destroyed such as shoe prints in dust, footprints, etc.

C. Organize the search.

(1) Make assignments for photographs, fingerprints, plaster casts, and evidence handling.

(2) Decide on search pattern, i.e., lane, grid, spiral or zone searches.

(3) Issue instructions to assisting personnel.

Write a Narrative Description of the Crime Scene

These are the investigator's original notes which will be used to refresh his memory at the trial. They should be an accurate description of the crime scene and should include:

A. Date, time and location of the search.

B. Weather and lighting conditions.

C. Identity of others participating in the search.

D. Assignments given to personnel.

E. Condition and position of evidence found.

Sketch the Crime Scene

A crime scene sketch is a handmade pictorial representation of conditions at a crime scene. It is useful in clarifying investigative data and making the situation easier to understand by eliminating unnecessary detail. A sketch does not replace photographs at the crime scene and should be used to show:

A. Dimensions of furniture, doors, windows, etc.

B. Distances from objects to extrance and exits.

C. Distances between objects.

D. Measurements showing the exact location of items of evidence. Each object should be located by two measurements from nonmovable items, such as doors, walls, etc.

Photograph the Crime Scene

Crime scenes will not remain undisturbed for very long, and therefore should be photographed as soon as possible, preferably before anyone is allowed into the scene.

A. Exterior crime scene:

(1) Establish the location of the scene by photographs from a distance to include a landmark.

(2) Take medium distance photographs to record the relative positions of closely related items of evidence.

(3) Take close-up photographs of individual items of evidence.

B. Interior crime scene:

(1) Establish the location of the building through photographs.

(2) Photograph rooms and other interior areas from typical observation points using a wide-angle lens when necessary to show relative positions of all items within the area.

(3) Take medium distance photographs to show the relative positions of closely related items of evidence.

(4) Take close-up photographs of individual items of evidence.

C. Evidence photographs are needed to:

(1) Record the condition of individual items of evidence before recovery. (Photographs must show the evidence in detail and should include a scale, Investigator's initials and the date.)

(2) Reproduce shoe, tire and similar impressions which can be recorded in no other way, or prior to attempts to lift or cast. Photographs should show identifying data as indicated above.

Process for Fingerprints

See Part IV of this book for instructions on fingerprinting a crime scene.

Make Shoe Print/Tire Tread Casts and/or Lifts

See Part V for instructions on the making of shoe print/tire tread casts and/or lifts.

Collect, Identify and Preserve the Evidence

For additional information on the collection, identification, and preservation of items of evidence, refer to the Evidence Chart and/or the appropriate paragraphs elsewhere in Part V concerning the type of examination desired. -

A. Collection.

(1) All evidence must be collected legally in order to be admissible in court at a later date.

(2) Evidence found during a search should be displayed immediately to another Investigator so that both Investigators can testify to its source.

(3) All evidence should be fully described in the searcher's notes and photographed in place prior to being picked up.

B. Identification.

(1) All articles of an evidentiary nature should be carefully marked for identification, preferably on the article itself, in a manner not to injure the evidence itself and not to be obliterated. These markings, to include initials, date and case number, enable the person finding the evidence to testify, at a later date, to the finding of it.

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C. Preservation.

(1) Each item of evidence should be placed in a suitable container, such as pillboxes, plastic vials or strong cardboard boxes. The container should be suitably identified and sealed.

(2) The legal "chain of custody" must be maintained at all times.

BOMBING CRIME SCENE

Bombing crime scenes, in spite of their massive destruction, must be conducted on the theory that everything at the scene prior to the explosion is still in existence unless it has been vaporized by the explosion. Locating and identifying items is the problem. The often-used statement that so much is destroyed by the explosion the cause must remain unknown is rarely true. Due to various factors the exact amount of explosives used cannot be determined based on an evaluation of the damage at the scene. (Note: The information contained in the above paragraphs concerning a crime scene search also applies to a bombing crime scene search.)

Purpose of Bomb Scene Search

The purpose of a bomb scene search is to determine what happened, how it happened, and gather evidence.

Special Considerations for a Bomb Scene Search

The following steps are to assist in the preparation, supervision, and evaluation of activity connected with the scene of a bombing. The topics covered are not meant to be all inclusive and no attempt has been made to comment on the many aspects of the bombing investigation.

A. Plan of action: Formulate a plan adapted to the particulars of the bomb crime scene. This plan will include consideration of the creation of an on-scene command post; establishment of lines of supervision; assignment of various tasks such as photographing, fingerprint processing, crowd control, collecting evidence; protecting the crime scene; obtaining necessary equipment; periodically evaluating progress; providing pertinent information to the public; safety; et cetera.

B. Command post: Consider establishing an on-scene command post particularly at a large bombing which may require days or weeks to complete the crime scene search. The command post should coordinate efforts among investigative personnel and between representatives of other agencies and utilities, as well as handle inquiries from sightseers, persons associated with the scene, relatives of victims, and the press.

(1) One person should be in overall charge of the bombing investigation, another over the actual crime scene search and another over the collection of the evidence. These three individuals must maintain close coordination and expeditiously exchange information on a continual basis. The evidence coordinator will report directly to the individual responsible for the overall bombing investigation.

C. Safety: Evaluate safety conditions at the outset of the crime scene search and on a continual basis throughout the search. Consider the possibility of a second bomb, a "jammed" bomb, or live explosives in the debris as well as the safety of crowds, nearby residents, and personnel at the crime scene. Utilities, weakened walls, et cetera, which may create dangerous situations, should also be considered.

Investigative personnel are not to assume the responsibility for handling a bomb.

D. Protection of crime scene: Take adequate safeguards to protect the crime scene from fire, law enforcement, utility, and rescue personnel as well as others such as sightseers, victims, and individuals with a personal interest in the property. Also, since most residues remaining after an initiation of an explosive are water soluble, the crime scene, as much as possible, should be protected against exposure to excessive moisture be it from rain, snow, broken water pipes, or any other source.

E. Photographs: Take appropriate photographs to give a photographic presentation of the crime scene. These photographs should be made immediately before, periodically during, and at the completion of the crime scene activity. Properly identify each photograph, coordinate the photographs with diagrams and/or blueprints or maps, and consider the advisability of aerial photographs.

F. Bomb scene specialists: If without a specialist(s) trained in handling and processing bomb scenes, make arrangements for obtaining such an individual(s). Although the basic principals of conducting a crime scene search apply in a bomb scene search, individuals with specialized knowledge of explosives, improvised explosive devices, damage produced by explosive charges, and other facets associated with bomb scene searches, such as the search and collection of physical bombing evidence, are extremely valuable to the effective and efficient processing of a bomb scene. These specialists need not be qualified bomb disposal specialists. They should be the first persons, if possible, to be selected for the evidence and crime scene search coordinator positions.

G. Equipment: Promptly make arrangements to obtain the necessary equipment to move the debris and material at the scene. Although the equipment needed at the scene varies, the following have been used:

(1) Hand tools: shovels, rakes, brooms, boltcutters, wire cutters, sledgehammers, hammers, screwdrivers, wrenches, chisels, hacksaws, magnets, flashlights, knives, 50' measuring tapes, and traffic wheel-measuring devices.

(2) Other equipment: screens for sifting debris, wheelbarrows, metal trash cans, power saws, cutting torch equipment, ladders, portable lighting equipment, metal detectors, large plastic sheets, photographic equipment, and parachute harness with related rope and pulleys.

(3) Heavy equipment: truck, front-end loader, bulldozer, crane, and shoring materials.

(4) Personal equipment: hard hats, safety goggles, gloves (work and rubber types), foul weather clothing, coveralls, and work shoes.

(5) Crime scene kit: Usual equipment used for the collection, preservation, and identification of physical evidence.

(6) Vehicle: If the bombed target was a vehicle, bring an identical vehicle, if possible, to the scene to assist in identifying fragmented and mutilated items.

H. Search for evidence: Bear in mind the search for evidence at a bombing crime scene is important because the crime scene may contain principal evidence which will lead to the identification of the bomber(s) and/or assist in the successful prosecution of the matter. The following guidelines are general in nature as the exact method of searching depends on various uncontrollable factors:

(1) Place one person in overall charge of the collection of the evidence from the various collectors as valuable evidence may not be admissible in court if a proper "chain of custody" cannot be established. Include the location where the items were found. A diagram of the crime scene is always useful.

(2) Do not stop the search after a few items of evidence have been found.

(3) Avoid the tendency to concentrate only on physical evidence, such as safety fuse, detonating cord, blasting caps, leg (electrical) wire, dynamite wrappers, batteries, clock and timing devices, electronic and electrical components, metal end cap from a TNT block, plastic end cap from a C4 block, explosive residues, and unconsumed explosives, which may represent a bomb as this can result in overlooking other valuable evidence, such as fingerprints, hair, fibers, soil, blood, paint, plastic, tape, tools, toolmarks, metals, writing paper, printing, cardboard, wood, leather, and tire tread-shoe print impressions.

(4) Conduct a well-organized, thorough, and careful search to prevent the necessity of a second search. However, have a secure "dump" area for debris in the event a second search is necessary.

(5) Normally, initiation of the search should start at the site of the explosion and work outward. If the bomb crater is in earth, obtain soil samples from the perimeter of the crater as well as from the sides and bottom making sure to dig into the substrata. If the crater is in another material, obtain similar samples.

(6) Sift small debris through a 1/4" wire screen onto an insect-type wire screen. Usually these screens are placed on 2-foot square wooden frames constructed from 2" by 4" lumber.

(7) X-ray the bodies of living and deceased victims who were in close proximity of the explosion site for possible physical evidence and if possible, have the evidence removed. (Their clothing should be retained as it may contain explosive residues.)

(8) Search a sufficient distance from the site of the explosion as evidence has been found several blocks from the sites of large explosions.

(9) Determine the possible flight paths of bomb components to prevent needless searching.

(10) Search trees, shrubbery, telephone poles, and the roofs, ledges and gutters of buildings. Instances have occurred where physical evidence has been "carried away" on the tires of fire and rescue vehicles.

(11) Establish a search pattern for large areas. A line of searches moving forward has been found to be a satisfactory method. A bomb scene specialist should follow the line of searchers to evaluate the items found, control the searchers, and furnish guidance. If a second search is desired, the positions of the searches on the line should be rotated. Charting the area to be searched will insure a thorough search pattern.

(12) Retain all items foreign to the scene and items which the searchers cannot identify after seeking the assistance of those familiar with the bombed target.

PART III

FBI TECHNICAL SERVICES DIVISION

ENGINEERING SECTION

Introduction

The Engineering Section is responsible for the supervision of the Bureau's radio and secure teletype communications system as well as for the development and/or procurement of many types of technical equipment used in support of our investigative activities. In addition, this section has the capability of examining evidence of an electrical or electronic nature, conducting analysis of magnetic tape, and providing expert testimony regarding findings.

Some of the specific services which the Engineering Section can provide in the forensic area are:

Examination of telephone devices

A. Toll fraud

(1) "Blue box"

(2) "Black box"

(3) "Red box"

B. To defeat records

(1) "Cheese box"

(2) Call diverters

C. Intercepting communications

(1) Illegal equipment attached to telephone line to monitor and/or record third party conversation

(2) Illegal radio equipment capable of intercepting telephone communications and transmitting to remote location

Examination of clandestine radio devices

Magnetic Tape Signal Analysis

A. Audio

(1) Enhancement of speech intelligibility

(2) Authenticity examinations

(3) Aural comparisons of known and suspect recordings in violation of sound recording copyright statutes

(4) Duplication of recordings made on obsolete or unusual format equipment

(5) Comparison of audiospectrograms (voiceprint comparisons)

B. Video

(1) Production of still photographs

(2) Video comparisons of known and suspect recordings in copyright violation matters

PART IV

FBI IDENTIFICATION DIVISION

The Identification Division of the FBI is the national repository of criminal identification data. The obvious need and demand by police officials led to an Act of Congress establishing, on July 1, 1924, the Identification Division. The fingerprint records of both the National Bureau of Criminal Identification and of Leavenworth Penitentiary, totaling 810,188, were consolidated to form the nucleus of the FBI files.

A. Concerned with fingerprint records and inquiries pertinent thereto.

B. Largest and most useful collection of fingerprint identification data in the world.

C. Information available to law enforcement agencies and officials.

D. All records and information relating thereto are classified as confidential.

E. Over 173,000,000 criminal and civil prints representing 64,000,000 persons are in file.

Will furnish standard forms for submitted identification data.

A. Advantages:

(1) Saves time of Investigative personnel as forms and information are uniform.

(2) Saves time of contributor in writing letters or requests.

(3) Insures inclusion of essential data.

B. Forms available:

(1) Preaddressed criminal fingerprint cards (Form FD-249) required.

(2) Application fingerprint cards (Form FD-258).

(3) Personal identification fingerprint cards (Form FD-353).

(4) Preaddressed postage and fees prepaid.

(5) Disposition sheets (Form R-84). To subsequently furnish final disposition to an arrest for which a fingerprint card was previously submitted.

(6) Wanted request form (Form I-12). To replace or cancel a wanted or flash notice in an individual's record.

(7) Death notice form (Form R-88). To submit information relating to death of individual for whom a fingerprint record is known to exist.

(8) Requisition form (Form I-178). To order supply of above-mentioned forms.

Search of fingerprint cards (should list literal or narrative form of charge rather than by state code citations).

A. In order to achieve uniformity in arrest data stored at the national level and to improve efficiency, the following policies and procedures were approved by the Attorney General of the United States:

(1) Fingerprints should not be submitted to the FBI Identification Division in connection with nonserious offenses unless there is a question of identity or a check of Identification Division files is considered necessary for current investigative purposes.

(2) Fingerprint cards submitted on nonserious offenses will be searched through Identification Division files and returned to the contributor with results of the search.

(3) Nonserious offenses appearing on fingerprint cards returned to contributors will not be posted to identification records.

(4) Every identification record furnished will bear an FBI number.

(5) Criminal fingerprint cards submitted to the Identification Division for which there will not be a court adjudication (final disposition) will be searched and returned to the contributor along with the results of the search.

(6) Non-Federal applicant fingerprint cards are searched through the FBI Identification Division files and records are disseminated only after the following requirements have been met:

a. A state statute must provide for fingerprinting as a requisite for the type of applicant position involved or for the type of license to be issued.

b. All applicant and licensee fingerprints must first be checked through the appropriate state identification bureau or, if no such bureau exists, through a central agency designated for such purpose within the state.

c. The state bureau or agency handling the fingerprint card should forward only those prints on which no disqualifying record or substantive information is found locally.

B. Value of records.

(1) Provides identification and record of prior offenders.

(2) Identifies fugitives from justice.

(3) Uncovers criminal information regarding persons seeking employment in law enforcment, government, and banking and securities institutions.

(4) Uncovers "habitual criminal law" offenders (three or more prior convictions or felonies).

(5) Provides prosecuting attorneys, judges, and parole officers with background of defendants.

(6) Identifies dead (homicides, accidental deaths, or deaths from natural causes).

a. Identification of victim essential to investigation of crime.

b. Generally essential to prosecution of crime.

c. Family can be notified.

d. Military burial rights established.

(7) Identifies victims of amnesia or accidents.

C. Approximately 24,000 fingerprints are received each day. Urgent inquiries and identifications are given expeditious handling.

D. Footprint File.

(1) If arrested person has no fingers, footprints should be taken for record purposes.

(2) Area behind "great" toes is used for classification.

(3) About 400 sets are contained in FBI files.

Name checks to locate identification records (includes aliases and nicknames).

A. Provides investigative leads and background of suspects where fingerprints are not available for search.

B. Locates fingerprint records or possible records of fugitives.

C. Adequate data must be furnished on which to make a search:

(1) Name

(2) FBI number, or

(3) Law enforcement agency arrest number, State Identification Division (SID) number, or

(4) Armed Forces service number, or

(5) Social Security Number.

(6) Any and all of the above should be furnished when known in order to expedite the service and assist in making it as accurate as possible.

Fugitive Program

A. Wanted notices placed on fingerprint records for law enforcement agencies.

(1) Agency notified immediately if individual is arrested.

(2) Over 200,000 fugitive notices on file with an average addition of 1,500 per month.

(3) Approximately 1,500 fugitives identified per month.

B. Records and personal descriptions of fugitives furnished to Agency.

C. One-year follow-up procedure to determine if "want" is still active.

LATENT FINGERPRINT SECTION

A. Latent print examinations:

(1) Will examine lifts, negatives, photographs or original objects for latent prints of value for identification purposes.

(2) Will compare latent prints for indefinite period with inked prints of suspects submitted or with named suspects whose prints are contained in our files.

a. Photographs and negatives of latent prints of value are prepared at time of original examination and retained for future comparisons.

b. No need to resubmit original evidence when making subsequent requests for comparisons.

c. All original evidence will be returned to contributing agency unless directed to make some other dispositon by the contributing agency.

B. Examination of fingers of deceased persons.

(1) Through visual examination or special techniques, FBI fingerprint specialists may derive ten-finger classification which permits file search. The best inked prints obtained from decomposed bodies are often not classifiable.

(2) If unable to determine ten-finger classification for file search, will preserve all prints, however fragmentary, for comparison with prints of persons named for this purpose by contributor.

(3) All such specimens must be returned to contributor since FBI has no authority to dispose of specimens.

(4) When investigating a case involving a deceased person, the following should always be done:

a. Take inked fingerprints and palm prints for positive identification and for comparison with latent prints which may subsequently be found.

b. If legible inked prints are not possible, sever hands (with proper authority-usually local coroner) and forward in accordance with shipping instructions in C. (4) below.

