



Handbook of Forensic Science



Office of the Director



Since its 1932 inception, the FBI Laboratory has consistently strived to enhance its service to the law enforcement and criminal justice communities. The Handbook of Forensic Science includes information to clarify the capabilities of the FBI Laboratory, as well as current techniques used to examine physical evidence.

Through exhaustive analysis, our technicians develop appropriate methodology to apply the most recent scientific and technological innovations to the examination of forensic evidence in criminal investigations. The reliability of these techniques is crucial, not only to the law enforcement profession, but also to the public we serve. The men and women who collect physical evidence at crime scenes must exercise prudent care in its handling and packaging in order to preserve its integrity. By doing so, they help to ensure that the results of laboratory examinations are accurate. Suggested guidelines and procedures are included in this manual.

The FBI distributes the Handbook of Forensic Science in its continuing efforts to assist crime investigators and laboratories throughout the world. I hope that this publication will promote optimum use of forensic evidence and crime laboratories. These are essential components in facilitating the successful resolution of the high number of investigations and prosecutions which overwhelm the criminal justice system and tax our resources at all levels of government.

A handwritten signature in black ink, reading "Louis J. Freeh". The signature is written in a cursive, flowing style.

Louis J. Freeh
Director

Handbook of Forensic Science





The FBI Laboratory is located in the J. Edgar Hoover FBI Building,
10th and Pennsylvania Avenue, Northwest, Washington, D.C. 20535

Building on a Tradition of Excellence

VISION STATEMENT OF THE FBI LABORATORY

*T*he FBI Laboratory will be foremost in the delivery of forensic examinations and other services to LAW ENFORCEMENT through:

- ▶ A total commitment to quality
- ▶ Technical leadership
- ▶ Prompt, accurate, and thorough response to all requests
- ▶ Innovative uses of technology to facilitate *INVESTIGATIONS*
- ▶ Sharing information and technology with the *CRIMINAL JUSTICE COMMUNITY*
- ▶ A work environment which fosters open communication, creativity, individual initiative, and personal achievement

Table of Contents

Introductory Remarks	iii
Vision Statement of the FBI Laboratory	vi
General Information	viii - ix
Safety and The Crime Scene	2
Basic Safety Guidelines	3
The Crime Scene	14
FBI Forensic and Technical Support Services	20
Document Services	21
Computer Analysis and Response Team (CART)	22
Linguistics Examinations	22
Questioned Documents	23
Shoe Print and Tire Tread Examinations	29
Racketeering Records Analyses	33
Latent Fingerprint Services	35
Forensic Science Research and Training Center (FSRTC)	41
Scientific Analysis Services	43
Chemical - Toxicological Examinations	44
DNA Analysis/Serology Examinations	48
Explosives (Examinations, Guidelines, etc.)	53
Firearms-Toolmarks Examinations	57
Hairs and Fibers Examinations	65
Materials Analyses	67
Special Projects Services	76
Graphic, Photographic, Structural, and Video Services	77
Technical Services	79
Audio/Video and Electronic Devices	80
The National Center for the Analysis of Violent Crime	82
Bomb Data Center	84
Criminal Justice Information Services (CJIS)	85
Packing and Shipping Evidence	91
Collection, Shipment, Identification, and Packaging Charts	98
Index	116
Publication Rights	

General Information

Definitions of Evidence

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

Anything a suspect has taken from, left at, or that may be otherwise connected with the crime scene or the crime itself.

Terminology

Laboratory, latent, physical, and tangible, are all adjectives that describe the types of evidence received at the FBI to be examined by our experts.

Laboratory evidence is subjected to scientific testing.

Latent evidence, usually hidden (undeveloped), is evidence that becomes visible by means of the forensic technology.

Physical evidence (normally inanimate) may be measured to determine its quantity or quality.

Tangible evidence can be touched and/or defined.

Purpose of Physical Evidence

Physical evidence aids in the solution of the case by:

- Connecting or eliminating suspects
- Developing or identifying suspects
- Developing or showing a similar method of operation
- Identifying loot or contraband
- Proving or disproving an alibi
- Providing leads

Physical Evidence Proves an Element or Theory of an Offense, for example:

- Bullets, residue at the scene of a fire, toolmarks, blood, semen, or stomach contents may all prove elements of certain offenses;
- Footprints may show that many were at the scene, and/or auto paint on clothing may show that a person was hit by a car instead of otherwise injured;
- Safe insulation, glass, or building materials on a suspect's clothing may prove entry;
- Safe insulation on tools may be sufficient to prove violation of statutes for possession of burglary tools.

Nature of Physical Evidence

Physical evidence falls into two classifications:

- Evidence with Individual Identifying Characteristics and
- Evidence with Class Characteristics only.

Evidence with individual identifying characteristics can be positively identified as coming from a specific source or person if sufficient identifying characteristics are present. For example: bullets, finger/shoe prints, handwriting, toolmarks, and pieces of glass where the broken edges can be matched, and wood where broken/cut surfaces can be matched.

Evidence with class characteristics only, no matter how thoroughly examined, cannot be placed into another class. A definite identification becomes impossible when more than one source is found in samples, or when microscopic/accidental markings are insufficient for positive identification on soil, blood, hairs, fibers, single-layered paint from a safe or car, glass fragments too small to match broken edges, and toolmarks, finger/shoe prints, or bullets.

The value of evidence with Class Characteristics only should not be minimized. In cases involving evidence with Class Characteristics, be alert for the following:

- Preponderance of such evidence;
- Evidence such as paint with several matching layers, or soil with foreign matter such as paint chips, odd seeds, and safe insulation;
- Elimination evidence, such as soil specimens from where a suspect claims he/she was; where he/she claims a car was; or paint or other materials from a source mentioned in an alibi.

Standard Reference Files and Collections

The FBI Laboratory maintains these collections so that evidence may be compared to the following standard files:

Adhesives
Ammunition
Checkwriter Standards
Duct Tape/Electrical Tape
Explosives and Related Items
General Rifling Characteristics
Hairs and Fibers
National Automotive Image File
National Automotive Paint File (Foreign and Domestic)
National Motor Vehicle Certificate of Title
National Motor Vehicle Altered Numbers File
National Vehicle Identification Numbers (VIN) File
Office Equipment Standards (typewriters, copiers, printers, etc.)
Reference Firearms Collection
Safe Insulation
Safety Paper Standards
Shoe Sole Design Standards
Tire Tread Design Standards
Watermark Standards

Files of Questioned Material include:

Anonymous Letters
Bank Robbery Notes
Fraudulent Checks

All forensic services, including the services of laboratory examiners if needed as expert witnesses, are rendered free of cost to contributing agencies.

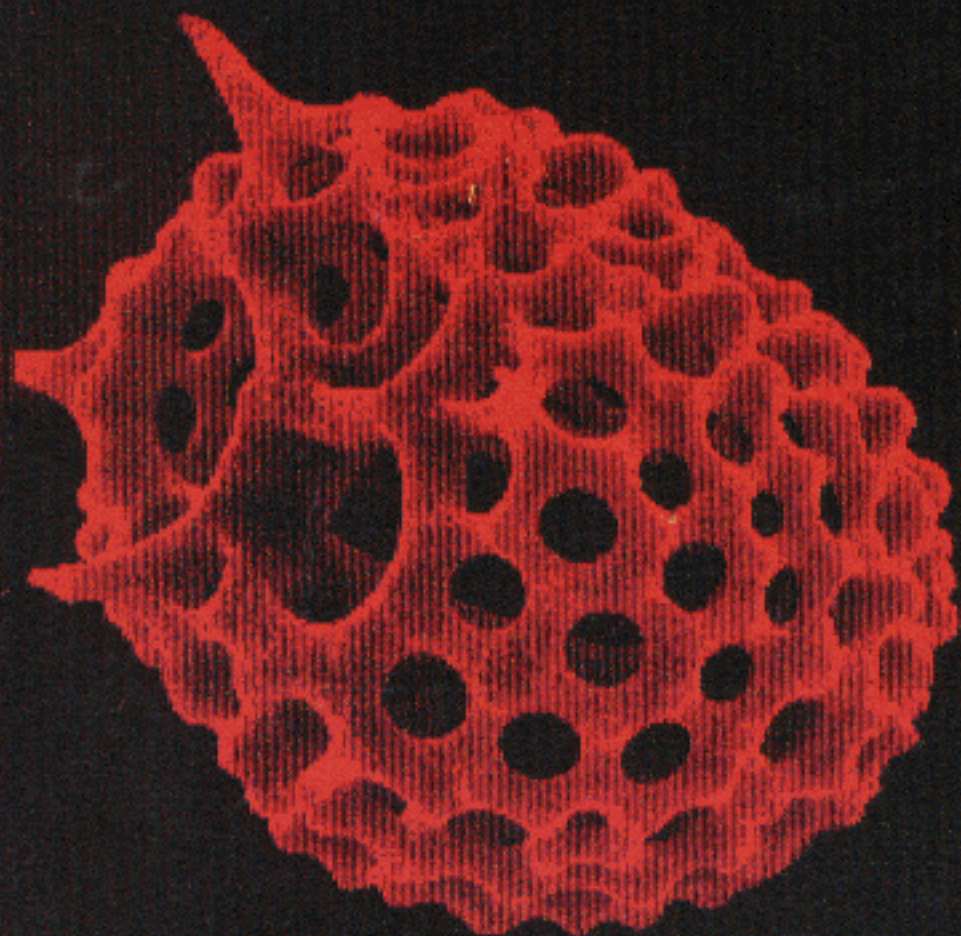
As a general rule, the FBI will not conduct forensic examinations if the evidence is subjected elsewhere to the same examination for the Prosecution. However, if the circumstances in a given instance are such that this restriction poses a significant obstacle to an orderly prosecution, these facts should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

To utilize more efficiently its resources, the Laboratory Division will not accept cases from other crime laboratories which have the capability of conducting the requested examination(s). If submitted, the evidence will be returned unopened and unexamined. However, mitigating circumstances may warrant an exception to this policy, such as fingerprint examinations.