C. Transmitting evidence to FBI Latent Fingerprint Section.

(1) Nonporous objects should be placed in individual nonporous protective coverings, such as transparent envelopes. If item is fragile, protect from breakage.

(2) Porous items should be placed in a protective covering, such as a paper envelope. Any number of such items can be placed in one envelope. Cardboard cartons need not be shipped in assembled position, but may be flattened out and covered with a protective wrapper.

(3) If evidence is exclusively for fingerprint examination, it should be directed to:

Director
Federal Bureau of Investigation
10th Street and Pennsylvania Avenue, N. W.
Washington, D. C. 20537
Attention: Identification Division
Latent Fingerprint Section

If examinations are involved requiring Laboratory and Latent fingerprint examination, submit to:

Director
Federal Bureau of Identification
10th Street and Pennsylvania Avenue, N. W.
Washington, D. C. 20535
Attention: FBI Laboratory

(4) Send by air express, registered mail, registered airmail or by personal delivery. If hands or fingers are being submitted, they should be placed in airtight container filled with alcohol or formaldehyde solution.

D. Latent print examinations and testimony.

(1) Examination will be made even if the evidence in the case has been or will be subjected to the same technical examination by other experts in this same scientific field.

(2) Expeditious service will be afforded specific evidence, if requested. Such priority treatment should be utilized only when absolutely necessary.

(3) FBI Latent Fingerprint experts will testify to their findings in a case at trial matters for all Federal agencies, U. S. Attorneys and military tribunals in both civil and criminal matters and for all duly constituted state, county and municipal law enforcement agencies in connection with their official investigations of criminal matters.

(4) In court proceedings other than a trial (preliminary hearing, grand jury presentation), it is requested that the original official report be used in lieu of the actual appearance of an FBI expert, if acceptable to the court. However, if the report is not acceptable, our expert will testify at the proceeding.

E. Developing Latent Prints.

(1) Nonporous or nonabsorbent surfaces, such as glass, polished metal, painted or varnished wood, porcelain and ceramic tile, are processed using fingerprint powders.

a. FBI recommends use of gray and black powders since other colors are more difficult to photograph.

b. Choose color of powder to contrast with color of surface being examined with the exception of reflective mirrors, glass or polished chrome. FBI recommends using gray powder only.

c. Do not powder obviously greasy surfaces, wet surfaces, bloody surfaces or prints in dust. Prints on such surfaces can only be photographed.

(2) Porous or absorbent surfaces such as paper, cardboard or unpainted wood are processed chemically using the iodine fuming, ninhydrin, and silver nitrate methods since these processes will develop latent prints for longer periods of time and stains may be removed or partially removed from document material.

F. Preservation of latent prints dictates that permanent replicas or photographs for comparison and prosecutive purposes be made:

(1) Photographing. (It is recommended that all latent prints be photographed before lifting.)

(2) Lifting.

a. All powder prints should be lifted after photographing.

b. Transparent tape and rubber tape in black and white are generally used to lift the latent print. When transparent tape is used, a color contrasting to the color of the backing card should be used to secure the the color of powder used.

G. Use of Fingerprint camera.

(1) Advantages:

a. Fixed focus.

b. Has its own light source.

c. Makes natural-size photographs and negatives.

(2) FBI recommends the use of a roll film adapter for 2 1/4 by 3 1/4 Folmer-Graflex and Sirchie fingerprint cameras. One hundred twenty Tri-X (eight exposures) roll film is recommended. One such adapter is the Horseman Roll Film Holder. Modification instructions are available upon request from the FBI Latent Fingerprint Section, Washington, D. C.

(3) Exposures.

a. Folmer-Graflex camera:

(1) Black powder print on white surface--snapshot.

(2) Gray powder on black surface--one second.

b. Sirchie camera:

(1) Set diaphragm at F 3.

(2) Black powder print on white surface--one second.

(3) Gray powder print on black surface--two seconds.

(4) Procedures for use of fingerprint camera:

a. Camera opening must be flush with surface.

b. Shut out all outside light.

c. Take several shots of each latent print with appreciable variations in exposure times (Example: snapshot, one second and two seconds.)

d. Take overlapping shots of large areas such as palm prints of simultaneous fingerprints.

e. Prints showing definite elevation of ridges and furrows sometime show better contrast by turning out lights on one side of camera.

f. Position latent prints in center of opening on front of camera. Include identification tag alongside each print to be photographed. This tag should bear initials, date, and other data necessary to identify with crime scene.

H. Reference Files in Latent Fingerprint Section.

(1) Single fingerprint files contain known prints of persons who have committed certain types of major crimes. Categories included are:

a. Bank robbery.

b. Bank burglary.

c. Bank larceny.

d. Kidnaping.

e. Extortion.

f. Interstate transportation of obscene materials.

g. Major thieves.

h. Professional fraudulent check passers.

(2) National Unidentified Latent File contains unidentified latent prints from crime scenes in FBI investigated major-type crimes.

I. Advanced Latent Fingerprint Schools.

(1) Latent print examiners will be sent as instructors. Submit request to local FBI.

(2) FBI will furnish technical equipment.

(3) Sponsored by a local law enforcement agency.

(4) Desire 15 to 20 local law enforcement officers in each school.

J. FBI Disaster Squad - will assist in identifying victims in major disasters.

(1) By traveling to the disaster site and fingerprinting the victims.

(2) By comparing prints of victims with available known prints.

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(3) Requires request from ranking Federal, state, or local law enforcement agency, coroner/medical examiner, or other governmental official.

Identification Literature

A. Reprints of articles previously appearing in the "Law Enforcement Bulletin" on detailed aspects of latent print work and general fingerprint identification matters.

B. Booklet of "Standardized Arrest Abbreviations."

C. Booklet entitled "Science of Fingerprints" available through the FBI by addressing your request to Federal Bureau of Investigation, J. Edgar Hoover F.B.I. Building, 10th Street and Pennsylvania Avenue, N. W., Washington, D. C. 20535, Attention: Office of Congressional and Public Affairs, Research - Correspondence/Tours Section; or the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402, at a cost of $4.25 each.

PART V

FBI LABORATORY DIVISION

SEROLOGY EXAMINATIONS

Forensic serology consists of the identification and characterization of blood and other body fluids in the crime laboratory. Evidence is received mainly in connection with violent crimes, such as murder, rape, robbery, and assault and battery. Evidence in burglary, hit-and-run cases and game violation cases are also frequently received.

BLOOD

Blood Examinations Aid Investigations

A. In location of the crime scene - Identification of human blood of a similar group to that of the victim can pinpoint the area for a crime scene search.

B. In determining the possible commission of a crime - Occasionally, the identification of human blood on a highway, sidewalk, porch, or in a car is the first indication of a crime's occurrence.

C. In identifying the weapon used - The grouping of human blood identified on a club, knife or hammer can be of considerable investigative and prosecutive value.

D. In proving or disproving a suspect's alibi - The findings of human blood on an item belonging to a suspect who claims an animal as the blood source. The findings of animal blood can substantiate the claim of an innocent person.

E. In eliminating suspects - The determination by grouping tests that human blood on suspect items is different from the victim's blood can facilitate the release of a suspect. Blood found similar to the suspect's blood group can help to substantiate a suspect's claim of having a nosebleed or other injury.

Information Determinable by Blood Tests

A. Identification of stains as blood - Chemical and microscopic analyses are necessary to positively identify blood. The appearance of blood can vary greatly depending on the age of stains and on other factors.

B. Determination whether blood is of human or animal origin - If animal, determination of specific animal family.

C. Determination of blood group if human.

(1) Classification of dried blood into one of the four groups of the International ABO Blood Grouping System may be done.

(2) Dried blood in sufficiently good condition and quantity may be further characterized by other blood grouping systems. These systems include Rhesus (Rh), MN and Lewis (Le), as well as six (6) enzymes and two (2) serum proteins which are assayed by electrophoresis (ie, PGM, GLO I, EsD, EAP, AK, ADA, Hb and Hp).

Limitations of Blood Examinations

A. It is not possible to identify human blood as coming from a particular person.

B. The race of the person from whom blood came cannot be conclusively ascertained; nor can the age of a dried stain be determined.

Collection, Identification and Wrapping of Bloodstained Evidence

A. Garments and fabrics:

(1) Investigator's identifying marks should be put directly on the fabric in ink, away from stained areas if possible.

(2) Each item should be wrapped separately.

(3) Stains which are moist must be dried out before wrapping or putrefaction of blood will occur.

(4) Drying should be done by exposure to the atmosphere in a secure, well-ventilated room and items should not be exposed to direct sunlight or heat.

B. Blood on surfaces such as walls or floors - Best to submit the wall or floor section, but can be scraped off into pillboxes or vial. Avoid envelopes; however, if only envelope is available, scrapings should be first enclosed in druggist fold and thoroughly sealed by cellophane tape. Container identified by investigator's marks. Take care to avoid contamination in the scraping. Success of the examinations can depend on you.

C. Blood on auto surfaces - If not present in sufficient quantity to scrape off, stained car unit should be submitted.

D. Blood on pieces of glass:

(1) Pieces should be submitted if stains are too thin for removal of adequate amount by scraping.

(2) Specimens should be insulated in package to avoid breakage in transit.

(3) Mark item itself or on container holding scrapings.

E. Blood in dirt or sand:

(1) If blood is encrusted on surface, the crusts should be removed and enclosed in separate pillboxes to avoid additional contamination with dirt and sand during shipment. Remainder of specimen may be submitted in circular ice cream-type container.

(2) Mark containers appropriately.

F. Blood on large metallic objects, such as car bumpers or pipes:

(1) If shipped in wooden box, the use of wooden cleats or wires inside box is suggested to hold specimen securely and avoid frictional removal of stains during shipment.

(2) Mark items themselves.

G. Liquid blood samples:

(1) Samples from victim and suspect should be submitted, if possible.

(2) Sample should be at least five cubic centimeters in a properly marked sterile container.

(3) No refrigerants and/or dry ice should be added to the sample.

(4) A small amount of an anticoagulant (EDTA or heparin) is recommended in the sample.

(5) Sample should be shipped Registered Airmail Special Delivery to the Laboratory.

(6) Stopper should be sealed with tape to avoid loosening due to air pressure differences in plane and possible loss of blood.

(7) Keep under refrigeration but do not freeze.

Blood Evidence Transmittal Letter

The letter of request should contain the following information:

A. A statement of facts surrounding the case.

B. Any claims made by the suspect as to the source of blood on evidence items.

C. Blood group of victim and suspect, if definitely known.

D. Whether or not animal blood might be present.

OTHER SIGNIFICANT BODY FLUIDS

Body Fluid Examinations Aid Investigations

A. Seminal Stains:

(1) Their identification by chemical and microscopic means on vaginal smears or swabs or on a rape victim's clothing may be of value in corroborating the claims of victim.

(2) If the depositor is a secretor and proper known controls are available, grouping test may provide the depositor's ABO blood type.

(3) Enzyme typing (PGM, etc.) also is possible in semen stains where sufficient sample size and quality are available.

B. Saliva Stains:

(1) When from a known source, may be used in conjunction with liquid blood from the same source to establish secretor status of individual (see below).

(2) When from questioned source, may provide information as to ABO blood type of depositor (proper known samples necessary).

C. Urine Stains:

(1) May be qualitatively identified based on chemical testing; however, absolute identification is not possible. No routinely available forensic techniques will give reliable blood group information from urine.

Secretors and Secretor Status

A. Secretors (about 80 percent of population) are individuals who have in their other body fluids (semen, saliva, vaginal fluid) detectable amounts of the same ABO group characteristics as in their blood.

B. Nonsecretors (remainder of population) do not exhibit such characteristics.

C. The Lewis blood grouping system is utilized to determine secretor status and a liquid blood sample is required. If this test is inconclusive, a dried saliva sample is needed.

Limitations on Seminal Stain and Saliva Stain Grouping Tests

A. Too often semen is mixed with urine or vaginal secretions of the victim and reliable grouping tests are not possible.

B. Saliva on cigarette stubs is often dirty. Saliva on cigar butts is not groupable. Ash trays should not be simply emptied into a container. Rather, individual cigarette butts should be separately packed and care taken to avoid ash and debris contamination of any possible saliva.

C. A person may be a "weak" secretor and the amount of blood group factor present in the semen or saliva is insufficient for reliable grouping tests.

D. Accurate evaluation of grouping test results on questioned semen and saliva stains requires known liquid blood samples from the victim and suspect.

E. In view of the difficulties involved in cigarette saliva grouping and the circumstantial nature of any successful result, it is often more expedient to request latent fingerprint in preference to serological examination.

Collection, Identification and Packaging of Evidence Stained with Body Fluids

A. Semen Samples:

(1) Clothing or other material bearing suspected semen stains should be marked with dates and initials, dried if moist, and each item packaged separately.

B. Saliva Samples:

(1) Questioned samples should be handled as above for semen.

(2) To obtain known saliva sample, donor should expectorate on filter paper to provide a stain approximately 1 1/2 inches in diameter. Saliva should be clean and undiluted. Stain should be circled with pencil before drying is complete. Label with initials, date and place in appropriately labeled envelope.

(3) Never submit liquid saliva samples.

THE RAPE CASE - SPECIAL EVIDENCE CONSIDERATIONS

A. Because of the possibilities of serological evidence in a rape case, evidence collection and preservation warrants special consideration. The forensic serologist can often provide the investigator with valuable information beyond the statement that "semen is present" on an item if the necessary samples are obtained and properly preserved prior to submission to the Laboratory. The situation outlined below represents the ideal case; however, in many instances, much of the evidence listed may be obtained without excessive difficulty.

B. It should be realized, however, that the majority of this evidence should be collected as soon as possible (within hours of the crime).

C. The following evidence should be obtained <u>from the victim</u> in a rape case:

(1) Two (2) vaginal smear slides for use as a means of showing that spermatozoa (and semen) is, in fact, present. Slides to be sent to a criminal laboratory should not be fixed or stained at all.

(2) Liquid blood sample at least 5cc. in volume. Anticoagulants may be used, heparin or ethylenediamine tetra acetic acid (EDTA) are preferred. This sample enables the serologist to determine the victim's blood group.

(3) Four vaginal swabs (dry before packaging). These would be used for grouping determinations in the event that the victim, suspect or both are found to be secretors.

(4) Two clean swabs from the same package as the above vaginal swabs. These would be used as unstained control swabs to show that any result obtained is or is not due to the cotton of the swabs themselves.

(5) Saliva sample or filter paper. (For instructions on how to obtain this sample see the appropriate information within saliva paragraph above.) Grouping tests on this sample will be conducted to determine secretor status if Lewis blood grouping tests are inconclusive.

(6) In addition to the above, items of clothing, bed clothes, etc., would logically be obtained from the scene and victim at this time or as soon after as possible.

D. Evidence collected from the <u>suspect</u> would logically include clothing, a liquid blood sample and a saliva sample, taken as described above. Hair samples should also be taken from the suspect(s).

MICROSCOPIC EXAMINATIONS

HAIRS AND FIBERS

Hairs and Fibers Examinations Aid the Investigation

These examinations are valuable in that they assist in:

A. Placing the suspect at the scene of the crime.

(1) Interchange of hairs or fibers between the victim's and suspect's clothing in crimes of violence such as rape, assault and murder.

(2) Hairs or fibers from a suspect left at the scene of crimes such as burglaries, armed robberies and car thefts.

B. Identifying the scene of the crime - hairs or fibers left at the scene of crimes such as burglaries and armed robberies.

C. Identifying the weapon or the instrument of a crime - hairs or fibers on wrenches, knives or clubs.

D. Identifying hit-and-run vehicles - hairs or fibers adhering to suspect automobile.

E. Corroborating witness testimony.

Information Determined from an Examination of a Hair

A. Whether animal or human.

(1) If animal, the species from which it originated (dog, cat, deer, beef, etc.)

(2) If human, the race, body area, how removed from the body, damage, and alteration (bleaching or dyeing) may be determined.

Limitations of Hair Examinations

A. Not positive evidence; however, is good circumstantial evidence.

B. Age or sex cannot be determined.

Information Determined From Fiber Examinations

A. Identification of the type of fiber.

(1) Animal (wool)

(2) Vegetable (cotton)

(3) Synthetic (man-made)

(4) Mineral (glass)

B. Determination as to whether or not questioned fibers are the same type and/or color and match in microscopic characteristics with those fibers which a suspect's garment is comprised of.

C. Not positive evidence, but good circumstantial evidence.

Fabric

A positive identification can be made if a questioned piece of fabric can be fitted to the known material. Composition, construction, color and diameter of fibers may be compared.

Tape

A positive identification can be made with the end of a piece of tape left at the scene of the crime and a roll of suspect tape (similar to fabric examination). Composition, construction and color may be compared.

Cordage/Rope

A piece of rope left at the scene of the crime may be compared with similar suspect rope.

A. Composition, construction, color and diameter can be determined.

B. Manufacturer can sometimes be determined, if tracer present.

BOTANICAL

Botanical examinations are conducted where plant material from a known source is compared with plant material from a questioned locale.

ANTHROPOLOGICAL

A. Frequent identifications are made through comparisons of teeth with dental records and X-rays with corresponding bone structures.

B. Examinations may be made to determine if skeletal remains are animal or human. If human, the race, sex, approximate height and stature and approximate age at death may be determined.

WOOD

The presence of a suspect at the crime scene can often be established from a comparison of wood from his clothing, vehicle or possession with wood from the crime scene.

Types of Wood Examinations

A. Specific source

(1) Side or end matching.

(2) Fracture matching.

B. Species identification

NIGHT DEPOSITORY TRAP DEVICES

Devices or items suspected as being portions of devices used to trap deposits placed in bank night depositories are examined as to design, construction, composition and trace evidence, and compared with similar devices previously received in an effort to determine if the device was designed by the same individual(s).

CIGARETTE IDENTIFICATION FILE

A. Used by examiners to identify cigarette butts received as evidence.

B. Currently composed of over 185 different types of American cigarettes.

C. New brands are obtained semiannually.

MISCELLANEOUS EXAMINATIONS

These examinations include the following:

A. Button matches

B. Fabric impressions

C. Glove prints

D. Laundry markings

(1) Invisible Laundry Mark File maintained

(2) No file maintained on visible laundry marks

E. Feathers

F. Knots

CHEMICAL EXAMINATIONS

TOXICOLOGY EXAMINATIONS

Purpose

Assists the medical examiner in determining the cause of death in suspected cases of poisoning.

Types of Poisons

A. Volatiles, such as carbon monoxide, alcohols, cyanide and solvents.

B. Heavy metals, such as arsenic, mercury, lead and antimony.

C. Solvent soluble compounds, such as aspirin, nicotine, and common drugs of abuse.

D. Miscellaneous poisons such as pesticides, inorganic compounds, plants, caustics and insecticides.

Background Information Useful to Toxicological Examiner

A. Copy of autopsy report.

B. Symptoms exhibited prior to death.

C. List of drugs administered to victim.

D. List of toxic chemicals normally encountered by victim in employment or at home.

Desirable Specimens for Complete Laboratory Examination

A. Brain (100 grams).

B. Liver (100 grams).

C. Kidney (100 grams).

D. Blood (20 cc) (add preservative and identify).

E. Urine (all).

F. Gastric contents (all).

G. Vitreous Humor.

H. Any suspect food, drugs or chemicals.

Preparation for Shipment to Laboratory

A. Place each organ and fluid in a separate sealed container.

B. Have pathologist label and initial each specimen.

C. Place containers in insulated box with dry ice or freezer packs (do not allow dry ice to touch glass jars).

D. Mark package "Keep Cool" and transmit by fastest practical method.

PHARMACEUTICAL AND DRUG EXAMINATIONS

Information Helpful to Laboratory Examiner

A. Interview of suspect regarding source and use.

B. Prescription data.

C. If possible, submit sample in original container.

Collection and Preservation

A. Each item packaged separately and securely.

B. Each item and/or its container clearly identified by initials and item number.

Information Determined from the Examinations

A. Weight of pharmaceuticals.

B. Quantitation of active ingredients.

ARSON EXAMINATIONS

Reasons for Arson

A. Insurance.

B. Revenge.

C. Crime coverage.

D. Pyromania.

E. Civil disobedience.

Things to Look for in Arson

A. Many fires in unrelated areas.

B. Arson devices.

(1) Candle plants.

(2) Cigarette in Matchbook.

(3) Molotov cocktail.

(4) Sugar, potassium chlorate, sulfuric acid.

C. Fire trails.

(1) Cloth ropes.

(2) Burn trails on carpeting.

(3) Deep charring trails in hardwood.

D. Removal of property - No typical remains of household goods in debris.

Types of Evidence

Specimens should be absorbent in nature or of a type that will retain a flammable liquid, such as:

A. Padded furniture.

B. Carpets.

C. Plasterboard.

D. Soil.

E. Clothing.

F. Molotov cocktails.

Preservation of Evidence

Most readily flammable liquids are volatile and are easily lost through evaporation.

A. Use air tight containers.

(1) Clean metal cans (preferable).

(2) Clean glass jars (well packed to prevent breakage)

B. Properly identify specimen - Initial specimen or container.

Interpretation of Laboratory Results

A. Gas chromatography examination of distillates recovered from supected arson debris usually aids in classifying the product as regard to distillation range such as gasoline, fuel oil and paint solvents.

B. Limitations: Generally unable to identify specific brand of gasoline or fuel oil due to weathering, common intermixing of commercial brands and lack of distinguishing characteristics between brands.

GENERAL CHEMICAL ANALYSIS EXAMINATIONS

Definition

Qualitative and quantitative analysis of miscellaneous chemical evidence.

Sources of Materials

A. Automobile accidents: Grease from suspect vehicle taken from appropriate area; grease smears from victim.

B. Fraud cases: Verification or disproving specifications in government purchases, product verification in "pyramiding" operations, con games, replacement of valuable product constituents with worthless constituents, etc.

(1) Desired information - Claims made for product by manufacturers or distributors, alleged constituents, complaints by users, etc.

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(2) Limitations - Products cannot be tested mechanically or to determine pros or cons of use. Analysis is limited to determination or constituents and literature search in reference thereto. Consideration of use of outside laboratories can be given to other necessary testing.

C. Malicious mischief cases: Destruction of paint surfaces, lawns, other valuables by the use of chemicals.

D. Assault cases: Use of harsh chemicals on assault victims, lubricants used in rape and sodomy cases, miscellaneous unknown chemicals found at assault scene, etc.

E. Sabotage: Corrosive chemicals or sugars in fuel tanks and oil pans, gears, etc., of drive trains; sea water contamination aboard ships.

F. Ink Analysis.

(1) Scope - Comparison of the formulation of questioned and/or known ink specimens including typewriter ribbons and stamp pad inks.

(2) Limitations - When ink formulations are the same, it is not possible to determine whether or not they originated from the same source to the exclusion of other inks having similar formulations.

(3) Standard ink reference files necessary for possible association of a questioned ink with a manufacturer are not maintained in the Laboratory.

G. Miscellaneous chemical examinations such as:

(1) Tear gas and dyes in bank robbery packets.

(2) Constituent determination in patent cases.

(3) Flash and water soluble paper in gambling and espionage cases.

(4) Verification of stolen chemicals in ITSP and TFIS cases.

MINERALOGY EXAMINATIONS

Mineralogy includes many materials, mostly inorganic, crystalline or mineral in character. Comparisons will, by inference, connect a suspect or object with a crime scene, prove or disprove an alibi, provide investigative leads or substantiate a theorized chain of events. Materials include glass, building materials, soil, debris, industrial dusts, safe insulations, ores, minerals, abrasives and gems.

GLASS

Glass, a noncrystalline, rigid material makes excellent physical evidence.

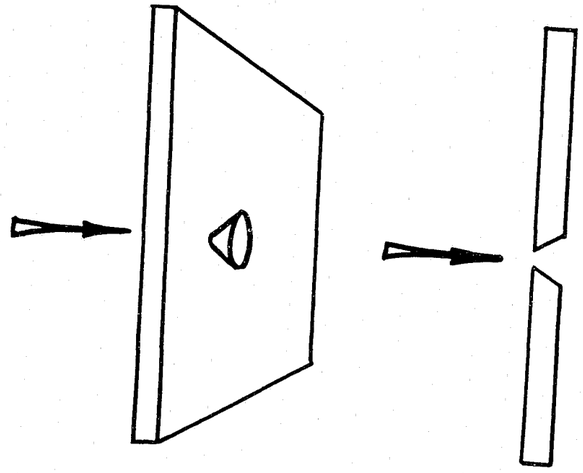
Glass Fractures

Fracture patterns are unique; examinations result in valuable information as to direction of breaking force; a physical match of two pieces of glass results in an opinion that they came from a common source to the exclusion of all other sources.

A. Penetration of glass panes by bullets or high speed projectiles produces a cone pattern from which the direction and some idea of the angle of penetration can be determined.

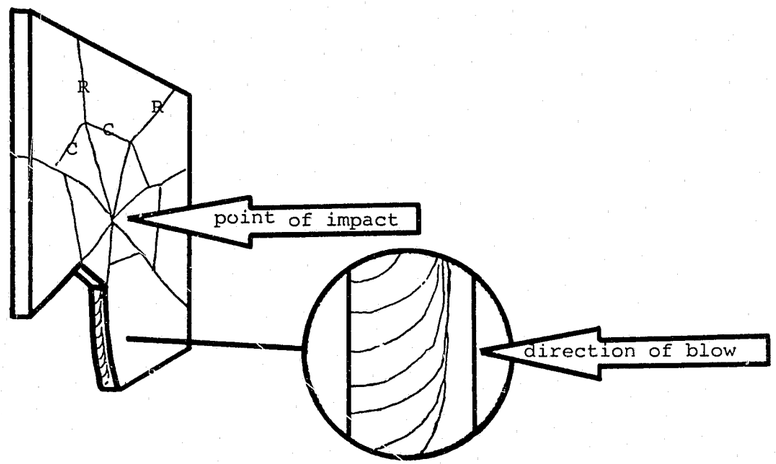
(1) If the cone is blown away, stress line patterns as described below are used to determine the direction of the force.

(2) The type of ammunition may sometimes be determined by firing tests.



B. By an examination of stress lines on radial cracks near the point of impact, the direction of the force used to break the glass can be determined.

(1) This determination depends on identification of the radial cracks and the point or points of impact. A sufficient amount of glass must be submitted to reconstruct a portion of the pane from the edge to the point of impact. All, or as much as possible, of the pane must be submitted.



(2) The pieces of glass remaining in the window after the breaking should each be labeled to indicate inside or outside prior to submission to the Laboratory.

(3) The direction of the breaking force cannot be determined from tempered glass (commonly found in auto windows) or very small panes of glass.

(4) Laminated glass, such as windshields present special problems. Submit entire windshield if possible.

(5) Heat breaks can be identified, but the side on which the heat was applied cannot be determined from fracture edges.

C. Pieces of glass may often be fitted together.

(1) By fitting pieces together with microscopic matching of stress lines, the Laboratory examiner can positively identify the pieces os originally having been broken from a single pane, bottle or headlight.

(2) If pertinent portions of a bottle or headlight can be fitted together, the manufacturer, type, etc., may be determined for lead purposes.

(3) If pertinent portions of plastic lenses (such as vehicle taillights) can be fitted together, the make and model of the lens and/or the vehicle can often be determined.

Glass Particles

When a window breaks, glass particles shower toward the direction of the force 10 feet or more. Particles, therefore, can be found in the hair and on the clothing of the perpetrator. Particles can also become embedded in bullets and/or objects used to break windows. Particles of broken glass from a hit-and-run vehicle are often present on the victim's clothing; many times the driver of a hit-and-run vehicle will emerge from the vehicle to determine what was hit or how seriously the victim was injured and, consequently, broken glass from the accident may often be found embedded in the driver's shoes.

A. By microscopic, optical and density comparisons, glass particles can be identified or compared with glass from a known source.

B. The Laboratory expert cannot identify the source to the exclusion of all other sources; however, it can be stated and demonstrated that it is highly improbable that the particles came from a source other than the matching known source; if two or more different known sources can be matched, the conclusion is greatly enchanced.

Glass Fibers and Fiberglass Insulation Materials

Glass fibers from boats, auto fenders, filters and most often building or duct insulations may adhere to the clothing or belongings of suspect(s). By microscopic and optical comparisons glass fibers are identified and compared with the known source by techniques similar to those used for comparing particles.

Collection of Glass Specimens

A. In cases where the direction of breaking force is required, pieces left undisturbed in the window must be marked as to inside or outside and all available glass must be submitted so that enough pieces can be fitted together to identify the radial cracks near the point of impact and the point of impact.

B. Where pieces are large enought to fit together, all available glass must be submitted to increase the probability of finding matching edges.

C. Do not use envelopes for glass. Wrap each piece securely and package tightly.

D. Send all available items of clothing of the suspect, comb his hair and check for particles in sweat on skin and in wounds.

E. Where fiberglass insulation is involved, be sure all sources from various areas are sampled. Look for added insulation over older insulation (send both).

SOILS, DUSTS, DEBRIS

Soil is defined as any finely divided material on the surface of the earth and may contain such man-made materials as cinders, shingle stones, glass particles, paint, rust, etc. Soil, as a category, includes debris, industrial dusts, oily soil from under vehicles as well as natural soils.

Value of Soil as Evidence

A. Soil varies widely from point to point on the surface on the earth and even more with depth. Many small samples are better than one large sample.

B. Soil cannot be positively identified as coming from one source to the exclusion of all others, but the Laboratory expert can associate questioned soil with a most probable source, conclude that a source cannot be eliminated or that a point or area could not be the source of the questioned soil. Such conclusions have proven extremely valuable in the proof of criminal cases.

C. Industrial dust specimens or soil near factories are often distinctive.

D. Debris may contain particles characteristic of a specific area.

Collection of Soil Specimens

A. The investigator should seek likely areas at the crime scene such as shoe prints, tire marks, burial sites or muddy areas where a transfer of soil to the suspect is logical. The investigator should attempt to get samples which appear the same as the soil on the suspect's shoes or belongings.

B. Several samples should be taken from crime scene areas because of the above-mentioned variation in small areas and additional samples in at least four directions up to 300' from the scene should be sampled to show that a variation does exist and to allow the Laboratory to "judge" the probability that the questioned soil could have come from the area. Samples should be taken from the surface no deeper than shoes or tires would depress the soil. Many small samples are desirable; a mixture from a large area or a sample taken too deeply may introduce unwanted variations.

C. Alibi areas such as the suspect's yard or work should be sampled.

D. Plant particles, leaves and seeds on or in soil may be identified and compared.

E. Where soil has fallen or been deposited inside buildings or cars send carpets or attempt to keep lumps intact by secure packing; lumps break up in a too large, unpacked container.

F. Soil from under car fenders may be in layers. Such soil should be chipped or cut off and packaged so that layers can be kept intact for comparison with similar lumps that may be found at the crime scene.

G. Shoes, tires and other items should be submitted to the Laboratory. Attempts to remove the soil in the field may destroy valuable soil characteristics.

Packaging of Soil Specimens

A. Do not use envelopes for soil.

B. Use leakproof containers; if glass jars must be used, pack so as to avoid breakage.

SAFE INSULATIONS

Safe insulation is found between the walls of fire-resistant safes, in vaults and safe cabinets. It is readily transferred to tools and clothing.

Collection and Packaging

A. Sample near broken edge of insulation.

B. Send tools or clothing to Laboratory; do not remove deposits in the field.

C. Pack to keep lumps intact; protect deposits on tools by wrapping.

BUILDING MATERIALS

Value of Evidence

A. Where entry is through a roof or wall, particles adhere to clothing or tools and may be on the loot or in toolbags or vehicles.

B. These materials are usually common materials with few characteristics. Maximum value as evidence requires the presence of several types, such as brick, mortar, plaster, stucco, etc.

Collection and Packaging

A. The hole should be examined and materials of each type should be obtained.

B. Submit in leakproof containers.

ORES, MINERALS, ROCK, CERAMICS

These materials will be examined or compared as requested. Mineral content of ores can be determined; spurious or excessive claims of ore value can be disproved.

ABRASIVE MATERIALS

In sabotage and malicious damage to engines, cars, trains, etc., abrasive materials may be put in oil or lubricants. These materials can be identified as sand or commercial abrasives and are of some value for comparison.

Collection of Specimens for Abrasives

A. If oil, the oil from the engine pump and/or filters should be submitted; abrasives settle in oil or fuel.

B. Send affected bearings or parts; the abrasive may be embedded; scratches or cuts may be typical of abrasive damage.

PRECIOUS STONES

The Laboratory can determine the kind of stone and whether genuine or synthetic.

FIREARMS IDENTIFICATION

Firearms identification is the study by which a bullet, cartridge case or shotshell casing may be identified as having been fired by a particular weapon to the exclusion of all other weapons.

CONCLUSIONS

Any one of the three conclusions listed below can be reached. If either A or B is reached that conclusion is positive as in fingerprint identification.

A. The bullet, cartridge case, or shotshell casing was fired by the weapon.

B. The bullet, cartridge case, or shotshell casing was not fired by the weapon.

C. There are not sufficient microscopic marks remaining on the bullet, cartridge case, or shotshell casing to determine if it was fired by the weapon or the condition of the weapon precludes the possibility of making an identification.

TERMINOLOGY

Caliber

In general, caliber denotes the nominal bore diameter of a barrel measured in either hundredths of an inch (.01) or in millimeters (mm). This provides an initial grouping capability, such as referring to .22 caliber or .30 caliber.

Caliber Designations

These designations expand from the basic caliber grouping in a variety of ways. Each one of these designations denotes a specific cartridge case size and configuration. While some cartridges will interchange, most are specific for a weapon of a particular cartridge designation. Among caliber designations are the following:

A. Descriptive words: .38 Special, .41 Magnum, .380 Auto, 9mm Corto.

B. Original powder charge: .30-40 Krag.

C. Manufacturer's or designer's name: .30 Remington, 6mm Remington, .257 Roberts.

D. Velocity: .250-3000.

E. Year of adoption: .30-06 Springfield.

F. Millimeters and length of case: 8 x 57, 7 x 57.

General Rifling Characteristics

These vary from manufacturer to manufacturer and consist of:

A. Number of lands and grooves.

B. Their dimensions.

C. Direction of twist of rifling.

D. Caliber.

TYPES OF EXAMINATIONS

Bullets

Marks on bullets can be produced by rifling in the barrel of the weapon or possibly in loading.

A. Recovered evidence bullet: Determine manufacturer, specific caliber, type and make of weapon from which fired and whether sufficient marks are present for identification. (Make of weapon involved based on general rifling characteristics.)

B. Bullet versus weapon: Determine also whether or not a bullet was fired from a particular weapon.

C. Shot pellets, buckshot and slug load from victim or scene: Can identify size of shot and gauge of slug load. Shot not identifiable with a suspect shotgun.

Fired Cartridge Case or Shotshell Casing

Marks on a fired cartridge case or shotshell casing can be produced by breech face, firing pin, chamber, extractor and ejector.