In certain situations, fingerprint evidence will be examined even if it is subjected to examination by other fingerprint experts. FBI experts will furnish testimony regarding evidence they have examined. But, in the interest of economy, their testimony should not be requested if another Prosecution expert is already testifying to the same results.

Facilities are available to all federal agencies, U.S. Attorneys, and military tribunals in both civil and criminal matters, and all duly constituted state, county, and municipal law enforcement agencies in the United States in connection with their official criminal investigative matters only.

2-RADIOLARIA-7



MAG=1200X
20.79 MICRONS

RADIOLARIA (Magnified 20.79 microns) Marine planktonic protozoan recovered from evidence to determine environmental history

Safety and the **Crime Scene**

Basic Safety Guidelines for Crime Scene Investigation and Evidence Collection

Laboratory examiners, photographers, evidence response team members, evidence technicians, fingerprint specialists, and others are often called upon to conduct crime scene searches and to identify bodies in mass disasters. Because of the inherent risk of exposure to human blood and other potentially infectious materials, as well as the various physical hazards present at the crime scene, the health and safety of these individuals may be compromised. For protection, it is essential that they develop and maintain an acute awareness of the hazards present in their work environment and take the necessary precautions and measures to protect themselves and their coworkers.

The purpose of this section is to identify general safety guidelines and personal protective measures that should be followed when handling potentially hazardous evidentiary materials or when exposed to hazardous environmental conditions. These recommendations are not all inclusive and should serve only as a guide and/or supplement for personal training and growth in safety awareness.

The basic safety guidelines for crime scene investigation and evidence collection are intended to serve only as a starting point for good safety practices. Personnel involved in crime scene investigations and evidence collection and handling should consult pertinent local, state, and federal laws concerning specific safety requirements and standards.

Routes of Exposure ¹

Inhalation

Inhalation is the most likely route of entry for chemicals as well as some infectious agents (e.g., tuberculosis). Chemical or biological contaminants present in inhaled air can easily enter the lungs and bloodstream where they can circulate throughout the system causing damage to target organs, such as the liver and kidney. Inhaled substances can be in the form of dusts, mists (aerosols), smoke, vapors, gases, or fumes. Proper work practices, engineering controls (e.g., ventilation) and, when necessary, the use of respirators minimize inhalation of air contaminants.

Ingestion

Ingestion is a less common route of exposure for both chemical and biological contaminants. Ingestion of a corrosive material can cause damage to the mouth, throat, and digestive tract. When swallowed, toxic chemicals may be absorbed by the body through the stomach and intestines. To prevent entry of toxic chemicals or biological hazards into the mouth, always wash your hands before eating, smoking, or applying cosmetics. Also, avoid bringing food, drink, and cigarettes into areas where contamination can occur.

Skin, Eye, and Mucous Membrane Contact

Contact of chemicals or infectious materials with the skin, eyes, or mucous membranes is a frequent route of entry. Chemical contact with those surfaces could result in local damage and subsequent absorption into the bloodstream, thereby causing other effects throughout the body. The effect of eye contact with a chemical can range from irritation to permanent blindness. Chemical exposure can be avoided by use of appropriate protective equipment such as gloves, safety glasses, goggles, and/or face shields.

Injection

Injection of foreign materials (chemical or biological) can cause a serious health hazard because the material can be delivered directly to the bloodstream or become embedded in the tissue. Exposure to toxic chemicals, human blood or other potentially infectious materials can inadvertently occur through mechanical injury from contaminated glass, metal, needles/syringes, or other objects. Therefore, extreme caution should be exercised when handling these or similar objects.

Crime Scene/Mass Disaster 2, 3

General Precautions

No one should enter the crime scene/mass disaster without the proper safety and personal protective equipment. (See Personal Protective Equipment, page 11.)

Individuals should not be permitted to eat, drink, smoke, or apply makeup at the crime scene/mass disaster.

The crime scene/mass disaster may be a source of contamination from a variety of sources including human blood and body fluids (both liquid and dried), human tissues and other remains.

Treat all human body fluids as potentially infectious and use Universal Precautions under Bloodborne Pathogen Safety, page 7.

In addition to the biological hazards, consideration must be given to the variety of chemical, environmental, and/or mechanical hazards that may be present at the crime scene/mass disaster.

Always be on the alert for sharp objects such as hypodermic needles, knives, razors, broken glass, nails, and exposed or cut metals.

Broken glass which may be contaminated should never be picked up directly with the hands. It should be collected using mechanical means, such as a brush and dust pan, tongs, or forceps.

Ensure that the crime scene/mass disaster is properly ventilated.

Mirrors and flashlights should be used when looking in confined spaces such as under car seats, beds, etc., prior to reaching into those areas with the hands.

Use a wooden paint stirrer, or other similar item, to search narrow and confined spaces, such as those found between car seats and chairs, before the hands are used.

Never recap hypodermic needles or place covers, such as pencil erasers, on the end of the needles.

Place all syringes, needles, and other sharp objects in puncture-resistant containers.

Refer to Bloodborne Pathogen-Chemical Safety, page 9, for specific safety procedures.

Access Control

Provide a means of controlled entry and exit for personnel and equipment entering or leaving the crime scene/mass disaster.

Provide a system for centralized decontamination of personnel and equipment and the collection of infectious waste (gloves, coveralls, etc.) to prevent transfer of potentially infectious material to noncontaminated areas such as the worker's office, car, or residence.

Procedures should be established for the proper disposal of all contaminated waste.

Violent Crimes

Violent crimes pose a greater potential for contact with infectious material.

All human blood, body fluids, and tissues, from both living and deceased individuals, must be handled as being potentially infectious for hepatitis and HIV (human immunodeficiency virus).

Avoid direct contact with all human blood, body fluids, and tissues. Personal protective equipment must be readily available and used. (See Universal Precautions under Bloodborne Pathogen Safety, page 7.)

Surgical caps, fluid-resistant protective clothing, face masks/shields, eye protection, shoe covers and boots should be worn in instances when gross contamination can be reasonably anticipated (e.g., autopsies, crime scenes, mass disasters).

Bombings

If a bombing incident occurs, investigative personnel should ensure that the following precautions are taken before entering the scene:

- Ensure that all utilities (electric, gas, and water) are turned off. Contact local utilities or power company for assistance.
- A bomb technician should first check the damaged area for unexploded bomb(s).
- The structure should then be checked by engineers for hazardous structural conditions.
- Do not touch or move any suspected explosive device at the crime scene until it has been rendered safe by a public safety bomb squad or military Explosive Ordnance Disposal Unit.

- Initial entry personnel should carry at least one radiation extremity monitoring alarming dosimeter/ratemeter in order to identify any potential radiation hazard.

- Use proper personal protective equipment such as hard hats, safety goggles, gloves, foul weather clothing, waterproof/puncture-resistant coveralls, steel-toe/steel-shank workboot, respirator, reflective tape for clothing, and any other protective item. (See Personal Protective Equipment, page 11.)

All bombing or explosive-related evidence which consists of substances of unknown composition, such as powders or liquids, must be assumed to be extremely sensitive and capable of initiation or detonation.

Unknown substances in these matters should be examined by a bomb technician or a forensic chemist before collection.

Prior to packaging for shipment, call the FBI Laboratory, Explosives Unit at (202) 324-2696 to ascertain the quantity needed for analysis, the packaging method to be used, and the proper shipping method. Also, call for questions regarding handling of these types of substances.

All unknown substances should be labeled:

Use caution when handling. Substance is possibly flammable or explosive.

All evidence collected at the crime scene which has been examined by a forensic specialist (bomb technician or chemist) and found to be safe and nonhazardous should be clearly labeled as such. The label should be clearly visible and include the name, agency, and phone number of the forensic expert who examined the material and made the determination that it was safe.

Clandestine Drug Laboratories

Clandestine drug laboratories may present extremely dangerous situations to untrained personnel. These laboratories often contain extremely dangerous chemicals, which may be intentionally mislabeled, as well as "booby trapped," to prevent entry. They should only be searched, cleared, and decontaminated by the Drug Enforcement Administration (DEA) personnel who are trained and certified for this type of work.

When dealing with clandestine drug laboratories, evacuate the scene, secure the area, and contact the nearest office of the DEA.