A. Fired cartridge case found at scene: Determine specific caliber, type and possibly make of weapon in which fired, and whether sufficient marks are present for identification.

B. Fired shotshell casing found at scene: Determine gauge, original factory loading and whether sufficient marks are present for identification.

C. Wadding or shot from victim or scene: From wadding determine gauge and possibly manufacturer of wadding. From shot, determine size. Shot not identifiable with a suspect weapon.

D. Fired cartridge case/shotshell casing versus weapon: To determine whether loaded into and/or fired in weapon.

(1) Based on identifiable firing pin impressions, breech face or chamber marks, can establish as fired in specific weapon.

(2) Based on extractor or ejector marks, can only identify as having been loaded into and extracted from specific weapon.

Unfired Cartridge or Shotshell

(Note: See paragraph regarding "Shipping of Live Ammunition") Sometimes it is important to determine whether the unfired cartridge or shotshell was loaded into and extracted from a weapon based on the presence of extractor and/or ejector marks. The following can be determined:

A. Cartridge: Specific caliber, type of weapon involved and whether sufficient marks for identification.

B. Shotshell: Gauge and whether sufficient marks are present for identification.

C. Cartridge/shotshell versus weapon: Determine if loaded into and extracted from a suspect weapon. Does not apply to revolvers.

Gunshot Residues

Gunshot residues may be located, depending on the muzzle-to-garment distance, by:

A. Microscopic examination of the area surrounding the hole for gunpowder particles and gunpowder residues, smudging and singeing.

B. Chemical processing of area surrounding hole to develop a graphic representation of powder residues and lead residues around hole. Test patterns obtained compared with those produced at various distances using suspect weapon and ammunition like that used in the case--from same source if possible.

Shot Pattern

The distance at which a shotgun was fired can be determined. It is necessary to test fire the suspect weapon at various distances using the same type of ammunition as involved in the case being investigated. Fired shotshells from the suspect weapon can be submitted. (See paragraph regarding the shipment of live ammunition.)

Trigger Pull

The amount of pressure necessary to fire a weapon can be determined.

Determination of Accidental Firing

A weapon can be examined to determine if it can or cannot be fired accidentally.

Identification of Gun Parts

Gun parts found can be identified as to:

A. Type of weapon from which it originated.

B. Whether the part came from a suspect weapon.

SUBMISSION OF EVIDENCE

Clothing for Gunshot Residue Examination

A. Protect each article of clothing at the time of removal and wrap each separately.

B. Make certain all garments are airdried in shade before submitting to the Laboratory.

C. Advise as to the location of the shots in the victim's body.

Live Ammunition

Live ammunition cannot be sent through the U. S. Mail but can be shipped via other carriers such as United Parcel Service (UPS) or Federal Express. The following guidelines must be strictly followed in order to comply with Department of Transportation regulations:

A. Surface Shipments (UPS) -

(1) Cardboard box with appropriate label and invoices marked "United Parcel Service."

(2) UPS "Hazardous Materials" label.

(3) Class C explosives label.

B. Air Shipments (Federal Express) -

(1) Cardboard box with appropriate label and invoices marked "Federal Express."

(2) Shipper's certification for restricted articles.

(3) "Small Arms Ammunition" stamped on outside of box.

Bullet and/or Gun

These can be sent registered mail, U. S. Postal Service

MARKING SPECIMENS FOR IDENTIFICATION

A. Bullets: On the nose or base. Be alert to foreign materials or impressions on the nose, if these could be important to your case.

B. Cartridge Cases and Shotshell Casing: Inside the mouth or side of case near mouth.

C. Firearms:

(1) Use common sense based on the circumstances.

(2) Mark gun inconspicuously, such as within the trigger guard.

(3) Marking can be script initials or other personal identifying mark. Do not use an "X."

(4) Also string-tag gun. Tag should list the caliber, make, model and serial number. Investigative notes should reflect how and where the gun is marked.

(5) Avoid defacing the weapon by indiscriminate markings. Mark it as if it were your own.

OBTAINING TEST SPECIMENS

Whenever possible, the weapon should be submitted to the Laboratory. If the weapon cannot be submitted, obtain test specimens of fired ammunition by firing either into water or cotton waste.

STANDARD REFERENCE FILES

The Standard Ammunition File (SAF) has been used constantly as a reference file in connection with current cases worked in the Firearms Unit. Comparisons are made of questioned specimens with domestic and foreign standards of manufacturers' samples in the file to determine the manufacture, caliber and bullet type of the questioned specimen. There are presently over 10,000 specimens maintained in the SAF. New specimens from ammunition manufacturers in this county and abroad are being constantly added to the file to assure that it is kept up to date.

Firearms Reference Collection

This collection contains over 2000 handguns and 800 shoulder weapons and is used for such things as:

A. Locating serial numbers.

B. Replacing inoperable weapon parts.

C. Identifying gun parts.

Standard Ammunition File

Reference Fired Specimen File

This file contains test bullets and cartridge cases obtained from weapons which have been in the Laboratory. (Note: An "Unidentified Ammunition File," "Open Case File" or "Unsolved Crime File" consisting of bullets and cartridge cases recovered from crime scene in local police matters is no longer maintained by the Laboratory.)

DISPOSITION OF WEAPONS

Non-FBI Cases

To insure proper disposal of a firearm(s) at the conclusion of your investigation, refer to your agency's regulations.

FBI Cases

In accordance with Manual of Administrative Operations and Procedures, Part II, Section 2-4.4.4, firearms may be accepted for disposal by the FBI Laboratory, ONLY, if one of the following two procedures is followed:

A. A Court Order signed by the presiding judge making disposition in the Bureau case,

B. A written waiver of ownership signed by the individual who had custody and control of the firearm at the time of seizure.

The Court Order should read as follows:

"It is hereby ordered that a firearm, to wit, (described firearm being submitted), seized in connection with the above-mentioned case be turned over to the Federal Bureau of Investigation for its use, destruction, or any other disposition at its discretion pursuant to the authority of Title 18 United States Code, Section 3611."

The following is an example of an approved waiver of ownership.

"I, the undersigned, do hereby release all rights and title to the firearm described as. . .

to the Federal Bureau of Investigation (FBI) Laboratory for use in its Reference Firearms Collection. This release is made unconditionally with the understanding that if the FBI

Laboratory has a similar firearm in its collection, or for any other reason does not desire to retain this firearm, it may be destroyed."

In the event any further questions arise, contact the Firearms Unit directly on extension 4378.

PRIMER RESIDUES

Antimony and barium are components of most primer mixtures and these elements can be deposited on the back of the thumb, forefinger and connecting web area of the hand when a firearm is discharged.

In order to analyze for these elements it is necessary to remove the suspected residues from the pertinent portion of the hands. The method most easily used in the field is the moistened cotton swab method. A cotton applicator-type swab on a plastic shaft is moistened with five-percent nitric acid and a portion of the back of the thumb, forefinger and web area is swabbed. A second swab is used for the remaining pertinent area. This procedure is repeated for the other hand. The swabs are then packaged in a sealable plastic container, labeled and submitted for analysis.

It is recommended that approximately one minute be used for the swabbing procedure for each hand. This is the time elapsed from the moistening of the first swab to the placing of the second swab in the plastic container.

The following information should be furnished to the Laboratory in the transmitted letter:

A. Brief case resume.

B. Date and time of shooting.

C. Date and time hands were swabbed.

D. Location of shooting, i.e., indoors, outdoors.

E. Description of firearm, i.e., caliber, type, manufacturer.

F. Brand of ammunition used.

G. Number of shots fired.

H. Subject right or left handed.

I. Treatment hands might have received prior to swabbing, i.e., washed, fingerprinted.

J. Occupation of subject.

The following items should be submitted to the Laboratory:

A. Swabs from the back of the right and left hands of each person.

B. Blank swabs consisting of two moistened swabs not used on the subject.

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TOOLMARK IDENTIFICATION

Toolmark examinations include, but are not limited to, microscopic studies to determine if a given toolmark was produced by a specific tool. In a broader sense, they also include the identification of objects which forcibly contacted each other; were joined together under pressure for a period of time and removed from contact; and were originally a single item before being broken or cut apart. The inclusion of these latter areas results from the general consideration that when two objects come in contact, the harder (the "tool") the softer the mark. (Saws, files and grinding wheels are generally not identifiable with marks they produce.)

CONCLUSIONS

A. That the tool produced the toolmark.

B. That the tool did not produce the toolmark.

C. That there are not sufficient individual characteristics remaining within the toolmark to determine if the tool did or did not produce the questioned toolmark.

TYPES OF TOOLMARK EXAMINATIONS

Toolmark with Tool

Several comparisons can be made between a tool and a toolmark such as the:

A. Examination of the tool for foreign deposits such as paint or metal for comparison with a marked object.

B. Establishment of the presence or nonpresence of consistent class characteristics.

C. Microscopic comparison of a marked object with several test marks or cuts made with the tool.

Toolmark Without Tool

Examination of the toolmark can determine:

A. Type of tool used (class characteristics).

B. Size of tool used (class characteristics).

C. Unusual features of tool (class or individual characteristics).

D. Action employed by the tool in its operation, and/or

E. Most importantly, if the toolmark is of value for identification purposes.

Metal Fracture

Fracture examinations are conducted to ascertain if a piece of metal from an item such as a bolt, automobile ornament, knife, screwdriver, etc., was or was not broken from a like damaged item available for comparison. This type of examination may be requested along with a metallurgy examination (see chapter on metallurgy).

Marks in Wood

This examination is conducted to ascertain whether or not the marks left in a wood specimen can be associated with the tool used to cut it, such as pruning shears, auger bits, etc. This examination may be requested along with a wood examination.

Pressure/Contact

Pressure or Contact examinations are conducted to ascertain whether or not any two objects were or were not in contact with each other either momentarily or for a more extended time.

Surface Replica Plastic Impressions

Surface replica plastic impressions of stamped numbers in metal, such as altered vehicle identification numbers, can be examined and compared with other as well as with suspect dies.

OBTAINING EVIDENCE IN TOOLMARK CASES

A. It is most desirable, if possible, to submit the actual toolmarked area for direct comparison. (Note: In number restoration cases, the Laboratory will routinely make a cast of the toolmark for a possible future comparison with marking stamps.)

B. If it is possible to submit the original, prepare and submit a cast, preferably in plastic, of the mark. For instuctions on how to prepare a plastic cast/impression see next page.

C. Photographs, although helpful in presenting an overall location of the mark, are of no value for identification purposes.

D. Do not forget to obtain samples of paint, safe insulation, and any other material likely to appear as foreign deposits on tools.

E. <u>Do not</u> place the tool against the toolmark for size evaluation.

Plastic Cast/Impression

The following instructions are for making a plastic cast/impression of stamped numbers in metal:

A. All casts should be taken before any number restoration is attempted. (See "Items with Obliterated Identification Markings" in metallurgy chapter for further information on number restoration.)

B. Casts should be taken using a suitable plastic surface replica kit.

C. The number one priority in taking a cast of stamped numbers is cleaning the number area of any foreign matter as the replica plastic will duplicate any foreign material left in the stamped characters. Thus, paint and dirt should be removed from the stamped area with a suitable solvent (acetone, gasoline or a commercial paint remover). A toothbrush could be used to help clean down to the botton of the stamped area and in no instance should a wire brush be used to clean the area as this will scratch the numbers and make subsequent identification of the stamps impossible. If there is any rust in the stamped numbers, use of "NAVAL JELLY" is appropriate to remove the rust.

D. Having cleaned the surface, a dam should be built around it to retain the liquid surface replica while hardening and cooling. The liquid and the powder of the replica kit are mixed for one minute in the aluminum pouch that contained the powder. The dam material should be a soft pliable claylike material such as caulking cord, "Play Dough" or modeling clay. Prior to forming the dam, nylon filament tape should be placed at each end of the characters, partly within the dam area to facilitate the case removal. All voids around the dam should be sealed to prevent leaking. Once the liquid has been poured and hardened lift up on the ends of the tape to lift out the cast. If the case has a lot of paint and rust, additional casts should be taken until the best possible cast has been obtained and this should be submitted to the Laboratory.

E. At normal room temperatures (65° - 75°), the plastic replica takes about 1/2 hour to set up. If the surface of the cast is hard but still warm, it should not be removed until the cast is cool to the touch. At low temperature (50° or below) setting time can be up to 8 hours or more. In this instance, if possible, the vehicle or metal should be moved to a heated building. Further, the area can be heated by several methods such as heat lamp, infrared light bulb, hair dryer directed on the number area and

then upon the case, etc. The use of a torch to heat the area is not recommended.

SUBMITTING TOOLMARK EVIDENCE TO LABORATORY

A. Pack to preserve the evidence and prevent contamination.

B. Properly identify each item to facilitate court presentation. Consider the possibility that the object from which the specimen was cut may be needed in court.

C. Submit the tool rather than making test cuts or impressions in field.

D. Mark ends of evidence which are or are not to be examined.

REFERENCE FILES

A. National Automobile Altered Numbers File: The FBI Laboratory is maintaining in the National Automobile Altered Numbers File selected specimens, including surface replica plastic impressions of altered vehicle identification numbers found on stolen cars, trucks and heavy equipment. The purpose of this file is to have a central repository for such specimens of altered numbers so that comparisons can readily be made at any time in an attempt to identify recovered stolen cars and possibly link such vehicles with commercialized theft rings nationwide or other cases investigated by the FBI.

B. National Vehicle Identification Number Standard File (NVSF): The FBI Laboratory maintains in the National Vehicle Identification Number (VIN) Standards File (NVSF) standards of VIN plates from each factory of the major manufacturers of American automobiles. The purpose of this file is to enable the Laboratory to determine whether or not a submitted VIN plate is authentic. Additionally, it gives the Laboratory the capability, in the event that bogus VIN plates are being prepared in an automobile factory, to identify not only which factory is involved, but also which machine is being used to produce the bogus VIN plates. Any suspect VIN plate encountered in investigations should be forwarded to the Laboratory for examination.

METALLURGY EXAMINATIONS

Metals or metallic objects may be metallurgically examined for comparison purposes and/or informational purposes.

EXAMINATIONS FOR COMPARISON PURPOSES

Determinations to ascertain if two metals or two metallic objects came from the same source or from each other usually require evaluations based on surface characteristics, microstructural characteristics, mechanical properties and composition.

A. Surface Characteristics - macroscopic and microscopic features exhibited by the metal surface including fractured areas, accidental marks or accidentally damaged areas, manufacturing defects, material defects, fabrication marks and fabrication finish. The fabrication finish reveals part of the mechanical and thermal histories of how the metal was formed, e.g., if it was cast, forged, hot-rolled, cold-rolled, extruded, drawn, swaged, milled, spun, pressed, etc.

B. Microstructural Characteristics - the internal structural features of a metal as revealed by optical and electron microscopy. Structural features include the size and shape of grains; the size, shape and distribution of secondary phases; nonmetallic inclusions, and other heterogeneous conditions. The microstructure is related to the composition of the metal and to the thermal and mechanical treatments which the metal had undergone; it therefore contains information concerning the history of the metal.

C. Mechanical Properties - describe the response of a metal to an applied force or load, e.g., strength, ductility, hardness.

D. Composition - the chemical element make-up of the metal including major alloying elements and trace element constituents. Because most commercial metals and alloys are nonhomogeneous materials and may have substantial elemental variations, small metal samples or particles may not be compositionally representative of the bulk metal.

EXAMINATIONS FOR INFORMATIONAL PURPOSES

Some of the kinds of information that can result from metallurgical examinations of metals or metallic objects in various physical conditions:

A. Broken and/or mechanically damaged (deformed) metal pieces or parts.

(1) Cause of the failure or damage, i.e., stress exceeding the strength or yield limit of the metal, material defect, manufacturing defect, corrosion cracking, excessive service usage (fatigue), etc.

(2) The magnitude of the force or load which caused the failure.

(3) The possible means by which the force or load was transmitted to the metal and the direction in which it was transmitted.

B. Burned, heated or melted metal.

(1) Temperature to which the metal was exposed.

(2) Nature of the heat source which damaged the metal.

(3) Whether the metal was involved in an electrical short-circuit situation.

C. Rusted or corroded metal.

(1) Length of time the metal has been subjected to the environment which caused the rust or corrosion requires that the investigator submit information concerning the environmental conditions surrounding the item when it was recovered.

(2) Nature of the corrosive environment.

D. Cut or severed metal.

(1) Method by which the metal was severed - sawing, shearing, milling, turning, arc cutting, flame cutting (oxyacetylene torch or "burning bar"), etc.

(2) Length of time to make the cut.

(3) Relative skill of the individual who made the cut.

E. Metal fragments.

(1) Method by which the fragments were formed.

(2) If fragments had been formed by high velocity forces, may possibly determine if an explosive has been detonated and the magnitude of the detonation velocity.

(3) Possible identification of the item which was the source of the fragments. In bombings, timing mechanisms can often be identified as to type, manufacturer and model; determinations are sometimes possible as to the time displayed by the mechanism when the explosive detonated and as to the relative length of time the mechanism was functioning prior to the explosion.

F. Nonfunctioning watches, clocks, timers and other mechanisms.

(1) Condition responsible for causing the mechanism to stop or malfunction.

(2) Whether the time displayed by a timing mechanism represents A.M. or P.M. (usually calendar-type timing mechanisms only).

G. Items unidentified as to use or source.

(1) Possible identification of use for which the item was designed, formed or manufactured, based on the construction of and the type of metal in the item.

(2) Possible identification of the manufacturer and of specific fabricating equipment utilized to form the item.