Removal of Hazardous Materials from the Crime Scene/Mass Disaster

All hazardous materials should be properly labeled, stating the type of hazard and any special handling procedures before being removed from the crime scene/mass disaster.

All hazardous material labels should be clearly visible and include the agency, name, and phone number of the forensic expert who examined the material.

Title 49 of the Code of Federal Regulations lists specific requirements that must be observed in preparing hazardous materials for shipment by air, highway, rail, water, or any combination thereof.

Title 49 of the Code of Federal Regulations, part 172.101, provides a Hazardous Materials Table which identifies those items considered hazardous for the purpose of transportation, special provisions, hazardous materials communications, emergency response information, and training requirements.

Exposure to Critical (Traumatic) Incidents ⁴

Shootings, drownings, accidents, sexual assault, and child abuse are only a few examples of critical (traumatic) incidents that law enforcement personnel are exposed to which may produce significant emotional responses. These responses may include any of the following:

- Alcohol/substance abuse
- Anger
- Anxiety
- Crying/depression
- Fatigue
- Flashbacks and intrusive thoughts
- Guilt
- Heightened sense of danger
- Isolation/withdrawal
- Marital problems
- Nightmares
- Numbness
- Perceptions of going insane
- Startle reactions (e.g., difficulty sleeping, headaches, muscle aches, stomachaches, high blood pressure, etc.)
- Trouble remembering/concentrating

For additional information or assistance concerning critical (traumatic) incidents, contact:

The International Critical Incident Stress Foundation, Baltimore, Maryland, (410) 730-4311. If emergency assistance is needed, contact the 24-hour: **Critical Incident Stress Debriefing (CISD) Hotline, (410) 313-2473.**

Safety

Bloodborne Pathogen Safety ⁵

On December 6, 1991, the Occupational Safety and Health Administration (OSHA) issued the regulation called "Occupational

Exposure to Bloodborne Pathogens (BBP)," found in Title 29, Section 1910.1030 of the Code of Federal Regulations. The standard covers those occupations having a high potential for exposure to bloodborne pathogens, including law enforcement, emergency response, and crime laboratory personnel.

Individuals covered by this standard should observe **Universal Precautions** to prevent contact with human blood, body fluids, tissues and other potentially infectious materials.

Universal Precautions require that employees treat all human blood, body fluids, or other potentially infectious materials to be infectious for hepatitis B virus (HBV), human immunodeficiency virus (HIV), and other bloodborne pathogens. Appropriate protective measures to be taken to avoid direct contact with these materials include:

- Use barrier protection at all times.
- Prohibit eating, drinking, smoking, or applying makeup at the crime scene/mass disaster.
- Use gloves when there may be hand contact with blood or other potentially infectious materials. Gloves should always be worn as if there are cuts, scratches, or other breaks in the skin. In some instances where there is heavily contaminated material, the use of double gloves is advisable for additional protection.
- Change gloves when contaminated or as soon as feasible if torn, punctured, or when their ability to function as a barrier is compromised.
- Always wash hands after removal of gloves or other personal protective equipment (PPE). The removal of gloves and other PPE should be performed in a manner

which will not result in the contamination of unprotected skin or clothing.

- Wear safety goggles, protective face masks or shields, or glasses with side shields to protect from splashes, sprays, spatters, or droplets of blood or other potentially infectious materials. These same precautions must be taken when collecting dried stains for laboratory analyses.
- Use disposable items, such as gloves, coveralls, shoe covers, etc., when potentially infectious materials are present.
- Place contaminated sharps (e.g., broken glass, needles, knives, etc.) in appropriate leakproof, closable, puncture-resistant containers when these sharps are to be discarded, transported, or shipped. If transported or shipped, containers should be appropriately labeled.
- Do not bend, recap, remove, or otherwise handle contaminated needles or other sharps.
- Use a protective device, such as a CPR mask, when performing mouth-to-mouth resuscitation.
- Decontaminate all equipment after use with a solution of household bleach (diluted 1:10), 70% isopropyl alcohol, or other appropriate disinfectants.
- After all evidence has been collected and the crime scene has been released, the owner or occupants of the affected property should be made aware of the potential risks from bloodborne pathogens.
- Evidence containing blood or other body fluids should be completely dried before it is packaged and shipped to the laboratory for analysis. Appropriate biohazard warning labels must be affixed to the evidence container indicating that a potentially infectious material may be present.

- To avoid direct contact and exposure to potentially infectious evidentiary materials in the courtroom, all evidence contaminated with human blood or other potentially infectious materials should be placed in a sealed, transparent package and labeled with the appropriate biohazard warning label.

Additional Precautions

In addition to Universal Precautions, there are certain requirements in the OSHA BBP standard that pertain to collection, handling, storage, transport, and shipping of blood and other potentially infectious material.

Evidence specimens contaminated with wet blood or other potentially infectious materials must be placed in a closable, leakproof container (i.e., heavy-duty plastic bag) when transported from the crime scene to the drying location. After drying, the evidence must be placed in a suitable and properly labeled container before being transported to the crime laboratory. (Note: Plastic bags used to transport evidence contaminated with wet blood or other fluids should be retained as evidence.)

OSHA's
BBP
standard
29 CFR
1910.1030
(g)(1)(i),
requires
that evi-
dence
specimens,

such as liquid blood (vacutainer tubes) or other potentially infectious materials, must be placed in a closable, leakproof container and labeled (see above) or color-coded prior to being stored or transported.

Engineering and work practice controls are used to eliminate or minimize employee exposure to hazardous materials.



Engineering controls (e.g., puncture-resistant containers for contaminated sharps, paint stirrers, and adjustable mirrors for locating evidence in confined/hidden spaces) isolate or remove the hazard, whether bloodborne or chemical, from the workplace. Workplace controls (e.g., handwashing facilities, wearing personal protective equipment) reduce the likelihood of exposure by altering the manner in which a task is performed.

For additional information on proper protection against blood and other potentially infectious materials, refer to "Personal Protective Equipment," page 11.

Decontamination of Nondisposable Clothing

These recommendations apply only to non-disposable clothing and not to clothing that is part of the personal protective equipment according to OSHA 29 CFR 1910.1030.

- Protect hands with disposable gloves.
- Remove contaminated garment carefully; protect skin and mucosal surfaces during removal, e.g., cover face and eyes with mask and goggles or face shield when removing garment over head.
- Fill a sink, bucket, or deep tray with cold water and soak contaminated part of garment to remove blood or other material. Using gloves, squeeze out water from garment; dispose of water into sewer, toilet, or dirty sink; rinse sink and container with plenty of water; disinfect container if needed.
- Store garment in plastic bag prior to being laundered.

- OR -

- Place garment into tray and cover contaminated area with one of the following disinfectants:

- 1:20 dilution of fresh chlorine bleach for fabrics that tolerate bleaching such as white coats or uniforms;
- 70% alcohol (ethanol or isopropanol) for delicate fabrics.

• Let soak for 10 minutes, remove, rinse with water, and dry. The disinfected garment can be laundered or dry cleaned.

Chemical Safety 1, 6

Depending on the type of material encountered, a variety of health or safety hazards may exist. Some of those hazards are identified by the following categories:

Flammable or combustible materials (e.g., gasoline, acetone, ether) ignite easily when exposed to both air and an ignition source such as a spark or flame.

Explosive materials (e.g., dynamite, C-4, TNT, etc.) are chemically unstable. Instability determines the sensitivity (i.e., the amount of energy required to initiate a reaction). Explosives containing nitroglycerine require a minimal amount of shock to be initiated. Heat, friction, and fire are also means for initiation.

Pyrophoric material is any liquid or solid igniting spontaneously in air at or below 130°F (54°C). Examples include phosphorus, sodium, and barium.

Oxidizers are a class of chemical compounds that can react violently with flammable and combustible materials. Some common types of oxidizers include chlorates, nitrates, hydrogen peroxide, perchloric acid, and sulfuric acid. Avoid storage with incompatible materials that could react with the oxidizer or catalyze its decomposition.

Corrosive materials are those substances which can cause injury to body tissue or be corrosive to metal. Corrosive injury may be to

a minor degree (irritation) or actual physical destruction of body tissues. Corrosive chemicals act on body tissues through direct contact with the skin or eyes, inhalation, or ingestion.

The key to working safely with chemicals is knowledge of their hazardous properties, proper training in handling and disposal techniques, and emergency preparedness.

For proper protection against Chemical Hazards, see "Personal Protective Equipment," page 11.

Latent Fingerprint Safety 2, 3

Refer to Bloodborne Pathogen Safety, page 6, when dealing with any human tissue or body fluid from a living or deceased individual.

When latent print evidence is contaminated by human biological material, appropriate personal protective equipment and engineering controls must be used during the examination.

Light Source Safety 2, 7, 8

The use of ultraviolet (UV) lights, lasers, and other alternative light sources are increasing in use not only in the latent fingerprint field, but in forensic science in general. While these tools are of great value to the forensic scientist, they also create some potentially hazardous conditions, especially when the user is untrained or unaware of the hazards associated with their use. The operator of any light source must be properly trained in the use and safety of these instruments. Regardless of the light source being used, it is **absolutely essential that appropriate eyewear be worn by the user and by all personnel in the vicinity of the device.**

When using UV light sources, it is essential that an individual's eyes be protected from direct exposure and that prolonged exposure to the skin be avoided.

Because some lasers create an apparent

point source of light which may not be visible to the viewer, there exists an enormous radiant energy which has the potential to cause irreversible damage to the retinal tissues of the eye from both direct and/or reflected beams.

Personal protection for the eyes requires goggles which have sufficient protective material and which are fitted so that stray light cannot enter from any angle. All laser protective eyewear should be clearly labeled with the optical density and wavelength for which protection is afforded.

Avoid both direct and indirect (reflected from a polished surface) eye and skin contact with a collimated laser beam.

Eyewear, worn while conducting examinations using high-powered lasers, should be approved by the American National Standards Institute (ANSI), and have an optical density of five or greater at the maximum operating wavelength.

Adequate ventilation should be provided with all lasers.

Lasers can present a shock hazard both indoors and outdoors in a wet environment.

Keep the exit port of the light source at a sufficient distance from surfaces to prevent overheating and combustion.

Firearms Safety

Weapons should never be shipped or stored in a loaded condition.

Remove all ammunition from firearms and follow DOT regulations for transportation.

For submission of live ammunition, bullets, and/or guns, see page 58.

Confined Space Safety ⁹

A confined space is an enclosed space large enough for an individual to bodily enter and perform assigned work. It has limited or constricted means of entry or exit and is not designed for continuous occupancy.

Entry into confined spaces may expose the individual to a variety of hazards, including toxic gases, explosive atmospheres, oxygen deficiency, and electrical hazards.

Conditions in a confined space must be considered immediately dangerous to life and health unless shown otherwise.

Some safety tips for working in confined spaces include:

- Never enter a confined space before all hazards (atmospheric, engulfment, and mechanical) have been identified and procedures have been developed to deal with them.
- Always isolate the confined space from all unwanted energy sources or hazardous substances.
- Always maintain proper mechanical ventilation in a confined space and make sure ventilation equipment does not interfere with entry, exit, and rescue procedures.
- Never introduce hazards such as welding, cleaning solvents, etc., in a confined space without first making provisions for these hazards.
- Always monitor for atmospheric hazards (oxygen, combustibles, toxins) prior to and during entry.
- Always provide barriers, as necessary, to warn unauthorized personnel and to keep entrants safe from external hazards.

- Always provide constant communications between entrants and outside attendants, and remember to have backup communications if using two-way radios.

- Always wear appropriate personal protective equipment; be familiar with the use and limitations of that equipment; and be sure it is properly maintained.

- Never attempt rescue in a confined space unless you are part of a designated rescue team and have the proper knowledge, skills, and equipment to effect a safe rescue.

- Use of safety belts and harnesses is mandatory.

For additional information, refer to the OSHA standard for permit-required confined spaces, 29 CFR 1910.146.

Personal Protective Equipment

Hand Protection ^{10, 11}

Hand protection should be selected on the basis of the material being handled and the particular hazard (biological or chemical) involved. For chemical resistance, select the glove material that offers the best level of protection for the chemicals handled. The following are some glove material types and their functions:

Nitrile (NBR) provides protection from acids, alkaline solutions, hydraulic fluid, photo solutions, fuels, lubricants, aromatic, petroleum, and chlorinated solvents. It also offers excellent resistance to punctures, cuts, and snags.

Neoprene offers resistance to oil, grease, acids, solvents, alkalis, bases, and most refrigerants.

Polyvinyl chloride (PVC) is chemically resistant to alkalis, oils, limited concentra-

tions of nitric and chromic acids. This material can be worn by most workers who are allergic to natural rubber.

Natural Rubber (Latex) resists mild acids, caustics, detergents, germicides and ketonic solutions, but it will swell and degrade if exposed to gasoline and kerosene. Because gloves made from natural rubber (latex) are adversely affected by exposure to high temperatures and direct sunlight, they should not be stored for an extended period of time in the passenger area or trunk of a car.

Have readily accessible hypoallergenic gloves, glove liners, powderless gloves, and other similar alternatives for those allergic to the normally provided gloves.

Check the gloves to be used for holes, punctures, and tears and remove rings or other sharp objects which may cause punctures.

Wear heavy (8-10 mil thick) latex gloves or a double layer of gloves when working with items heavily contaminated with blood or other human biological material.

Remove gloves carefully by grasping the cuffs and pulling them off inside out, starting at the wrist and working toward the fingers.

Discard disposable gloves in designated containers. Do not reuse.

Eye Protection ^{1, 12}

Eye protection is an important consideration when working at a crime scene or when handling potentially hazardous materials. Appropriate eye protection (face shields, goggles and safety glasses) should be worn when handling any of the following materials:

biohazards
caustics, corrosives, or irritants

explosives
flammable materials
lasers
radioactive materials
UV light

Types of Eye Protection

Refer to **American National Standard Practice for Occupational and Educational Eye and Face Protection, American National Standards Institute, ANSI Z87.1-1989** (or latest revision) for additional information.

Safety Glasses

At the crime scene, you are likely to encounter both biological and chemical hazards. There always exists the potential for splashing biological fluids or chemicals. In addition, flying objects may enter the eyes if not properly protected. Safety glasses should be worn at all times in the presence of these hazards. In most instances, safety glasses with side shields are adequate. Where there is danger of splashing of biological fluids, chemicals, or flying particles, goggles and/or full face shields will give more protection.

Contact Lenses

Contact lenses are not to be used as eye protection. In the event of a chemical splash into the eye, it is often extremely difficult to remove the contact lens to irrigate the eye. Gases and vapors can be concentrated under such lenses and cause injury or permanent eye damage.

Prescription Safety Glasses

Crime scene personnel whose vision requires the use of corrective lenses should wear safety eye protection of one of the following types:

protective lenses.

- Safety eyewear that can be worn over prescription glasses without disturbing the adjustment of the glasses.

Safety Goggles

Goggles are not intended for general use. They are intended for wear when there is danger of splashing chemicals or flying particles.

Face Masks/Shields

Full-face masks/shields that protect the face and throat should always be worn when maximum protection from flying particles and harmful liquids (biological or chemical) is needed.

Foot Protection ¹⁰

Shoes that completely cover and protect the foot are recommended. Shoes that expose the foot in any way should not be worn. In addition, fabric shoes, such as tennis shoes, should not be worn as they may readily absorb liquid. Certain hazardous situations may require footwear that has conductive soles, insulated soles, steel toe and shank, and is chemical resistant.

Respiratory Protection ^{1, 10, 13}

Certain crime scenes, such as bombings and clandestine laboratories, may produce noxious fumes and other airborne contaminants which require respiratory protection.

Safety supply companies carry many types of respirators ranging from a disposable dust mask to a self-contained breathing apparatus. Selection should be made according to the guidelines in the **American National Standard Practices for Respiratory Protection Z88.2-1992**, after consultation with health and safety professionals.

The critical elements for the successful use of a respirator include training, motivation, medical evaluation, fit testing, and a respirator maintenance program. Without a complete respiratory protection program, personnel will not receive the degree of protection anticipated from a respirator, even if it is a correct choice for the situation. As a minimum, compliance with Title 29 CFR 1910.134 is **mandatory** whenever respirators are used by personnel, whether on a required or voluntary basis.

Head Protection¹⁴

Elimination or control of hazards leading to an accident should be given first consideration, but many accidents causing head injuries are difficult to anticipate and control. Where these conditions exist, appropriate head protection must be provided to eliminate injury.

Head protection, in the form of protective hats, must resist penetration and absorb the impact. In certain situations, such as bombings which can cause structural damage to a scene, additional head protection may be necessary. Heavy-duty fireman-type hats provide added protection to the ears and posterior neck. Protective helmets also protect against electrical shock.

The standard recognized by OSHA for protective hats is contained in **ANSI Requirements for Industrial Head Protection, Z89.1-1986**. This standard should be consulted for further details.

Endnotes

1 Prudent Practices for Handling Hazardous Chemicals in Laboratories, National Research Council, Committee on Hazardous Substances in the Laboratory, National Academy Press, Washington, D.C. 1981.

2 Bigbee, P.D., Laboratory Safety, 2nd. Edition, Federal Bureau of Investigation, June 1, 1989.

3 "Report of Special Committee for Safety," International Association for Identification, 2516 Otis Drive, Alameda, CA.

4 James M. Horn, M.F.S. and Roger M. Solomon, "Peer Support: A Key Element for Coping with Trauma," Police Stress, Winter 1989, Vol. 9, No. 1, pp. 25-27.

5 U.S. Department of Labor, Occupational Safety and Health Administration, Title 29 CFR Section 1910.1030, "Occupational Exposure to Blood-borne Pathogens; Final Rule." December 6, 1991.

6 Mark J. Upfal, MD, MPH, Pocket Guide to First Aid for Chemical Injuries, Edited by John R. Stuart, Genium Publishing Corporation, Schenectady, NY. 1991.

7 Betty Carrell, BS, RN, and R. James Rockwell, Jr., MSc, Lasers: Identification and Recommendations for the Occupational Health Nurse, AAOHN Update Series 3/14.