(3) Identification of possible sources of the item if an unusual metal or alloy is involved.

H. Lamp bulbs which were subjected to an impact force(s) or from vehicles involved in an accident.

(1) Whether the lights of a vehicle were incandescent at the time of the accident; both broken and unbroken lamp bulbs may exhibit the characteristics which are necessary for the determination.

I. Objects with questioned internal components.

(1) X-ray radiography can nondestructively reveal the interior construction and the presence or absence of defects, cavities or foreign material.

J. Items with obliterated identification markings.

(1) Obliterated identification markings are often restorable, including markings obliterated by melting of the metal (welding, "puddling"). Obliterated markings can also be restored on materials other than metal. Because different metals and alloys often require specific methods for restoration of obliterated markings, the Laboratory should be contacted for number restoration procedures for field processing of items too large or heavy for submission to the Laboratory.

INSTRUMENTAL ANALYSIS EXAMINATIONS

These examinations entail the use of instrumentation such as infrared spectroscopy, X-ray diffractrometry, emission spectrometry, etc., for identification or comparison of the compositions of paints, plastics, explosives and dyes.

PAINTS, PLASTICS, AND DYES

Automobile Paints

It is possible to establish the year and make of an automobile from a paint chip by use of the National Automotive Paint File which contains paint panels representing paints used on all makes of American cars; light, medium, and heavy trucks; vans and many popular imported cars such as Mercedes Benz, Volkswagen, Porsche, Audi, BMW, Renault, Honda, Subaru, Datsun and Toyota. A very careful search of the accident or crime scene should be made to locate small chips because:

A. Paint fragments are often found in the clothing of a hit-and-run victim.

B. Paints may be transferred from one car to another, from car to object, or from object to car during an accident or the commission of a crime.

Nonautomobile Paints

Paint on safes, vaults, window sills, door frames, etc., may be transferred to the tools used to open them. Therefore, a comparison can be made between the paint on an object and the paint on a tool.

Dyes

Dyes in questioned and known samples of lipstick, cosmetics, cloth, shoe polish, and many other miscellaneous materials can be compared with each other but they cannot be associated with a specific source or manufacturer.

Plastics/Polymers

It is not possible to specifically identify the source, use, or manufacturer of plastic items from composition alone but comparisons such as the following can be made:

A. Trim from automobiles, depending upon the uniqueness of the composition, is compared with plastic remaining on the victim or property struck in a hit-and-run.

B. Plastics comprising insulation on wire used in bombings or other crimes are compared with known or suspected sources of insulated wire.

C. Plastic/rubber tapes from crime scenes are compared with suspected sources.

D. Polymers used in surgical cloth-backed tape are compared with sources.

E. Miscellaneous plastic material from crime scenes is compared with possible sources.

General Notes to Investigators

A. If paint samples are to be obtained from any painted surface, chip the paint off the surface rather than scrape it off. When paint is chipped off a surface, its layer structure is intact. Each layer is a point of identification. It is better to have eleven layers of paint on a questioned and known specimen rather than only the top layer in the known specimen.

B. Be careful in the packing and marking of small paint chips and other small particles of evidence.

(1) Do not stick small paint particles on Scotch tape -- remember that these small particles have to be removed from the container and laboriously cleaned and packed in a small electrode.

(2) Do not put small particles in cotton. It is difficult to remove the particles from the cotton.

(3) Do not send in envelope, unless protected in paper using druggist fold.

FLUORESCENT POWDERS, DYESTUFFS, AND OTHER MARKING MATERIALS

Purpose

Marking materials are used to prepare an object, be it a decoy package, cash box, money, etc., in order that a detectable trace will be left on a person or the property of a person who handled the object.

Selection Factors

A. The choice of dye, powder, or chemical depends on factors inherent with each situation.

B. The material used can be a dry powder, liquid, or grease and be available in many visible and fluorescent colors.

C. Fluorescent materials require a source of ultraviolet light to examine the subject's hands or clothing.

D. Dyes and chemicals require no supplemental equipment.

E. Do not use a dye, such as methyl violet, since it finds common usage in carbon papers, indelible pencils, etc.; such materials may provide an alibi.

Dyestuffs (Malachite Green and Methylene Blue)

A. These dyes have a disadvantage in that they become visible to the subject after contact with normal perspiration.

B. They can be easily procured from drugstores, chemical supply houses or commercial and school laboratories.

C. They must be finely ground or powdered.

D. They are water soluble and can be washed off.

Chemical Dusting powder (Silver Nitrate)

A. Has the disadvantage of becoming visible to subject.

B. Has the disadvantage of not being immediately visible until exposed to the light for several minutes.

C. Can be procured from drugstores, chemical supply houses or commercial and school laboratories.

D. Must be finely ground or powdered.

E. Produces in the presence of ordinary light a brown stain which cannot be removed without injury/damage to the skin. The stain will wear away or disappear after a few weeks.

Combination of Dyestuffs and Silver Nitrate

It is frequently advisable to use a mixture such as a 50-50 mixture of powdered malachite green and silver nitrate. Malachite green will be immediately visible but can be subsequently washed off. Silver nitrate which may not be immediately visible cannot be removed.

Fluorescent Materials

A. Has the advantage of not being visible to the subject.

B. Has the capability of being subsequently identified as the same powder used, by analysis of deposits on clothing, etc.

C. Has the disadvantage of requiring a source of ultraviolet light.

D. Phosphorescent materials are different from fluorescent powders and must not be used since these may be detected by the subject even without an ultraviolet source.

E. Must be applied in a finely ground or powdered form.

F. Choice of form depends on object to be marked; for example:

(1) Contact areas of tools can be coated with a grease, such as vaseline mixed with a fluorescent powder, without creating suspicion. Richer deposits are transferred when a grease film is used.

(2) Normally dry surfaces, such as gloves, money, doorknobs, steering wheels, etc., would arouse suspicion if coated with a grease. After coating an appropriate surface with grease, the remainder of object and/or container may be dusted with dry powder.

(3) Time, amount of light, and other factors may limit application to dusting since the dusting procedure is rapid and does not require meticulous attention.

(4) Liquid fluorescent materials normally used as a writing medium. Care must be taken to prevent liquid marks or discolorations on paper or surface treated.

G. Availability of fluorescent chemicals: Commercially produced marking materials are available through police supply houses.

H. Procedures for application:

(1) In applying grease, use bare fingers and rub over the surfaces of the items to be marked so as to leave a thin film. Avoid large "globs" of grease.

(2) In applying powder form, numerous methods are commonly used, such as shaking powder over items, dusting with a powder puff or pad of cheesecloth, or brushing over the surfaces in a manner similar to that used to dust with fingerprint powder.

(3) Liquids can be applied with a clean pen, small paint brush, or spray-type dispenser.

EXPLOSIVE EXAMINATIONS

Explosives should be handled only by qualified personnel. Explosive devices or bombs should be handled only by qualified bomb disposal personnel.

A. Types of explosions:

(1) Mechanical - illustrated by the gradual buildup of pressure in a steam boiler or pressure cooker. If the boiler or pressure cooker is not equipped with some type of safety valve, the mounting steam pressure will eventually reach a point when it will overcome the structural resistance of its container and an explosion will occur.

(2) Atomic - may be induced by either fission (the splitting of the nucleus of atoms) or fusion (the joining together under great force of the nuclei of atoms).

(3) Chemical - the rapid conversion of a solid or liquid explosive compound into gases having a much greater volume than the substances from which they are generated. The entire conversion process takes only a fraction of a second and is accompanied by shock, heat and loud noise. All explosives manufactured by man are chemical explosives with the exception of atomic explosives. Chemical explosions are the type of most importance to law enforcement.

B. Classification of explosives:

(1) Low explosives - rate of change to gaseous state is relatively slow - deflagration reaction. Included would be:
   a. Black powder
   b. Smokeless powder

(2) High explosives - rate of change to gaseous state is extremely rapid - detonation reaction. Included would be:
   a. Commercial dynamites
   b. Military explosives such as TNT or C4

SHIPPING EXPLOSIVES

Explosives are classified as hazardous material. Therefore, special packaging is required and the amount which can be sent in each shipment is regulated.

The Explosives Unit of the FBI Laboratory should be contacted for shipping and packaging instructions each and every time an explosive is to be shipped to the FBI Laboratory for examination. The shipping instructions furnished must be strictly adhered to, because the improper packaging and shipment of an explosive is a serious matter affecting safety.

FORENSIC EXAMINATIONS

The Explosives Unit conducts physical examinations to identify explosives and blasting accessories such as blasting caps, safety fuse, detonating cord, etc.; identifies bomb components such as switches, batteries, wires and timing mechanisms; assists in the obtaining of explosive examinations by instrumental anaylsis; and reconstructs the bomb, if possible.

Explosive Examinations (Instrumental Analysis)

Instrumental Analysis of materials in explosive cases is conducted to aid the Explosives Unit when determining if:

A. Unknown substances are high explosive, low explosive, or incendiary.

B. Confiscated or unknown explosives are by compositional analysis, consistent with known explosive products.

C. By the examination of residues from a bombing, the type of explosive(s) used can sometimes be determined. It should be noted that most residues remaining after the initiation of an explosive are water soluble. Therefore, these residues must be protected against exposure to excessive moisture. Also, other residues evaporate quickly necessitating the immediate sealing of collected debris in airtight plastic bags.

Explosive Reference Files

The Explosives Unit maintains extensive reference files on commercial and military explosives and improvised explosive devices or homemade bombs. These files contain technical data plus known standards of explosive items and bomb components.

DOCUMENT EXAMINATIONS

Document examination consists for the most part of a side-by-side comparison of handwriting, typewriting, and other written and printed matter to establish an identification. Besides submitting documents for document examinations, consideration should always be given to submitting them for latent fingerprint examinations. These latent fingerprint examinations will be conducted after the original document has been photographed and the requested document examinations have been conducted.

CONCLUSIONS

Conclusions are positive and reliable when the examinations are conducted by competent experts. (Note: Age, sex, character, etc., cannot be determined with certainty in handwriting.)

In some document examinations, a "no conclusion" is reached as opposed to an "identical" or "not identical" conclusion. Some of the reasons for a "no conclusion" are:

A. Limited questioned material.

B. Inadequate known material.

C. Lack of contemporaneous standards (long interval of time exists between the preparation of the questioned and known material).

D. Disguise (definite conclusion often impossible).

E. Lack of sufficient identifying characteristics (although ample quantities of both questioned and known samples are available).

DOCUMENTARY EVIDENCE

All efforts must be made to maintain and preserve documentary evidence in the same condition as it was received. This evidence must not be folded, torn, tampered with, marked or touched unnecessarily, stamped, soiled, subjected to indented writing, mutilated, etc. Each item of evidence should be placed in a separate envelope/container. The legal "chain of custody" must be maintained at all times and all evidence must be stored in the designated areas within each office.

Marking for Identification

Unless legal aspects or good judgment dictate otherwise, all articles seized as evidence should be carefully marked for identification. These markings should be of a character so as not to injure the evidence itself. They should be made in such a manner as to preclude the possibility of the marks being obliterated.

Their character should be such as to make it possible for the person or persons who obtained the evidence to testify at a later date that this particular article was found at a certain place at a certain time. Each mark should be distinctive; therefore, an "X" should never be used. If the evidence is not marked, it should be placed either in a clear plastic envelope along with a slip of paper showing initials, date, and other pertinent data or in another suitable envelope/container identified on the outside with the date, initials, and other pertinent data.

Original vs. Photocopy

The original evidence rather than a photocopy (photograph or copy made from a photocopier machine) should be submitted because many types of examinations, such as most types of forgeries, certain kinds of typewriting, and checkwriter or notary seal impressions, etc., can be made only on the original. Also, the original is utilized by the examiner to prepare court exhibits. Some examinations, however, can be made using good quality photographs of the original evidence. A photocopy is normally satisfactory for file searches. In no case should the inability to forward the original evidence constitute a valid reason for not requesting an examination.

Obtaining Known Handwriting Samples

The following guidelines are to be used to obtain known handwriting and/or hand printing samples from a person (writer).

A. Reproduce the original conditions as nearly as possible as to text, speed, slant, size of paper, size of writing, type of writing instrument, etc.

B. Obtain samples from dictation until it is believed normal writing has been produced (the number of samples necessary cannot be determined in advance).

C. Do not allow the writer to see either the original document in question or a photograph thereof.

D. Remove each sample from the sight of the writer as soon as it is completed.

E. Do not give instuctions in spelling, punctuation or arrangement.

F. Use the same writing media, such as type and size of paper, writing instruments, printed forms such as checks or notes.

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G. Obtain the full text of the questioned writing in word-for-word order at least once, if possible. Signatures and less extensive writing should be prepared several times, each time on a different piece of paper. In hand printing cases, both upper case (capital) and lower case (small) samples should be obtained.

H. In forgery cases the Laboratory should also be furnished with genuine signatures of the person whose name is forged.

I. Obtain samples with both the right and left hands.

J. Obtain samples written rapidly, slowly, and at varied slants.

K. Obtain samples of supplementary writings such as sketches, drawings, manner of addressing an envelope, etc.

L. Writer should initial and date each page.

M. Witness each sample with date and initials (or name).

N. If readily available, samples of undictated writing should be obtained, such as application for employment, social or business correspondence, school papers, etc.

Obtaining Known Typewriting Samples

The following guidelines are to be used to obtain known typewriting samples:

A. Obtain a full word-for-word text of the message in question using as nearly as possible the same degree of touch as used in the questioned text.

B. Obtain samples of the complete keyboard (all letters, numerals and symbols).

C. Obtain pertinent identifying data regarding the typewriter (make, model, serial number, etc.) and type this data as well as information such as the date sample was obtained, name of person taking the sample, where the typewriter was located, etc., on the sample.

D. Obtain data, if available, regarding when the machine was last serviced or repaired.

E. Properly witness each sample (initial and date on reverse side).

F. If the typewriter is equipped with a paper type ("one-time") ribbon, remove the used portion and submit it to the Laboratory whenever available.

G. If new cloth ribbon is used in the typewriter, consider removing it and submitting it to the Laboratory.

H. If the typewriter used a cloth ribbon, also obtain a stencil sample as follows:

(1) Physically remove the cloth ribbon from the typewriter or mechanically remove it by placing the ribbon mechanism in the stencil position.

(2) Place a piece of carbon paper over a piece of ordinary paper and insert both in the typewriter.

(3) Begin typing and allow the faces of the type to strike the carbon paper directly, and

(4) Submit the stencil sample, which is the typed text on the ordinary paper, to the Laboratory. (A stencil sample gives very clear impressions of the typefaces.)

I. If the typewriter contains no ribbon and one is not readily available, obtain a stencil sample by following steps (2) through (4) above.

REQUESTING EXAMINATIONS

When a document examination is desired, follow the instructions in, Request for Examination of Evidence, in the chapter on collection and preservation of physical evidence and include in the requesting communication the following:

A. Which of the submitted items are the questioned and the known specimens.

B. Which questioned items are to be forwarded for latent fingerprint processing.

C. Personal characteristics of the writer, such as any nervousness, handicap, illness, injury, etc., or any efforts by the writer to distort or diguise his/her writing.

TYPES OF DOCUMENT EXAMINATIONS

A. Handwriting (script).

B. Hand printing or hand lettering.

C. Forgeries.

(1) If a traced forgery, try to locate the pattern or master signature from which traced.

(2) Simulated or copied forgeries, include samples of genuine signatures to determine the extent of simulation.

(3) If a freehand forgery, the forger has no knowledge of how the genuine signature looks.

D. Typewriting.

(1) New machines are usually difficult to identify with questioned material.

(2) An examination of questioned typewriting can assist in determining a possible make and model of typewriter used to prepare the material.

(3) Questioned and known typewriting specimens of the same size and style of type cannot be identified unless individual defects or wear characteristics are exhibited in the samples.

E. Paper.

(1) Definite identification is seldom possible.

(2) Consideration should be given to indented writing, watermarks, tool or knife marks along the edges, whether the paper was torn in a manner to leave stubs in a tablet, and whether torn edges are suitable for comparison with torn edges on a source item.

F. Writing instruments (pencils, pens, crayons, ball-point pens).

G. Checkwriters:

(1) Examination of checkwriter impressions assists in determining the manufacturer of the machine used to produce the impressions.

(2) Positive identification of questioned with known samples is difficult because the construction of checkwriting machines inhibits the development of unique identifying defects and wear characteristics.

H. Printing and other duplication or photocopying processes.

I. Indented writing.

(1) Photographic and lighting techniques are used to determine the context of indented notations.

(2) The document should not be folded or creased.

(3) Care should be taken to insure accidental indented writings are not made in a document after its collection as evidence.

J. Obliterated or eradicated writing.

(1) Nondestructive methods include photography, using ultraviolet and infrared techniques, and microscopic examination.

(2) Staining methods may produce minor stains. The Laboratory should be advised whether minor staining may be applied.

K. Used carbon paper.

(1) Carbon paper should not be folded or creased.

(2) Examination may disclose the context of handwritten or typewritten material pertinent to an investigation.

L. Burned or charred paper.

(1) Questioned entries on charred or burned paper may be disclosed with appropriate examination.

(2) The material should be shipped between layers of cotton in a strong container.

M. True age of a document.

(1) May be based on watermarks, letterhead or other printing and typewriting.

(2) Determination of exact dating is difficult.

REFERENCE FILES OF KNOWN STANDARDS

A. Typewriter Standards.

(1) Consists of original samples of typewriting from numerous styles of type made in this county and many styles of type made in foreign countries.

(2) Permits classification of questioned typewriting on the basis of make and model.

B. Watermark Standards.

(1) An index of watermarks and brands used by paper manufacturers.

(2) Aids in tracing source or origin of paper.

C. Safety Paper Standards.

(1) Original samples of safety paper used for checks.

(2) Aids in determining manufacturer.

D. Checkwriter Standards.

(1) Collection of original checkwriter impressions.

(2) Permits classification of questioned checkwriter impressions as to make and model.

E. Shoe Print and Tire Tread Standards.

(1) Collection of sole and heel designs, tire tread designs and wheelbase measurements.

(2) Permits identification of manufacturer of shoe, heel, soles and tires.

F. Office Copier Standards.

(1) Collection of standards taken from photocopy and office duplicator machines.

(2) Aids in determining the possible manufacturer of office copying machine utilized to prepare questioned material.

G. National Motor Vehicle Certificate of Title File

(1) Consists of original, genuine state motor vehicle certificates of title, manufacturer's statement of origin, and vehicle emission stickers.

(2) Aids in determining authenticity of questioned material.

FILES OF QUESTIONED MATERIAL

A. National Fraudulent Check File.

(1) Contains samples of checks, writings, and other documentary material used by impersonators and other persons involved in fraudulent check schemes.

(2) Assists in identifying individuals involved in fraudulent check schemes and associates questioned material in various cases as having originated from a common source.

(3) A search through the file will be made even through the questioned material was previously searched through a check file maintained by a state or local agency, or technically examined by another agency.

B. Anonymous Letter File.

(1) Consists of photographic copies of kidnap notes, extortion and threatening letters.

(2) Assists in identifying the source of such questioned material and associates questioned material in various cases as having originated from a common source.

(3) Letters of abusive or "crank" nature are neither searched nor added to the file, unless mitigating circumstances so warrant.

(4) Letters determined to be of no prosecutive value are not to be submitted to the Laboratory, unless mitigating circumstances so warrant.

C. Bank Robbery Note File.

(1) Consists of photographic copies of writings of known bank robbers, of holdup notes found in the possession of known suspects and of notes used in actual holdups, or attempted holdups, of banks and other establishments.

(2) Assists in identifying questioned notes with known writers and associates questioned notes in various robbery cases as having originated from a common source.

(3) Notes and miscellaneous questioned writings found on counters and wastebaskets in banks which are obviously the work of mischief or prank will not be searched, and will not be added unless mitigating circumstances so warrant.

D. National Motor Vehicle Certificate of Title File

(1) Consists of photographic copies of fraudulent titles, statements of origin, vehicle emission stickers.

(2) Assists in associating questioned material in multiple cases as having originated from a common source.

E. Pornographic Materials File

(1) Collection of evidentiary pornographic materials submitted to the Laboratory.

(2) Aids in determining information which may indicate that questioned material has moved in interstate commerce.

(3) Assists in determining the production and distribution sources of the material.

PHOTOGRAPHIC EXAMINATIONS

Forensic Photography

Different, specialized techniques such as infrared, ultraviolet, and monochromatic photography can be utilized to assist in rendering visible latent photographic evidence which is not otherwise visible to the unaided human eye. Examples of this type of evidence includes alterations and obliterations to documents, invisible laundry marks, indented writing, et cetera.

Bank Robbery Film

The Laboratory can examine this film to:

A. Attempt enhancement of poor quality photographic exposures and/or prints.

B. Compare in detail the unknown subject's clothing as depicted in the film with the clothing obtained from a suspect.

C. Determine the individual's height as depicted in the film. Height is determined preferably from a height chart but it can also be done mathematically. Often height can be determined to within an inch.

D. Compare facial features of the unknown subject in the film with those in the photograph of a suspect.

Copyright Matters

The Laboratory can conduct examinations in this area to determine:

A. Whether a questioned film is a stolen legitimate print or an illegal duplicate.

B. Whether the image and sound track of the known and questioned films originated from common-source material.

C. Other basic information such as type of film stock, date of manufacture, type of sound track, image format, etc.

Miscellaneous Photographic Examinations

Various other types of photographic examinations can be conducted such as:

A. Comparison of film or prints to determine if they were taken by a specific camera.

B. Determine the type and date of Polaroid film as well as preparing a print from the "throw-away" portion.

C. Examination of photographs in security matters.

SHOE PRINT AND TIRE TREAD EXAMINATIONS

How to Collect Physical Evidence

Shoe print and tire tread evidence found at the scene of a crime may provide important evidence for investigation and eventual prosecution of a case. Where applicable, casts should always be made immediately following appropriate photography of the impressions. The original impression is most valuable and should be retained and preserved whenever possible and practical such as when the impression is on glass, paper, or some other surface.

Photographing the Evidence

Photographs should supplement casts and lifts.

A. Photograph the crime scene showing the positions of individual items of evidence.

B. Photograph shoe prints and tire tread impressions prior to lifting or casting.

(1) Use camera on a tripod. Polaroid photographs are not recommended.

(2) Place a ruler and identification label beside the impression.

(3) Set the camera directly over the impression and focus so the impression fills the negative.

(4) Expose while holding light source (flash gun) to one side and low.

(5) Take second photograph with light rotated through 90° horizontally.

Impressions in Surfaces

Casts should always be made where possible. Many different substances can be used for casting purposes such as silicone rubber products on hard surfaces such as counter tops, commercial products such as Castone, and flowers of sulphur for snow. Plaster of Paris is usually recommended as it is relatively inexpensive and usually more readily available. A cast produces a positive impression of the size and design of the shoe or tire that made the impression. Cast all available shoe impressions and the entire circumferences of all tires (in sections), if practical. Casts destroy the questioned impressions when they are removed and care should be taken to insure perfect reproductions. Therefore, if the caster is

inexperienced, it is suggested that practice be conducted on an impression made by the caster prior to working with the evidence impressions.

A. Materials needed:

(1) Good grade of plaster (plaster without fiber content) or other casting material with which the investigator is familiar.

(2) Container for mixing.

(3) Water for plaster casts.

(4) Sticks, twigs or wire mesh (hardware cloth) for reenforcement of plaster casts.

(5) Paddle for stirring.

(6) Strips of wood or metal to build the form around the impression.

(7) Spray gun, plastic spray or something similar may be needed for problem impressions such as those in loose dirt or sand.

(8) Flowers of sulphur can be used for impressions in snow. These casts are brittle and should be "backed" with a stronger material such as Plaster of Paris. Heat the crystals in a double boiler to liquid form, let cool until a film appears on the surface, and pour gently into impression. If flowers of sulphur use is not practical, some success may be experienced by using Plaster of Paris wherein the batter is cooled by the addition of ice or snow.

B. Preparation of the impression:

(1) Clean out loose material carefully and do not disturb the impression.

(2) Plastic spray or hair spray may be used to fix problem impressions such as those in sand or loose dirt. Use of the spray should be limited to those with proper experience. Improperly used, sprays may cause loss in the detail necessary for minute comparison purposes. Some success has been noted with the use of fine water spray in connection with sand impressions.

(3) Build forms around the impressions to confine the plaster and improve appearance of the casts.

C. Preparation of Plaster of Paris mixture:

(1) Start with approximately enough water to fill the impression.

(2) Sprinkle plaster into the water; stir continually until the mixture is about the consistency of thin pancake batter.

(3) Immediately pour the plaster gently into the impression to avoid "washing away" the impression. Pouring the mixture down the side of the stirring paddle and into the impression is recommended. Do not break the flow until the entire surface is covered to a depth of approximately 1/2-inch thickness.

(4) Place reenforcements in after pouring the plaster approximately 1/2-inch thick.

(5) Renew pouring until the case is 1 to 1 1/2 inches thick.

(6) Scratch date, initials and other pertinent information into the back of the cast while it is still relatively soft.

(7) Remove only loose material from the face of the cast when lifted. Improper cleaning before the cast cures can damage the detail of the surface impression.

(8) The cast is very fragile and must be handled carefully, especially for mailing. Do not place the casts in plastic bags. Dry the casts thoroughly beore shipping. Newspapers are suitable for wrapping casts.

(9) If casts are sent through the mail, wrap in a manner to avoid breakage during shipment.

Impressions on Firm Surfaces

Floors, broken glass, desk tops, chairs, paper, etc., often bear dust impressions of shoe prints or tire treads. When evidence such as this is suspected the following should be done:

A. Search the suspect areas with a flashlight and darken the area if possible. Direct the beam of light parallel to the suspect surfaces.

B. Photographs should be made. Hold the light source as close to the floor as possible for a side-lighting effect.

C. Retain the original evidence, if possible, to send to the Laboratory. Protect the impressions so they will not rub off in handling.

D. Lift the impression if the original evidence cannot be retained.

(1) Use large pieces of fingerprint-lifting tape and lift the print. Do not dust or otherwise treat the impression. Start the tape at one edge and roll over the impression attempting to keep out air bubbles.

(2) Photographic film-gelatin on film when moistened forms an excellent surface for lifting impressions. Clear film is made by fixing and washing. Black film is made by exposing, developing, fixing and washing. The film should be placed in water, wiped off and dried until tacky. The tacky film should be applied to the impression with a squeegee (scraper or roller) from one edge using care to avoid air bubbles.

(3) Protect the lifted impressions so they will not be destroyed or "erased" during handling or shipping.

Laboratory Examinations

A. Reference files are maintained for the determination of a possible manufacturer of a shoe or tire that made a particular questioned impression.

(1) Shoe Print File: Contains photographs of designs used in soles and heels made by major manufacturers in the United States.

(2) Tire Tread File: Contains blueprints, drawings or photographs of tire tread patterns furnished by tire manufacturers.

B. Comparisons are made between the cast, photograph, and/or lift made from a questioned impression with a known tire or shoe. A positive identification depends on the detail reproduced from the original impression and the presence of sufficient identifying characteristics as a result of wear.

GAMBLING EXAMINATIONS

TYPES OF SPECIALIZED ASSISTANCE AND EXAMINATIONS AVAILABLE

Bookmaking

Analysis and interpretation of individual handwritten, printed, and computerized systems of recording wagering on sports events, policy and numbers betting based on horse and dog racing, stock market data, drawn numbers, etc. Testimony concerning manner of conducting such gambling operations and terminology.

Gaming Equipment of Clubs, Casinos, and Carnivals

Determining whether playing cards, dice, slot machines, roulette wheels and a wide variety of carnival games, including related electronic devices, are deceptively marked and/or altered to permit cheating and increased percentages. Testimony concerning manner of conducting such games.

Lotteries, etc.

Evidence of this nature would include lottery tickets, sports parlay cards, sweepstakes, tip tickets and boards, punch boards, and machine tickets. If the printing plates or numbering dies are located, it may be possible to prove that evidence collected was printed by the particular plate or die.

Loan Sharking (Shylocking) Records

Analysis of accounting type notations to determine amount of outstanding loans, amounts paid in accrued interest and principal, total number of loans, and true annual rate of interest computed by the actuarial method.

Water-Soluble and Flash Paper

Determining the nature of specialized paper encountered in gambling operations. Because flash paper is considered to be a "hazardous material" the following should be noted:

A. If flash paper must be stored, extreme caution should be exercised. Avoid storage near any other combustible material. After it is obtained, it should, as soon as possible, be sealed in polyethylene envelopes and placed in a refrigerator.

B. Before forwarding any flash paper for examination, telephonically contact the Laboratory, Technical Evaluation Unit, for shipping instructions.

CONTINUED

1 OF 2

TYPES OF GAMBLING EVIDENCE

A. Sports wagering slips.

B. Numbers wagering slips.

C. Summaries of wagering slips or tallies including adding machine adding tapes used to calculate wagering or to summarize writers' accounts. Charting of wagers, systematically done to determine volume of wagering on various events.

D. Accounting and financial records or "bottom sheets" showing numerous accounts (sometimes encoded), amounts and/or commissions paid to writers.

E. Related paraphernalia - sports schedules or lines sheets, sports records materials, dream books, cut cards, parlay manuals, conversion charts, scratch sheets, racing forms, computer printouts and related materials, etc.

F. Semidestroyed material such as charred, shredded, torn or wet water-soluble paper.

G. Transcripts of pertinent legally obtained telephone conversations.

H. Cards, dice, carnival paraphernalia such as "razzle dazzle" charts and similar types of gambling material.

I. Electronic and electro-mechanical gambling devices including slot machines, bingo-type pinball machines, video-display devices, etc.

J. Other devices or evidence, when pertinent, such as "cheese boxes," clandestine signaling devices, etc.

CRYPTANALYSIS EXAMINATIONS

Because of the unique nature and wide scope of these examinations and of the material which may be available for examination, it may be appropriate to telephonically contact the Technical Evaluation Unit of the FBI Laboratory to resolve any questions that might arise.

TYPES OF EXAMINATIONS

Cryptographic

A. Cryptograms or codes.

B. Notes or notebooks containing cryptic notations.

C. Material containing unreadable or indecipherable writing.

D. Material containing symbols or having unusual literal or numerical orientation.

E. Correspondence or documents which might contain hidden intelligence, such as:

(1) Marked letters or numbers.

(2) Double meaning, wherein certain words and/or phrases are given arbitrary meanings by the writer.

(3) Concealment ciphers, where letters or words are significant according to their positions in the document.

Mathematical

A. Problems of a probability nature, that is, to determine the liklihood that an event will occur (or will have occurred) given a certain set of circumstances.

B. Analysis of computer or calculator printouts or charts, such as tachographs, etc.

C. General mathematical analysis.

Authorship and Speaker Identification

These examinations are normally done for investigative purposes and not for testimony.

A. Aural material (usually from recording of subject)

(1) Determination of accents for geographical background.

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(2) Determination of possible ethnic, educational, and employment background, and age and sex of subject.

(3) Comparison with other material to determine if same speaker is common to each sample.

B. Written or printed material.

(1) Determination of geographical, ethnic, age or educational idiosyncrasies.

(2) Comparison with other material to determine common authorship.

MATERIAL TO BE FURNISHED TO THE LABORATORY

Cryptographic or Mathematical

A. Any work papers available.

B. Identity of foreign languages that might be involved.

C. Information as to what the intent of the document might be.

D. Complete background information on the case.

E. Special training a subject may have had.

F. Books, code books, cipher machines, pads, tables, programmable calculators, etc., in the subject's possession.

Authorship Identification

A. Background of possible subjects.

B. Complete background on the case.

C. In written material, either the original or good photocopies should be furnished.

D. Recordings of speakers should be original, if possible, or other high quality reproductions.

RADIATION HAZARDS

INTRODUCTION

Radioactive materials are becoming common items due to the growth of the nuclear power industry. Accidents, deaths and injuries resulting from the handling and transportation of such materials have been few. The probability of a serious accident or an incident requiring police action will, hopefully, remain small. Since the hazard is invisible, prudence dictates that a basic knowledge of radiation will insure intelligent action.

TERMINOLOGY

Atoms

Atoms are small particles of matter which have the characteristics of an element. For example, gold and silver are both elements and the smallest particle of gold or silver which can be identified as gold or silver is an atom of gold or an atom of silver.

Isotopes

Isotopes are varieties of the same element which have the same chemical properties but have a different nuclear structure and therefore different physical properties. For example, we have three isotopes of hydrogen; namely, Hydrogen One, Hyrdogen Two and Hydrogen Three.

A. Stable isotopes are incapable of spontaneous change and thus are not radioactive.

B. Unstable or radioactive isotopes undergo spontaneous changes and emit nuclear radiations.

NUCLEAR RADIATIONS

Nuclear radiations involve the emission of energy or particles from a nucleus of an atom.

Alpha Particle

An alpha particle is a positively charged particle emitted from a nucleus and is similar to a helium nucleus. It has a relatively large mass with low penetrating power and a short range. Alpha particles will usually not penetrate the skin but danger occurs when alpha emitters are introduced into the lungs or intestines.

Beta Particle

A beta particle is a high speed negatively charged electron emitted from a nucleus. It has little mass, low penetrating power and a short range. The more energetic particles will penetrate the skin. Danger is due to skin burns and internal damage if the emitter enters the body and lodges in a body organ.

Gamma Ray

A gamma ray is a unit of radiation energy similar to X-rays. Gamma rays can do body damage even when located outside of the body due to their penetrating power.

Neutron

A neutron is a component of the nucleaus of an atom which has no electrical charge.

RADIATION EFFECTS

Nuclear radiations avoid detection by all our senses. Excessive dosages are normally hazardous. Police activity in or around radiation areas requires special vigilance. Radiation hazards are usually considered as either external or internal hazards.

External Hazards

Bodily damage can result from overexposure to gamma rays even though the radioactive material is outside the body. Gamma rays are external hazards.

Internal Hazards

Bodily damage can result if radioactive material emitting alpha and beta particles contaminates our food or the air we breath and in this manner is taken into our bodies in excessive amounts. Alpha and beta particles are considered internal hazards.

DETECTION EQUIPMENT

Survey Meters

Survey meters are portable instruments designed to enable one to evaluate a particular radiation hazard. They may be designed to detect and measure alpha, beta and gamma radiation and are used for the evaluation of contaminated foods and water. Survey meters read either in roetgens/hour or milliroentgens/hour (1,000 milliroentgens= 1 roentgen).

Dosimeters

Dosimeters are pocket-size (or smaller) instruments used to measure the total gamma ray dosage accumulated by the person wearing the dosimeter. Some dosimeters can be read at any time by the wearer (self-reading dosimeters). Other dosimeters such as film badges are not self-reading. These latter type dosimeters are processed in a laboratory. Dosimeter readings are normally in roentgens or milliroentgens.