8 American National Standard for the Safe Use of Lasers, (ANSI Z136.1-1986), American National Standards Institute, Inc., New York, NY.

9 John V. Conforti, Confined Space Pocket Guide, Edited by Christine Gorman, Genium Publishing Corporation. 1992.

10 Laboratory Survival Manual, Environmental Health and Safety Office, University of Virginia, Charlottesville, VA.

11 "Choose the Proper Gloves for Chemical Handling," Best's Safety Directory 1990, 30th Edition, Pioneer Industrial Products, Willard, OH.

12 American National Standard Practice for Occupational and Educational Eye and Face Protection, American National Standards Institute, ANSI Z87.1-1979, New York, NY.

13 Hazardous Waste Handling Pocket Guide, Editor Christine Gorman, Genium Publishing Corporation. Schenectady, NY. 1991.

14 U.S. Department of Labor, Occupational Safety and Health Administration, "Personal Protective Equipment," OSHA 3077. Revised 1992.



Evidence cannot be presumed to be *evident*...it must be proven...
and, it must be documented and demonstrated...

FBI Document Section

The Crime Scene

The physical evidence recovered during investigations of crime scenes is one of the critical areas in contemporary law enforcement. Often, the facts and tangible items of evidence derived from these investigations make the difference between success and failure when a case is brought to trial. With the evolution of the scientific aspects of forensic science, more attention must be awarded at crime scenes to recovering and maintaining the integrity of evidence which will be eventually examined by specialists in the crime laboratory.

One important consideration, bearing on the modern view of forensic science is that this field is sometimes associated only with work accomplished in the crime laboratory. This consideration, however, is in actuality a very limited perspective on the overall area of forensic science. It is obvious that the ability of the laboratory to provide scientific interpretations is dependent to a great extent on the recognition, recovery and documentation of evidence at the crime scene. In essence, then, the field investigator or crime scene technician is as much a part of forensic science as the highly skilled laboratory examiner. If the evidence from a scene is not properly handled, the work of the crime laboratory can be hindered to a great extent.

Therefore, it is suggested the discipline of forensic science be regarded as a multifaceted one. Each level of evidence involvement must be planned, organized, and performed with a central issue in mind—effective use of the physical evidence to its greatest potential.

It should be ensured that the crime scene searches are conducted in a systematic and methodical fashion. Numerous suggestions are presented in terms of practical aspects of day-to-day search operations.

Due to the myriad situations which can occur, it would be virtually impossible to cover all conceivable possibilities. Nonetheless, the material contained herein brings out significant concerns common to almost all agencies. Additionally, these points should serve as catalysts for the reader to generate other important items based on specific agency needs.

If more information on this topic is needed, contact the Forensic Science Training Unit, Quantico, Virginia, telephone (703) 640-1239.

Practical Suggestions Regarding Crime Scene Administration and Management

Preparation

Accumulate packaging and collection of materials necessary for typical search circumstances.

Prepare the preliminary format for the paperwork needed to document the conducting of the search.

Ensure that all specialists are aware of the overall forms of evidence usually encountered as well as the proper handling of these materials.

Evaluate the current legal ramifications of crime scene searches (e.g., obtaining of search warrants).

Discuss the search with involved personnel before arrival at scene, if possible.

Identify, when feasible, a person-in-charge prior to arrival at scene.

Make preliminary personnel assignments before arrival at scene, if practicable.

Consider the safety and comfort of search personnel. When encountering a potentially dangerous

scene or inclement weather, be prepared with:

- clothing
- communication
- lighting assistance
- shelter
- transportation
- food
- medical assistance
- scene security
- equipment

Assess the personnel assignments normally required to successfully process a crime scene.

The following information is provided as an example of the personnel responsibilities. (Depending on circumstances and personnel availability, it may not be feasible to have one person assigned to each duty. It is relatively common for one individual to accomplish two or more responsibilities.)

Person-In-Charge

- administrative log
- narrative description
- preliminary survey
- scene security
- final decision making

Photographer

- photographs
- photographic log

Sketch Preparer

- sketch
- documentation of items on sketch

Evidence Recorder

- evidence log
- evidence custodian

In instances of prolonged search efforts, consider the use of shifts using two or more teams. Transfer paperwork and responsibility in a preplanned manner from one team to the next.

Organize communication with services of any ancillary nature (e.g., medical examiner, prosecutive attorney) in order that questions which surface during crime scene search may be resolved. Take steps to organize a command post headquarters for communication, decision making, etc., in major/complicated crime scene investigations.

The possibility of coordinating multijurisdiction scene investigations should be explored. It is advantageous to have working agreements that are mutually acceptable to potentially involved agencies. These agreements should be made before confusion occurs in an actual multijurisdiction case, rather than as a later crisis response.

Basic Stages in a Crime Scene Search

Approach Scene

- Be alert for discarded evidence.
- Make pertinent notes.
- Establish frame of mind to take control of scene regardless of circumstances observed on arrival.
- Consider personal safety.

Secure and Protect Scene

- Take control on arrival.
- Determine extent to which scene has thus far been protected.
- Check for adequate scene security even if advised that it has been protected prior to arrival.
- Obtain information from logical personnel who have entered scene and have knowledge relative to its original conditions.
- Identify one individual who is designated as the person-in-charge for final decision making and problem resolution.
- Take notes—do not rely on memory.

Keep out unautho-

rized personnel—begin recording who enters and leaves.

Initiate Preliminary Survey

- The survey is an organizational stage to plan for the entire search.
- Cautiously, walk through the scene.
- Maintain definite administrative and emotional control (usually the person-in-charge).
- Select appropriate narrative description technique.
- Acquire preliminary photographs.
- Delineate extent of the search area—usually expand initial perimeter.
- Organize methods and procedures needed—recognize special problem areas.
- Determine manpower and equipment needs—make specific assignments.
- Identify and protect transient physical evidence, e.g., evidence that can be lost such as hairs, fibers, dust, etc.
- Develop a general theory of the crime.
- Make extensive notes to document the scene's physical and environmental conditions, assignments, movement of personnel, etc.

Evaluate Physical Evidence Possibilities

This evaluation begins upon arrival at scene and becomes detailed in the preliminary survey stage.

Based on the preliminary survey, establish evidence types most likely to be encountered.

Ensure collection and packaging equipment is sufficient for task at hand—a given scene may require special techniques not normally used.

Focus first on evidence that could be lost (e.g., detached from garment) and leave the least transient forms of evidence to be last.

Ensure all personnel consider the great variety of possible evidence, not only evidence within the scope of their respective specialties.

Focus first on the easily accessible areas in open view and progress eventually to possible out-of-view locations—look for purposely hidden items.

Consider whether the evidence appears to have been moved inadvertently.

Evaluate whether or not the scene and evidence appear intentionally contrived.

Prepare Narrative Description

The narrative is a running, written description of the condition of the crime scene in general terms.

Represent the scene in a general to specific reference scheme.

Use photographs to supplement narrative description.

Use a systematic approach in recording the narrative—no item is too insignificant to record if it catches one's attention.

Do not permit the narrative effort to degenerate into a sporadic and unorganized attempt to recover physical evidence—it is recommended that evidence not be collected at this point, under most circumstances.

Methods of narrative include: written, audio, and video (sight/sound or sight only).

Depict Scene Photographically

Begin photography as soon as possible—plan before photographing.

Document the photographic effort with a photographic log.

Ensure that a progression of overall, medium, and close-up views of the scene is established.

Use a recognized scale device for size determination when applicable.

When a scale device is used, first take a photograph without the inclusion of this device.

Photograph the evidence in place before collecting and packaging it.

Be observant of and photograph areas adjacent to the crime scene—points of entry, exits, windows, attics, etc.

Consider the feasibility of aerial photography.

Photograph items, places, etc., to corroborate the statements of witnesses, victims, and suspects.

Take photographs from eye level, when feasible, to represent the scene as would be observed by normal view.

Points to Consider

Use two-dimensional photographs supplemented by diagrams/sketches.

Do not hesitate to photograph something which has no apparent signifi-

cance. Film is relatively cheap compared to the importance of providing evidence to the investigator.

Prepare Diagram/Sketch of Scene

The diagram establishes a permanent record of items, conditions and distance/size relationships—diagrams supplement photographs.

Draw a rough sketch at the scene—normally not drawn to scale.

Typical material on the rough sketch:

- . specific location
- . date
- . time
- . case identifier
- . preparer/assistants
- . weather conditions
- . lighting conditions
- . scale or scale disclaimer
- . compass orientation
- . evidence
- . measurements
- . key or legend

Number designations on the sketch may be coordinated with same number designations on the evidence log in many instances.

This sketch should contain sufficient measurements and details to be used as a model for a drawn-to-scale diagram, if neces-

sary.

Be sure to select the sketch technique before beginning the sketch—ensure that enough room is allowed to include all pertinent information and measurements.

General progression of sketches:

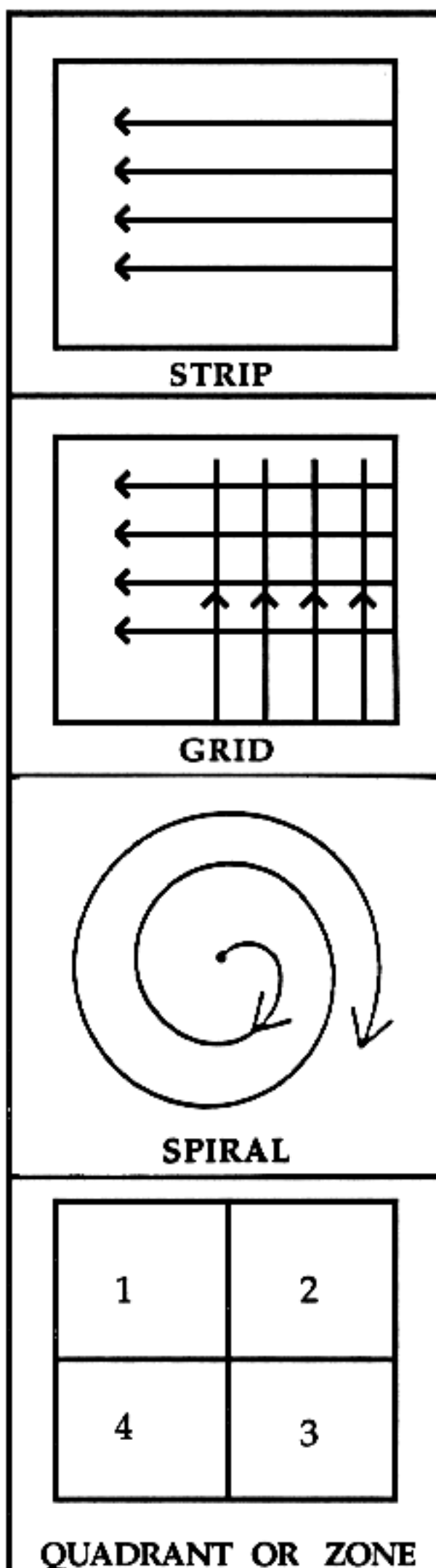
- lay out the basic perimeter.
- set forth fixed objects, furniture, etc.
- insert evidence as it is recovered.
- record appropriate measurements.
- set forth the key/legend, compass orientation, etc.

Conduct Detailed Search/Record and Collect Physical Evidence

Accomplish the search based on a previous evaluation of evidence possibilities.

Conduct search from general to specific, regarding evidence items.

Use specialized search patterns when possible, (e.g., strip, grid, spiral, quadrant or zone).



Photograph all items before collection and enter notations in the photographic log (remember to use a scale device when necessary).

Mark evidence locations on the diagram/sketch.

Complete the evidence log with appropriate notations for each item of evidence.

Have at least two persons:

- see evidence in place before collection.
- observe it being recovered.
- mark evidence (mark item itself whenever feasible).
- place identifying marks on evidence containers.

If feasible, have one person as an evidence custodian—especially in relatively complicated crime scenes involving large amounts of evidence.

Do not excessively handle the evidence after recovery.

Seal all evidence containers at the crime scene.

Do not guess on packaging requirements—different types of evidence may necessitate different containers.

Do not forget entrance and exit areas at the scene for potential evidence.

Be sure to obtain appropriate **known standards**

(e.g., fiber samples from a known carpet).

Always make a complete evaluation of the crime scene. Do not rely on the results of Laboratory tests only.

Constantly check paperwork, packaging notations, and other pertinent recordings of information for possible errors which may cause confusion or problems at a later time.

Four Basic Premises to Consider

The best search options are often the most difficult and time consuming.

You cannot over-document the physical evidence.

There is only one chance to perform the job properly.

There are two basic search approaches, in this order:

1. A **cautious** search of visible areas, taking steps to avoid evidence loss or contamination.

2. After the cautious search, a vigorous search for hidden/concealed areas.

Conduct Final Survey

This survey is a critical review of all aspects of the search.

Discuss the search jointly with all personnel for completeness.

Double-check documentation to detect inadvertent errors.

Ensure that photographs are taken of scene showing the final condition after completion of the search.

Check to ensure all evidence is accounted for before departing the scene.

Ensure all equipment used in the search is gathered.

Make sure possible hiding places or difficult access areas have not been overlooked in a detailed search.

Critical issues:

Have you gone far enough in the search for evidence, documented all essential things, and made no assumptions which may prove to be incorrect in the future?

Release Crime Scene

Release the crime scene only after completion of the final survey.

At minimum, documentation should be made of:

- time/date of release.
- to whom released.
- by whom released.

Ensure that the evidence found at the crime scene is gathered according to legal requirements, is documented, and is appropriately marked for future reference.

Once the scene has been formally released, reentry may require a warrant.





















Only the person-in-charge should have the authority to release the scene. Ensure that all personnel follow this rule.

Release the scene with the notion that there is only one chance to perform the job correctly and completely. Release then occurs once personnel are satisfied this is the situation.

Consider the need for experts (e.g., blood pattern analyst, medical examiner) to observe the scene before it is released.

FBI Criminal Justice Information Services

LEAVE BLANK		FINGERPRINTS ALL INDICANT FINGER PLACES		FBI LEAVE BLANK	
LAST NAME Gangster		FIRST NAME N.		MIDDLE NAME Torious	
FIRST NAME		AGE "Baby Face" Ford		DATE OF BIRTH 47-756	
SIGNATURE OF PERSON FINGERPRINTED <i>N. T. Ford</i>		DATE FINGERPRINTED 12/4/92		PLACE OF BIRTH U.S.A	
THIS DATA MAY BE COMPILED IN LOCAL, STATE AND NATIONAL FILES		SEX M		RACE C	
DATE 12/4/92		HEIGHT 5'6"		WEIGHT 267	
SIGNATURE OF SPECIAL AGENT IN CHARGE <i>Elliot Nove</i>		EDUCATION HS		RELIGION B	
CHARGE Fraud, Tax Evasion		FD-302 FILE		FBI LEAVE BLANK	
FINAL DISPOSITION Life without parole		LOCAL AGENCY FILE NO. 345-23-4235		NCC CLASS - RNC	
		CAUTION			

					
1. R. THUMB	2. R. INDEX	3. R. MIDDLE	4. R. RING	5. R. LITTLE	
					
6. L. THUMB	7. L. INDEX	8. L. MIDDLE	9. L. RING	10. L. LITTLE	
   		 		   	
RT FOUR FINGERS TAKEN SEPARATELY		L. THUMB		L. THUMB	
				RT FOUR FINGERS TAKEN SEPARATELY	

History

An Act of Congress established the FBI's Identification Division on July 1, 1924, to provide identification services. The fingerprint records of both the National Bureau of Criminal Identification and the Leavenworth Penitentiary, totalling 810,188, were consolidated to form the nucleus of the FBI fingerprint files.

In 1924, the FBI began processing fingerprint cards on a manual basis. The prints were inked impressions on a standard 8"x 8" fingerprint card, as shown in the picture above. Trained fingerprint examiners made identifications by comparing the prints submitted with those in the FBI's master file.

Current Operation

The FBI serves as the Nation's civil and criminal fingerprint repository and for the criminal justice information to federal, state, local, and international members of the criminal justice community. As of November 1992, over 200,500,000 criminal and civil prints, representing over 67,000,000 persons, are in file. During Fiscal Year 1992, the FBI processed more than 9.2 million fingerprint cards and received over 3.6 million pieces of correspondence from more than 67,000 users of this service. The FBI receives over 34,000 fingerprint cards each day.

During 1989-1990, the FBI and other criminal justice representatives coordinated an effort to revitalize the FBI's criminal justice information services. In February 1992, the FBI established Criminal Justice Information Services (CJIS) Division to serve as the focal point and central repository for criminal justice information services in the FBI. As a result, the current fingerprint operations of the Identification Division were merged into the CJIS Division on May 1, 1993.

Standard Forms for Submitting Identification Data:

- **Advantages:**

1. Saves time of investigative personnel as forms and information are uniform.
2. Saves time of contributor in writing letters or requests.
3. Ensures inclusion of essential data.

- **Forms available:**

- FD-249 - Required form for preaddressed criminal fingerprint cards.
FD-258 - Applicant fingerprint cards.
FD-353 - Personal identification fingerprint cards.
I-12 — Form used to place a flash notice in an individual's record.
I-178 — Requisition form to order supply of above-mentioned forms.
R-84 — Disposition sheets to subsequently furnish final disposition to an arrest for which a fingerprint card was previously submitted.
—Preaddressed postage and fees prepaid envelopes for criminal justice use.

Search of Fingerprint Cards

Submit the charge in narrative form rather than by state code citations.

- 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 in connection with nonserious offenses unless there is a question of identity or a check of FBI files is considered necessary for current investigative purposes.

2. Fingerprint cards submitted on non-serious offenses will be searched through FBI files and returned to the contributor with results of the search.
3. Every identification record furnished will bear an FBI number.
4. Criminal fingerprint cards submitted to the FBI 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.
5. Nonfederal applicant fingerprint cards are searched through FBI 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 purposes 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.

- **Value of records.**

1. Provides identification and record of prior offenders.
2. Identifies fugitives from justice.
3. Uncovers criminal information regard-

ing persons seeking employment in law enforcement, government, and banking and securities institutions.