SIGNIFICANCE OF DETECTION EQUIPMENT READINGS

Roentgen

Roentgen is a standard unit of measure of the energy of X-ray or gamma radiation which is absorbed. Often the term milliroentgen, one thousandth part of one roentgen, is used. The following table is a listing of radiation doses and their effects.

Acute Dose (roentgens)	Probable Effect of Total Body Dose
0 to 50	No obvious effect except possibly minor blood changes.
80 to 120	Vomiting and nausea for about 1 day in 5 to 10 percent of exposed personnel. Fatigue but no serious disability.
130 to 170	Vomiting and nausea about 1 day, followed by other symptoms of radiation sickness in about 25 percent of personnel. No deaths anticipated.
180 to 220	Vomiting and nausea for about 1 day, followed by other symptoms of radiation sickness in about 50 percent of personnel. No deaths anticipated.
270 to 330	Vomiting and nausea in nearly all personnel on first day, followed by other symptoms of radiation sickness. About 20-percent deaths within 2 to 6 weeks after exposure; survivors convalesce about 6 months.

Acute Dose (roentgens)	Probable Effect of Total Body Dose
400 to 500	Vomiting and nausea in all personnel on first day, followed by other symptoms of radiation sickness. About 50-percent deaths within 1 month; survivors convalesce for about 6 months.
500 to 750	Vomiting and nausea in all personnel within 4 hours from exposure, followed by other symptoms of radiation sickness. Up to 100-percent deaths; survivors convalesce for about 6 months.
750 to 1000	Vomiting and nausea in all personnel within 1 to 2 hours. Probably no survivors escape from radiation sickness.
1000 to 5000	Incapacitation almost immediately. All personnel will be fatalities within 1 week.

RADIATION PROTECTION

The following factors should be considered when evaluating available protection.

A. If all containers of radioactive material are sealed or closed and are intact, it is unlikely that radioactive hazards are associated with the incident. Efforts should be made to protect the integrity of the containers during essential rescue, salvage and clean-up operation.

B. If radioactive isotopes become loose from the container or are liberated by a handling accident, the following factors should be understood:

(1) Distance. The distance between individuals and the radiation source appreciably decreases radiation intensity. In most cases, for example, the distance of 2 feet from the source will decrease the radiation to one-quarter its value at 1 foot; a distance of 10 feet from the source will decrease the radiation to one-hundredth its value at 1 foot.

(2) Time. The time one spends in the radiation field should be kept to an absolute minimum. A 2-hour exposure in a radiation field will be twice as great as a 1-hour exposure.

(3) Shielding. Dense materials such as steel, concrete and dirt between the individual and the source can cut down the intensity of gamma radiation. Generally, the radiation may be cut in half by 1 1/2 inches of steel, 4 1/2 inches of concrete, 4 1/2 inches of earth, or 10 inches of water.

(4) Containment. Restriction of the radioactive material to a limited area will help to establish boundaries for the hazard. Efforts should be made to keep the material from scattering. If there is a fire associated with an incident, high pressure hoses might break open containers and widely scatter radiation. Vehicles and individuals repeatedly entering the area could track away any material from incidents involving spills. Such travel should be limited to that which is absolutely necessary.

C. External and/or internal hazards can be present whenever radioactive materials are found. If it is not known what the hazards are, assume both to be present. To protect against internal hazards personnel should wear breathing masks or some type of filter system over the nose or mouth. If possible, all personnel should be kept upwind from the scene of the incident and all smoking and eating should be prohibited in the restricted area. Personnel entering the area where there is radioactive dust should be wearing disposable or washable outer clothing.

EMERGENCY PROCEDURES FOR ACCIDENT

A. Keep all but rescue personnel away from the immediate accident scene.

B. Immediately report the accident to the nearest Department of Energy facility or military base, whichever is appropriate.

C. Keep sightseers away - 500 yards or more, if possible.

D. Stay out of smoke or vapors if a fire is associated with the accident.

E. Hold people who may have been exposed to the contamination in an area for appropriate examination by emergency personnel.

F. Do not fight fires involving explosives except under the direction of an expert.

G. Do not permit the taking of souvenirs.

H. Keep unauthorized personnel from entering the scene.

PART VI

COLLECTION AND PRESERVATION OF PHYSICAL EVIDENCE

PURPOSE OF COLLECTION AND EXAMINATION OF PHYSICAL EVIDENCE:

A. Aid in solution of case:

(1) Develop M.O.'s or show similar M.O.'s.

(2) Develop or identify suspects.

(3) Prove or disprove an alibi.

(4) Connect or eliminate suspects.

(5) Identify loot and/or contraband.

(6) Provide leads.

B. Prove an element of the offense:

(1) Safe insulation, glass or building materials on suspect's clothing may prove entry.

(2) Stomach contents, bullets, residue at scene of fire, semen, blood, toolmarks may all prove elements of certain offenses.

(3) Safe insulation on tools may be sufficient to prove violation of possession of burglary tools statutes.

C. To prove theory of a case:

(1) Footprints in the soil may show how many were at scene.

(2) Auto paint on clothing may show that the person was hit by a car instead of injured otherwise.

COLLECTION OF PHYSICAL EVIDENCE (five things to keep in mind):

A. Obtain it legally:

(1) Warrant.

(2) Consent.

(3) Incidental to arrest.

B. Describe it in notes:

(1) Location, circumstances, how obtained.

(2) Date, chain of custody.

(3) How identified.

C. Identify it properly:

(1) Use initials, date, case number.

(2) Preferably on evidence itself. Liquids, soils, tiny fragments must be placed in suitable container, sealed and marked on the outside.

D. Package it properly. One case to a box:

(1) Use suitable containers such as round pillboxes, plastic vials, glass or plastic containers, strong cardboard cartons.

(2) Seal securely against leakage.

(3) Package each item separately - avoid any appearance of leakage or contamination.

(4) If wet or bearing blood, air-dry before packaging (except arson cases where hydrocarbons are present).

E. Maintain chain of custody - keep it short:

(1) Same person or persons that recovered the evidence should initial, seal and send evidence, if possible.

(2) Maintain in a locked vault, cabinet or room until shipped.

(3) Send by air express, registered mail, registered air mail or personal delivery to the Laboratory or Identification Division* (there is no way to trace parcel post, certified mail or regular mail).

REQUESTING LABORATORY ASSISTANCE

The information under this caption, as well as that contained elsewhere in this section under the particular type of examination or assistance desired should be consulted to facilitate the submission of requests to the Laboratory Division.

REQUESTS FOR EXAMINATION(S) OF EVIDENCE

All requests should be made in a written communication, in triplicate, addressed to the Director, Federal Bureau of Investigation, Washington, D.C. 20535, with an attention line in accordance with instructions below and should contain the following information:

A. Reference to any previous correspondence submitted to the Laboratory in the case.

B. The nature of and the basic facts concerning the violation insofar as they pertain to the Laboratory examination.

C. The name(s) and sufficient descriptive data of any subject(s), suspect(s), or victim(s).

D. The list of the evidence being submitted either "herewith" or "under separate cover." (Note: Due to evidential "chain of custody" requirements, all evidence sent through the U.S. Postal Service (USPS) system must be sent by registered mail and not by parcel post or regular mail. If United Parcel Service, Federal Express, or air freight is used, utilize their "acknowledgment of delivery," "protective signature," "security signature," or any other such service which provides the same protection as USPS registered mail.)

(1) "Herewith": This method is limited to certain small items of evidence which are not endangered by transmission in an envelope clearly marked as containing sealed evidence and attached securely to the written communication which should state "Submitted herewith are the following items of evidence...

(2) "Under separate cover.": This method is generally used for shipment of numerous and/or bulky items of evidence. The written communication should state "Submitted under separate cover by (list the method of shipment be it USPS, Registered mail, United Parcel Service, Federal Express, or air freight) are the following items of evidence." For further information concerning the preparation of packages sent under separate cover see Packaging Chart elsewhere in this section.

E. A request stating what types of examinations are desired to include, if applicable, comparisons with other cases.

(1) Evidence will not be forwarded by the Laboratory Division to the Latent Fingerprint Section, Identification Division, for latent fingerprint examinations unless specifically requested to do so in the written communication.

F. Information as to where the original evidence is to be returned as well as where the original Laboratory report is to be sent.

G. A statement, if applicable, as to whether

(1) The evidence has been examined previously by another expert in the same technical field.

(2) Any local controversy is involved in the case.

H. Notification of the need and reason(s) for an expeditious examination; bearing in mind this treatment should not be routinely requested.

ATTENTION LINES FOR COMMUNICATIONS AND PACKAGES

The following guidelines should be adhered to as closely as possible to avoid any unnecessary delay in the routing of mail at FBI Headquarters.

A. Requests for Laboratory examination only, should be marked "Attention: FBI Laboratory."

B. Requests for a fingerprint examination only, should be marked "Attention: Identification Division, Latent Fingerprint Section."

C. Requests for both a fingerprint examination and Laboratory examination of any type should be marked "Attention: FBI Laboratory."

SHIPMENT OF EVIDENCE

The following steps should be followed to properly prepare a package for shipment of numerous and/or bulky items of evidence. (Note: Comply with the following steps A. through I. if a cardboard box is used and step J. if a wooden box is used):

A. Take every precaution to preserve the items of evidence as outlined in the applicable sections of the Evidence Chart as well as afford appropriate physical protection of the latent fingerprints thereon to include identification with the word "LATENT."

B. Choose a cardboard box suitable in size.

C. Wrap each item of evidence separately to avoid contamination.

D. Do not place evidence from more than one investigative case in the same box.

E. Pack the evidence securely within the box to avoid damage in transit.

F. Seal the box with gummed tape and clearly mark the outer portions of the box with the word(s) "EVIDENCE." (Note: If any of the evidence in the box is to be subjected to a latent fingerprint examination, also clearly mark the outer protions of the box with the word "LATENT.")

G. Place a copy of the original written request for the examinations(s) in an envelope marked "INVOICE" and securely affix this envelope to the outside of the sealed box.

H. Enclose the sealed box in wrapping paper, seal the wrapping paper with gummed tape, and address the package to the Director, Federal Bureau of Investigation, Washington, D.C. 20535, with the proper attention line as outlined above.

I. Ship the package by U. S. Postal Service, Registered Mail, United Parcel Service, Federal Express, or air freight.

J. Choose a durable wooden box suitable in size and

(1) Comply with the above steps A., C., D., and E.

(2) Securely fasten the lid on the box and address it to the Director, Federal Bureau of Investigation, Washington, D.C. 20535, with the proper attention line.

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(3) Place a copy of the original written request for the examination(s) in an envelope marked "INVOICE," place the invoice envelope in a clear plastic cover, and tack it to the box.

(4) Comply with step I. above.

Police Headquarters
Right City, State (Zip Code)
March 17, 19--

Director
Federal Bureau of Investigation
10th Street and Pennsylvania Avenue, N.W.
Washington, D.C. 20535

ATTENTION: FBI LABORATORY

Dear Sir:

RE: GUY PIDGIN, SUSPECT
EMPALL MERCHANDISE MART
BURGLARY

Sometime during the early morning of March 16, 19--, someone entered the Empall Merchandise Mart through an unlocked side window and made an unsuccessful attempt to rip open the safe. The outer layer of metal on the safe door had been pried loose from the upper right corner and bent outward ripping the metal along the top and down the side of the safe about 12" each way. The burglar may have been scared away because the job was not completed. Investigation led us to one Guy Pidgin who denies involvement. He voluntarily let us take his shoes and trousers and a crowbar that was under his bed in his rooming house.

I am sending by registered mail a package containing the following evidence in this case:

1. One pair of shoes obtained from Guy Pidgin
2. A pair of grey flannel trousers obtained from Guy Pidgin
3. One 28" crowbar obtained from Guy Pidgin
4. Safe insulation taken from door of safe at Empall Merchandise Mart
5. Piece of bent metal approximately 12" x 12" taken from door of safe at Empall Merchandise Mart. In order to differentiate the two sides cut by us we have placed adhesive tape on them.
6. Chips of paint taken from front and side of safe.
7. One fingerprint card for Guy Pidgin, FBI #213762J9
8. Ten transparent lifts taken fron the crime scene.

Sample

It would be appreciated if you would examine the shoes and trousers to see if there are any safe insulation or paint chips on them and match the paint taken from the safe. Also, we would be interested to know whether it is possible to determine if the crowbar was used to open the safe. Please compare the transparent lifts to the fingerprints of Guy Pidgin, FBI #213762J9.

This evidence, which should be returned to us, has not previously been examined by any other expert.

Very truly yours,

James T. Wixling
Chief of Police

1-336 (Rev. 10-26-79)

FEDERAL BUREAU OF INVESTIGATION

Washington, D. C. 20537

REPORT
of the
LATENT FINGERPRINT SECTION
IDENTIFICATION DIVISION

YOUR FILE NO. 12-741
FBI FILE NO. 95-67994
LATENT CASE NO. A-73821

March 22, 19--

REGISTERED

TO: Mr. James T. Wixling
Chief of Police
Right City, State (Zip Code)

RE: GUY PIDGIN;
EMPALL MERCHANDISE MART
RIGHT CITY, STATE
MARCH 16, 19--
BURGLARY

REFERENCE: Letter March 17, 19--
EXAMINATION REQUESTED BY: Addressee
SPECIMENS: Piece of beat metal, Q5
Ten transparent lifts
Fingerprints of Guy Pidgin, FBI #213762J9

Four latent fingerprints of value were developed on the piece of metal, Q5. Seven latent fingerprints of value appear on three lifts marked "safe door" and five latent fingerprints of value appear on two lifts marked "side window." No latent prints of value appear on the remaining lifts.

The four latent fingerprints developed on the piece of metal, designated Q5, have been identified as finger impressions of Guy Pidgin, FBI #213762J9.

The remaining twelve latent fingerprints are not identical with fingerprints of Pidgin.

Photographs of the unidentified latent fingerprints have been prepared for our files and will be available for any additional comparisons you may desire.

(Continued on next page)

Sample

THIS REPORT IS FURNISHED FOR OFFICIAL USE ONLY

Mr. James T. Wixling March 22, 19--

Should you desire the assistance of one of the FBI's fingerprint experts in the trail of this case, we should be notified in ample time to permit the necessary arrangements. This report should be used, however, if legal consideration permits in lieu of the appearance of our expert in any pretrial action such as preliminary hearing or grand jury presentation. Our representative cannot be made available to testify if any other fingerprint expert is to present testimony on the same point, namely, that the impressions in question are identical.

The lifts and the fingerprints of Pidgin, which should be retained for possible future court action in this case, are enclosed.

The results of the laboratory examinations, as well as the disposition of the piece of metal, Q5, are the subjects of a separate report.

Enclosures (11)

7-1a (Rev. 4-26-78)

REPORT of the

FBI LABORATORY

FEDERAL BUREAU OF INVESTIGATION
WASHINGTON, D. C. 20535

To: Mr. James T. Wixling
Chief of Police
Right City, State (Zip Code)

March 22, 19--

FBI FILE NO. 95-67994

LAB. NO. 10319021 S RF PD ST

YOUR NO.

Re: GUY PIDGIN - SUSPECT;
EMPALL MERCHANDISE MART;
BURGLARY

Examination requested by: Addressee

Reference: Letter dated March 17, 19--

Examination requested: Microscopic - Instrumental Analyses - Toolmarks

Specimens:

Q1 Right shoe belonging to GUY PIDGIN (Your item 1)

Q2 Left shoe belonging to GUY PIDGIN (Your item 1)

Q3 Pair of gray flannel trousers belonging to GUY PIDGIN (Your item 2)

Q4 28" crowbar belonging to GUY PIDGIN (Your item 3)

Q5 Piece of bent metal from door of safe (Your item 5)

K1 Insulation from safe door at EMPALL MERCHANDISE MART (Your item 4)

Sample

This examination has been made with the understanding that the evidence is connected with an official investigation of a criminal matter and that the Laboratory report will be used for official purposes only, related to the investigation or a subsequent criminal prosecution. Authorization cannot be granted for the use of the Laboratory report in connection with a civil proceeding.

K2 Paint from front and side of safe at EMPALL MERCHANDISE MART (Your item 6)

ALSO SUBMITTED:

One fingerprint card and ten transparent lifts (Your items 7 and 8)

Result of examination:

The insulation from the safe at the EMPALL MERCHANDISE MART, K1, is a vermiculite type used by several leading safe manufacturers.

Particles of vermiculite safe insulation similar to K1 were found in and on the shoes, Q1 and Q2, on the crowbar, Q4, and in the debris removed from the gray trousers, Q3. The particles of safe insulation on or in Q1, Q2, Q4 and Q3 either came from the safe represented by K1 or from another safe containing the same kind of insulation as K1.

The paint chips, K2, from the safe consisted of five layers of paint:

1) Dark green enamel
2) Light green enamel
3) Gray enamel
4) Black lacquer
5) Red primer

The Q3 trousers contained chips of paint consisting of five layers of paint similar in colors, layer structure, texture and composition to the K2 paint and could have come from the same source as K2 or another surface painted in a similar manner with similar paint.

The Q4 crowbar has smears of green paint on it similar to the top two layers of paint of K2 and the smears could have come from th same source as K2.

The Q5 piece of metal had no toolmarks of value for comparison with the Q4 crowbar.

The evidence in this case is being returned to you under separate cover by registered mail. The "ALSO SUBMITTED" items will be the subject of a separate report.

Evidence Chart

The following chart is provided to give assistance in the collection, identification, preservation, packaging, and sending of evidence to the Laboratory. This chart should be used in conjunction with similar evidence information contained elsewhere in this section under each type of examination desired. This evidence information and chart are not intended to be all inclusive.