4. Uncovers "habitual criminal law" offenders (three or more prior felony convictions).
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.
8. Identifies missing persons.

• **Footprint File**

1. If arrested person has no fingers, footprints may be taken for records purposes.
2. Area behind "great toes" is used for classification.
3. About 400 sets of footprints are contained in FBI files.

Name Checks to Locate Identification Records (checks include aliases and nicknames)

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

- Locates fingerprint records or possible records of fugitives.

- 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

- Wanted notices are placed on fingerprint records for law enforcement agencies.

1. The law enforcement agency is notified immediately if a fugitive is arrested.
2. Over 152,752 (as of 11/92) fugitive notices are processed, with an average additional of 2,000 per month.
3. Approximately 2,000 fugitives are identified per month.

- Records and personal descriptions of fugitives are furnished to the law enforcement agency.

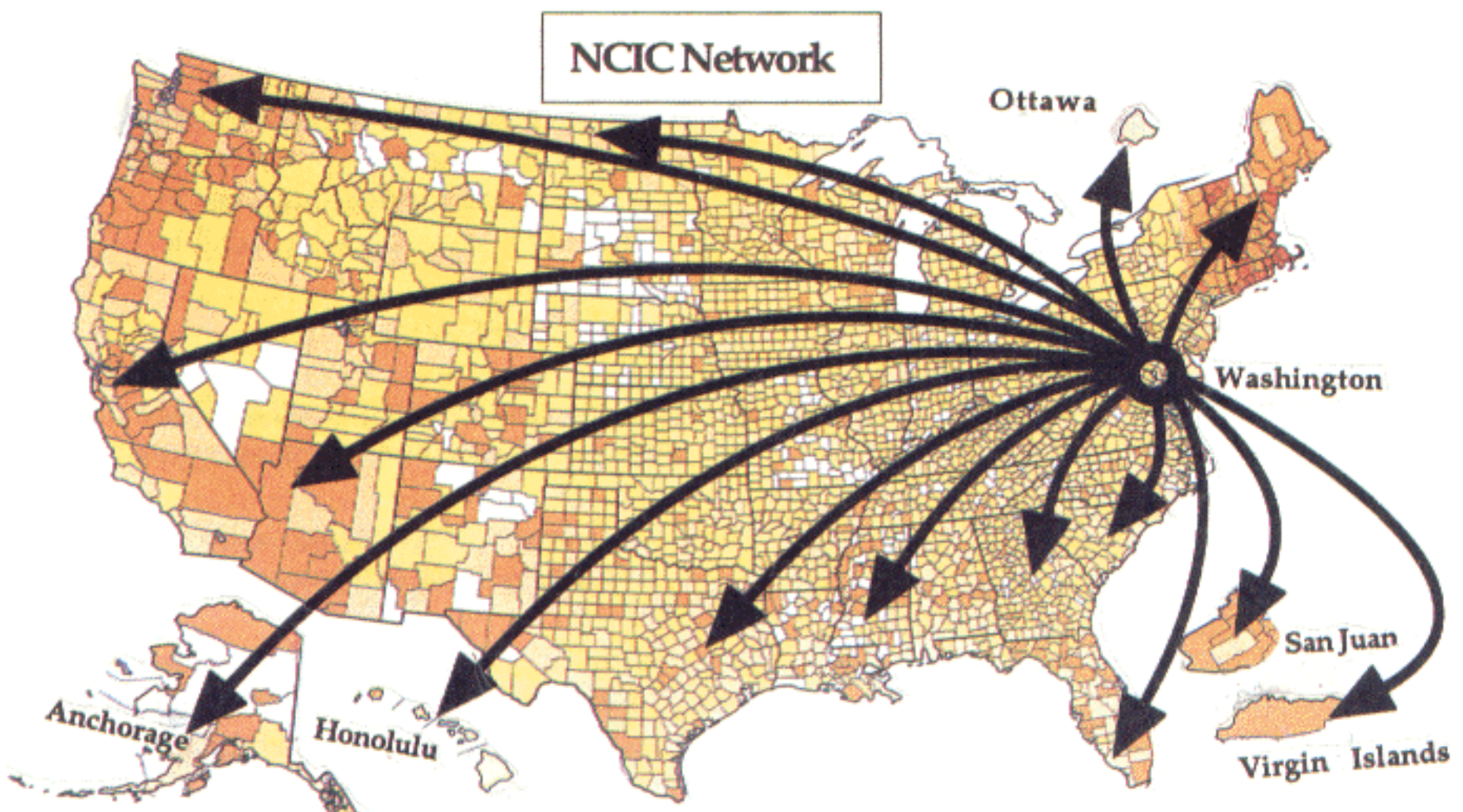
Note:

All reported statistics are based on receipts and file holdings as of November 1992.

Automated Improvements

The Uniform Crime Reporting (UCR) program was conceived and implemented in 1930. At its inception, the UCR program provided an accounting of the extent and nature of criminal activity and served as an administrative tool for criminal justice leaders to better manage their departments. Today, more than one million items of data are collected from over 16,000 law enforcement agencies on a voluntary basis. These agencies represent jurisdictions covering over 96 percent of the U.S. population. Reliance on UCR data has expanded and now includes legislators and scholars. The benefits from this program are indeed significant and have resulted in an increased understanding of the crime problems which confront the country.

The National Crime Information Center (NCIC) is a nationwide computer-based inquiry/response information system established in January 1967 to service the criminal justice community. NCIC's purpose is to maintain a computerized filing system of accurate and timely documented criminal justice information readily available through a telecommunications network. Inquiry response activity averages 1.3 million transactions per day through over 100,000 terminals.



In 1990, the Machine Readable Data (MRD) project was established. Through the MRD, states were contacted and encouraged to submit disposition information by tape for entry into the FBI's automated data base. The MRD enhances the FBI's ability to post dispositions and, thereby, provide a more complete and accurate criminal history record to the criminal justice community.

Another automated improvement is the Identification Division Automated Services (IDAS) system. The IDAS system maintains a name index and fingerprint index to arrest records of twenty-five million subjects arrested throughout the United States. An average of 35,000 fingerprint cards and 100,000 Interstate Identification Index (IIT) on-line transactions are processed daily.

For additional information on the above services, contact the User Services Section, CJIS Division, FBI Headquarters, telephone number (202) 324-5456.

Research and Development

In 1989, the FBI and other criminal justice representatives coordinated efforts to develop a conceptual road-map to revitalize the FBI's criminal justice information services to meet the needs of its users into the next century. Major initiatives, resulting from these efforts, include the Integrated Automated Fingerprint Identification System (IAFIS) program, the enhancement of the NCIC to NCIC 2000, and the enhancement of the UCR program through implementation of the National Incident-Based Reporting System (NIBRS).

Purpose

The IAFIS program is the development and implementation of a technologically advanced, automated criminal justice information services system based upon image capture, storage, and retrieval. The key concept is the electronic submission of fingerprint images, rapid search, identification, and response while an offender is still in custody. This involves the total elimination of fingerprint cards at every stage of the process.

NCIC 2000 is the enhancement of the current operational NCIC system. NCIC 2000 will incorporate advanced technologies such as the capture, transmission, retrieval, and printout of fugitives' photographs and fingerprint images; remote (patrol car) searching of a fingerprint image against a fugitive and missing person fingerprint data base; enhanced data retrieval techniques (improved phonetic name search); the development of prototype work stations and mobile imaging units; and on-line access to other systems (Federal Bureau of Prisons and the Canadian Police Information Centre).

NIBRS is the enhancement of the current UCR program and is an incident-based reporting system, meaning data is collected on each single crime occurrence and its components. Reporting guidelines have been developed and distributed to the criminal justice community. Implementation is complete in six states, and in testing, development or planning stages in 40 other states.

IAFIS Components

The IAFIS will consist of three integrated major systems:

- **Identification Tasking and Networking (ITN):** the submission of electronic fingerprint images via NCIC or mailed fingerprint cards for identification purposes by fingerprint examiners.
- **Automated Fingerprint Identification System (AFIS):** an automated approach for performing fingerprint comparisons for the identification of criminals.
- **Interstate Identification Index (III):** the national system for the exchange of criminal history records, supporting the implementation of the National Fingerprint File (NFF) concept.

Enhanced Services

For more than the past half century, the partnership between the FBI and the criminal justice community has significantly contributed to the ongoing battle against crime. Current trends and developments indicate that fingerprint identification will play an even wider and more significant role in criminal and noncriminal processes in the years to come.