Hazardous Materials

Over 3,000 items, including flash paper, live ammunition, explosives, radioactive materials, flammable liquids and solids, flammable and nonflammable gases, spontaneously combustible substances, and oxidizing and corrosive materials are currently considered as hazardous materials. All require special packaging and the amount of each item which can be shipped is regulated. Therefore, the applicable action listed at the top of the opposite page is to be taken:

A. Flash paper: Contact the FBI Technical Evaluation Unit for shipping instructions each and every time this item is to be submitted to the Laboratory.

B. Live ammunition: For shipping instructions see paragraph regarding Live Ammunition.

C. Other hazardous materials: Contact the FBI Explosives Unit for shipping instructions each and every time any hazardous material, except flash paper or live ammunition, is to be submitted to the Laboratory.

Nonhazardous Materials

If evidence of this type is not found in this chart or elsewhere in this section, locate a specimen which is most similar in nature and take the appropriate actions or call the Laboratory at 202-324-4410 for general instructions

SPECIMENS	AMOUNT DESIRED STANDARD	EVIDENCE	SEND BY
Abrasives, including carborundum, emery, sand, etc.	Not less than one ounce	All	Registered mail or Federal Express
Acids	100 milliliters (ml.)	All to 100 ml.	Contact FBI Chemistry Unit for instructions
Adhesive tape	Recovered roll	All	Registered mail
Alkalies -- caustic soda, potash, ammonia, etc.	100 ml. 100 gm.	All to 100 ml. All to 100 gm.	Contact FBI Chemistry Unit for instructions
Ammunition (Cartridges)			For instructions re shipping live ammunition, see page 52 under "Live Ammunition"

IDENTIFICATION	WRAPPING AND PACKING	REMARKS
On outside of container. Type of material. Date obtained. Name or initials	Use containers, such as ice-cream box, pillbox, or plastic vial. Seal to prevent any loss.	Avoid use of envelopes
Same as above	Plastic or all-glass bottle. Tape stopper. Pack in sawdust, glass, or rock wool. Use bakelite or paraffin lined bottle for hydrofluoric acid.	Label acids, glass, corrosive.
Same as above	Place on waxed paper or cellophane	Do not cut, wad or distort.
Same as above	Plastic or glass bottle with rubber stopper held with adhesive tape.	Label alkali, glass, corrosive.
Same as above	For instructions re shipping of live ammunition, see paragraph regarding Live Ammunition	Unless specific examination of cartridge is essential, do not submit.

SPECIMEN	AMOUNT DESIRED STANDARD	EVIDENCE	SEND BY	IDENTIFICATION	WRAPPING AND PACKING	REMARKS
Anonymous letters, extortion letters, bank robbery notes.		All original documents	Registered mail.	Initial and date each unless legal aspects or good judgment dictates otherwise.	Place in proper enclosure envelope and seal with "Evidence" tape or transparent cellophane tape. Flap side of envelope should show (1) wording "Enclosures(s) to FBIHQ from (name of submitting office)," (2) title of case, (3) brief description of contents, and (4) file number, if known. Staple to original letter of transmittal.	Do not handle with bare hands. Advise if evidence should be treated for latent fingerprints.
Blasting caps	(Contact FBI Explosives Unit for instructions)					
Blood: 1. Liquid Known samples	One tube each (sterile) 5cc-10cc, blood only. No preservatives	All	Registered airmail special delivery	Use adhesive tape on outside of test tube. Name of donor, date taken, doctor's name, name or initials of investigator.	Wrap in cotton, soft paper. Place in mailing tube or suitable strong mailing carton.	Submit immediately. Don't hold awaiting additional items for comparison. Keep under refrigeration, not freezing, until mailing. No refrigerants and/or dry ice should be added to sample during transit. Fragile label.
2. Small quantities: a. Liquid Questioned samples		All	Registered airmail special delivery	Same as above	Same as above	If unable to expeditiously furnish sample, allow to dry thoroughly on the nonporous surface, and scrape off; or collect by using eye dropper or clean spoon, transfer to nonporous surface and let dry; or absorb in sterile gauze and let dry.

SPECIMEN	AMOUNT DESIRED STANDARD	EVIDENCE	SEND BY
b. Dry stains Not on fabrics		As much as possible	Registered mail
c. For toxicological use		20 cc. (Blood and preservative mixture)	Registered airmail special delivery
3. Stained clothing, fabric, etc.		As found	Registered mail Federal Express, United Parcel Service (UPS)
Bullets (not cartridges)		All found	Registered mail
Cartridges (live ammunition)		All found	For instructions re shipping live ammunition, see paragraph regarding Live Ammunition.
Cartridge cases (shells)		All	Registered mail
Charred or burned documents		All	Registered mail

IDENTIFICATION	WRAPPING AND PACKING	REMARKS
On outside of pillbox or plastic vial. Type of specimen, date secured, name or initials.	Seal to prevent leakage.	Keep dry. Avoid use of envelopes
Same as liquid samples	Medical examiner should use a standard blood collection kit.	Preservative desired (identify preservation used). Refrigerate. Can freeze.
Use tag or mark directly on clothes. Type of specimens, date secured, name or initials.	Each article wrapped separately and identified on outside of package. Place in strong box placed to prevent shifting of contents.	If wet when found, dry by hanging. USE NO HEAT TO DRY. Avoid direct sunlight while drying. Use no preservatives.
Initials on base, nose or mutilated area	Pack tightly in cotton or soft paper in pill, match or powder box. Label outside of box as to contents	Unnecessary handling obliterates marks.
Initials on outside of case near bullet end	Same as above	
Initials preferably on inside near open end and or on outside near open end.	Same as above	
On outside of container indicate fragile nature of evidence, date obtained, name or initials.	Pack in rigid container between layers of cotton	Added moisture, with atomizer or otherwise, not recommended.

SPECIMEN	AMOUNT DESIRED STANDARD	EVIDENCE	SEND BY	IDENTIFICATION	WRAPPING AND PACKING	REMARKS
Checks (fraudulent)		All	Registered mail	See anonymous letters	See anonymous letter	Advise what parts questioned or known. Furnish physical description of subject.
Check protector, rubber stamp and/or date stamp known standards (Note: Send actual device when possible)	Obtain serveral copies in full word-for-word order of each questioned check-writer impression. If unable to forward rubber stamps, prepare numerous samples with different degrees of pressure		Registered mail	Place name or initials, date, name of make and model, etc., on sample impressions.	See anonymous letters and/or Packaging Chart above	Do not disturb inking mechanisms on printing devices.
Clothing		All	Registered mail Federal Express or United Parcel Service (UPS)	Mark directly on garment or use string tag. Type of evidence, name or initials, date.	Each article individually wrapped with identification written on outside of package Place in strong container.	Leave clothing whole. Do not cut out stains. If wet, hang in room to dry before packing.
Codes, ciphers and foreign language material		All	Registered mail	Same as anonymous letters	Same as anonymous letters	Furnish pertinent background and technical information.
Drugs: 1. Liquids		All	Registered mail, UPS or Air Express	Affix label to bottle in which found including name or initials and date.	If bottle has no stopper, transfer to glass-stoppered bottle and seal with adhesive tape.	Mark "Fragile." Determine alleged normal use of drug and if prescription, check with druggist for supposed ingredients.
2. Powders, pills and solids		All to 30 gms.	Registered mail, UPS or Air Express	On outside of pillbox, name or initials and date.	Seal to prevent any loss by use of tape	

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SPECIMEN	AMOUNT DESIRED STANDARD	EVIDENCE	SEND BY
Dynamite and other Explosives	(Contact FBI Explosives Unit for instructions)		
Fibers	Entire garment or other cloth item	All	Registered mail
Firearms		All	Registered mail, UPS or Federal Express
Flash paper	One sheet	All to 5 sheets	Contact FBI Document Section, Operations Unit #1, for instructions
Fuse (safety)	(Contact FBI Explosives Unit for complete instructions)		
Gasoline	100 ml.	All to 100 ml.	Contact FBI Chemistry Unit for instructions
Gems		All	Registered mail insured

IDENTIFICATION	WRAPPING AND PACKING	REMARKS
On outside of sealed container or on object to which fibers are adhering.	Folder paper or pillbox. Seal edges and openings with tape.	Do not place loose in envelope.
Mark inconspicuously as if it were you own. String tag gun, noting complete description on tag. Investigative notes should reflect how and where gun marked.	Wrap in paper and identify contents of packages. Place in cardboard box or wooden box.	Unload all weapons before shipping. Keep from rusting. See ammunition, if applicable.
Initials and date	Individual polyethylene envelopes double wrapped in manila envelopes. Inner wrapper sealed with paper tape.	Fireproof, place in vented location away from any other combustible materials, and if feasible, place in water tight container immersed in water. Mark inner wrapper "Flash Paper "Flammable."
On outside of all-metal container, label with type of material, name or initials, and date.	Metal container packed in wooden box.	Fireproof container
On outside of container	Use jeweler's box or place in cotton in pillbox.	

SPECIMEN	AMOUNT DESIRED: STANDARD	EVIDENCE	SEND BY	IDENTIFICATION	WRAPPING AND PACKING	REMARKS
General unknown 1. Solids (nonhazardous)	500 gms.	All to 500 gms.	Registered mail	Name or initials, date on outside of sealed container	Same as drugs	If item is suspected of being a hazardous material, treat as such and contact FBI Explosvies Unit for shipping instructions.
2. Liquids (nonhazardous)	500 ml.	All to 500 ml.	Registered mail	Same as for liquid drugs	Same as drugs	Same as above
Glass fragments		All	Registered mail, UPS or Air Express	Adhesive tape on each piece. Name or initials and date on tape. Separate questioned and known.	Wrap each piece separately in cotton. Pack in strong box to prevent shifting and breakage. Identify contents.	Avoid chipping and mark "Fragile."
Glass particles	All of bottle or headlight. Small piece of each broken pane.	All	Registered mail	Name or initials, date on outside of sealed container	Place in pillbox, plastic or glass vial; seal and protect against breakage.	Do not use envelopes.
Glass wool insulation	1" mass from each suspect area	All	Registered mail	Same as above	Sealed container	
Gunshot residues 1. Cotton applicator swabs with plastic shafts (Do not use wood shafts)		All	Registered mail	On outside of container, Date and name or initials. Label as to name of person and which hand.	Place swabs in plastic containers	Do not use glass containers
2. On cloth		All	Registered mail	Attach string tag or mark directly. Type of material, date, and name or initials.	Place fabric flat between layers of paper and then wrap so that no residue will be transferred or lost.	Avoid shaking.

SPECIMEN	AMOUNT DESIRED STANDARD	EVIDENCE	SEND BY	IDENTIFICATION	WRAPPING AND PACKING	REMARKS
Hair	Dozen or more full-length hairs from different parts of head and/or body.	All	Registered mail	On outside of container. Type of material, date and name or initials.	Folded paper or pillbox. Seal edges and openings with tape.	Do not place loose in envelope.
Insulation (see glass wool insulation)						
Handwriting and hand printing, known standards	For instructions re obtaining known standards see chapter on Documents in Part IV		Registered mail	Name or initials, date, from whom obtained, and voluntary statement should be included in appropriate place.	Same as anonymous letters.	
Matches	One to two books of paper. One full box of wood.	All	UPS or Federal Express	On outside of container. Type of material, date and name or initials.	Metal container and packed in larger package to prevent shifting. Matches in box or metal container packed to prevent friction between matches.	Keep away from fire, "Keep away from fire" label
Medicines	(See Drugs)					
Metal	One pound	All to one pound	Registered mail, UPS or Air Express	Same as above	Use paper boxes or containers. Seal and use strong paper or wooden box.	Melt number, heat treatment, and other specifications of foundry if available. Keep from rusting.

SPECIMEN	AMOUNT DESIRED STANDARD	EVIDENCE	SEND BY	IDENTIFICATION	WRAPPING AND PACKING	REMARKS
Oil	250 ml. together with specifications	All to 250 ml.	UPS	Same as above	Metal container with tight screw top. Pack in strong box using excelsior or similar material.	DO NOT USE DIRT OR SAND FOR PACKING MATERIAL. Keep away from fire.
Obliterated, eradicated, or indented writing		All	Registered mail	Same as anonymous letters	Same as anonymous letters.	Advise whether bleaching or staining methods may be used. Avoid folding.
Organs of the body		200 gms. of each organ	UPS, air express, or Registered Airmail special delivery	On outside of container. Victim's name name, date of death, date of autopsy, name of doctor, name or initials.	Plastic or glass containers. Metal lids must have liners.	"Fragile" label. Keep cool. Send autopsy report. Add no preservatives to the organs. Use dry ice on the package.
Paint: 1. Liquid	Original unopened container up to 1 gallon if possible	All to 1/4 pint	Registered mail, UPS or Air Express	On outside of container. Type of material, origin if known, date, name or initials.	Friction-top paint can or large-mouth, screw-top jars. If glass, pack to prevent breakage. Use heavy corrugated paper or wooden box.	
2. Solid (paint chips or scrapings)	At least 1/2 sq. inch of solid, with all layers represented.	All. If on small object send object	Registered mail, UPS or Air Express	Same as above	If small amount, round pillbox or small glass vial with screw top. Seal to prevent leakage. Envelopes not satisfactory. Do not pack in cotton.	Avoid contact with adhesive materials. Wrap so as to protect smear.

SPECIMEN	AMOUNT DESIRED: STANDARD	AMOUNT DESIRED: EVIDENCE	SEND BY	IDENTIFICATION	WRAPPING AND PACKING	REMARKS
Plastic casts of tire treads and shoe prints	Send in shoes and tires of suspects. Photographs and sample impressions are usually not suitable for comparison.	All shoe prints; entire circumference of tires	Registered mail, UPS or Air Express	On back before plaster hardens. Location date, and name or initials.	Wrap in paper and cover with suitable packing material to prevent breakage. Do not wrap bags.	Use "Fragile" label. Mix approximately four pounds of plaster to quart water. Allow casts to cure (dry) before wrapping
Pornographic Materials		All	Registered mail, UPS, or Air Express	See Anonymous Letters	See Anonymous Letters	Mark inner wrapping "OBSCENE," advise if evidence should be treated for latent fingerprints
Powder patterns (See gun powder residues)						
Rope, twine, and cordage.	One yard or amount available	All	Registered mail	On tag or container. Type of material, date, name or initials.	Wrap securely.	
Saliva samples	1.5" diameter stain in center of filter paper	All	Registered mail	On outside envelope and on filter paper put type of sample, name of donor, date of collection and collector's initials or name.	Seal in envelope	Stain should be circled in pencil for identification. Filter paper available from hospitals and drug stores. Allow to dry.
Safe insulation	Sample all damaged areas	All	Registered mail, UPS or Air Express	On outside of container. Type of material, date, name or initials.	Use containers, such as pillbox, or plastic vial. Seal to prevent any loss.	Avoid use of glass containers and envelopes.
Shoe print lifts (impressions on hard surfaces)	Photograph before making of dust impression.	All	Registered mail,	On lifting tape or paper attached to tape. Name or initials and date.	Prints in dust are easily damaged. Fasten print or lift to bottom of box so that nothing will rub against it.	Always secure crime scene area until shoe prints or tire treads are located and preserved.

SPECIMEN	AMOUNT DESIRED STANDARD	EVIDENCE	SEND BY
Soils and minerals	Samples from areas near pertinent spot.	All	Registered mail
Tools		All	Registered mail, UPS or Air Express
Toolmarks	Send in the tool. If impractical, make several impressions on similar materials as evidence using entire marking area of tool.	All	Registered mail, UPS or Air Express
Typewriting, known standards	For instructions re obtaining known standards see chapter on Documents in Part IV		Registered mail
Urine	Preferably all urine voided over a period of 24 hours.	All	Registered mail
Vaginal samples 1. Slides (microscope)		Minimum of two slides	Registered mail

IDENTIFICATION	WRAPPING AND PACKING	REMARKS
On outside of container. Type of material, date, name or initials.	Pillbox or plastic vial.	Avoid glass containers and envelopes.
On tools use string tag. Type of tool, identifying number, date, name or initials	Wrap each tool in paper. Use strong cardboard or wooden box with tools packed to prevent shifting.	
On object or on tag attached to or on opposite end from where toolmarks appear. Name or initials and date.	After marks have been protected with soft paper, wrap in strong wrapping paper, place in strong box, and pack to prevent shifting	
Place name or initials, date, serial number, name of make and model etc., on specimens.	Same as anonymous letters	Examine ribbon for evidence of questioned message thereon.
On outside on container. Type of material, name of subject, date taken,	Bottle surrounded with absorbent material to prevent breakage. Strong cardboard or wooden box.	Use any clean bottle with leakproof stopper.
Same as above for saliva samples	Use commercial slide box	Slide box available at hospitals. Doctor should not fix slides. No cover slips. Air dry.

SPECIMEN	AMOUNT DESIRED STANDARD	EVIDENCE	SEND BY
2. Swabs	Two unstained swabs from same package as stained.	Minimum of two swabs	Registered mail
Water	2 liters	2 liters	Registered mail
Wire (See also tool-marks.)	Three feet Do not kink.)	All (Do not kink.)	Registered mail
Wood	One foot or amount available.	All	Registered mail

IDENTIFICATION	WRAPPING AND PACKING	REMARKS
Same as above	Seal in envelope.	Allow swabs to dry before packaging.
Same as for urine	Same as for urine	Same as for urine
On label or tab. Type of material, date, name or initials.	Wrap securely.	Do not kink wire.
Same as above	Wrap securely.	

END