Through our revitalization initiatives, the FBI will improve upon that partnership by:

Eliminating fingerprint card submissions and providing rapid search, identification, and response to electronic fingerprint images;

Having the capability to process an average of 73,000 electronic fingerprint submissions per day;

Developing and implementing an on-line Interstate Photo System to provide mugshots;

Updating the current operational NCIC system through the NCIC 2000 project, to provide more complete and timely information to the criminal justice community;

Implementing new guidelines for the comprehensive collection of data through a new program known as NIBRS, which is an upgrade of the current UCR program;

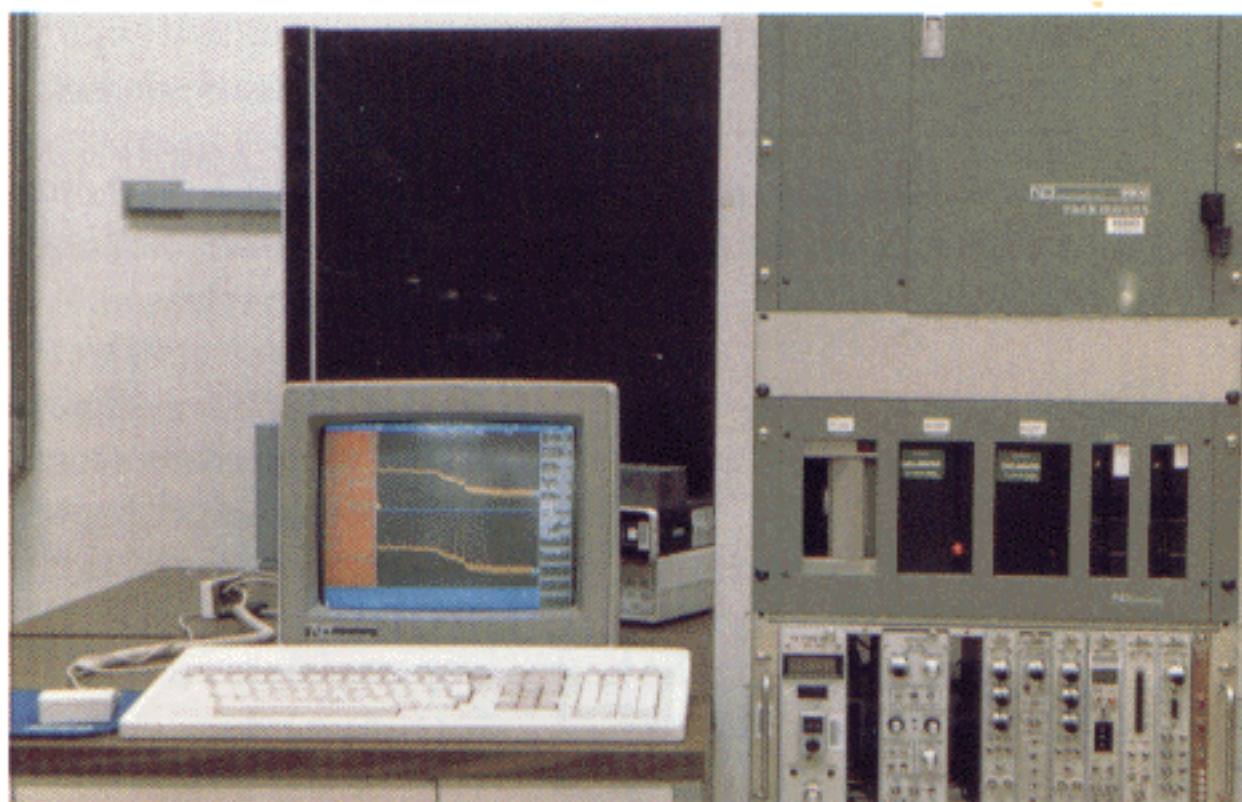
Establishing the NFF, which will reduce the duplication of effort and cost for criminal history record keeping at the state and national levels;

Developing and implementing the Felon Identification in Firearms Sales program, which will permit criminal justice agencies to screen applicants for firearms and related permits;

Producing better management and statistical reports for the criminal justice community to better manage its resources, for legislators to devise the necessary legislation to combat crime, and for scholars to have a better understanding of the seriousness of crime and its impact on society.

For further information, please contact the Requirements Management Section, CJIS Division, FBI Headquarters, telephone number (202) 324-5084.

FBI Forensic and Technical Support Services



The FBI Laboratory is the only federal full-service forensic science laboratory, serving the law enforcement community. Its services are supported by the Document, Forensic Science Research and Training Center, Latent Fingerprint, Scientific Analysis, Special Projects, Technical, and Training—all detailed in the next pages.

Gamma ray spectrometer analyzing a neutron activation sample

The Document, Latent Fingerprint, Scientific Analysis and Special Projects support services are located in the J. Edgar Hoover F.B.I. Building and may be reached through the telephone operator at (202) 324-3000. The Forensic Science Research and Training Center, with offices in Quantico, Virginia, may be reached through telephone numbers (703) 640-1181 or (703) 640-1123.

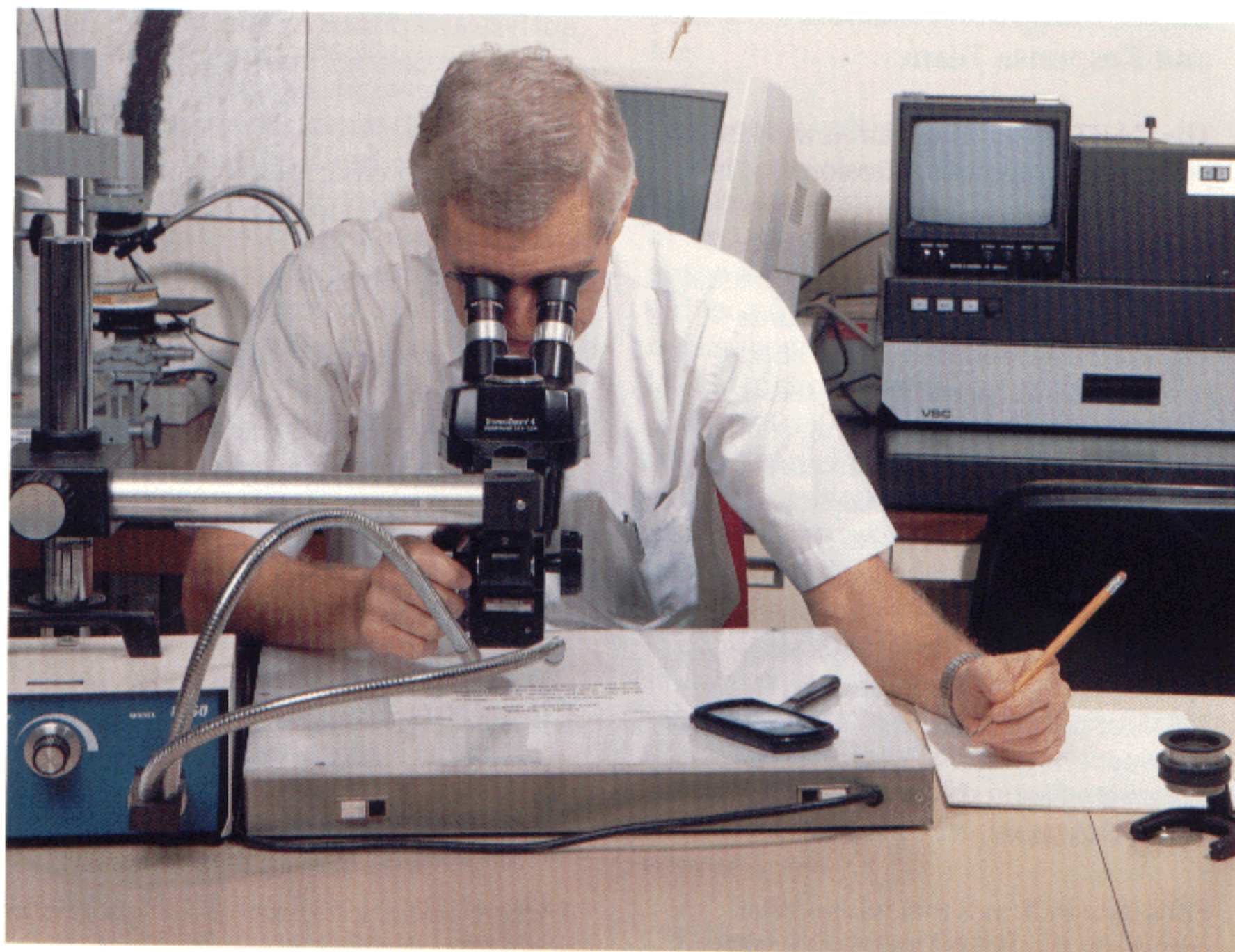


Scanning electron microscope



Examination of bullets for rifling impressions

Document Services



The FBI Laboratory's Document Section provides a great diversity of forensic services to the FBI and other law enforcement agencies. These services are of critical importance combating white-collar crime, organized crime, drug trafficking, and general criminal activity which include scientific examinations of physical evidence involving ink, paper, forgeries, alterations, obliterations, erasures, handwriting, typewriting, office printers, photocopies, encrypted information, and shoeprint and tire tread impressions. A number of important document reference collections are maintained for use in identifying materials and linking seemingly unrelated criminal activities.

The most productive reference files are The Bank Robbery Note File, The Anonymous/Extortionate Letter File, and The Office Equipment File. The latter is used to facilitate determinations concerning the types of office equipment and machines used to process documents, such as photocopiers, typewriters, facsimile machines, laser and dot matrix computer printers, etc.

Also provided are magnetic media examinations and data recovery extractions from seized computer equipment/software systems used in furtherance of criminal activities. Clandestine racketeering enterprise records are analyzed, decrypted, and interpreted in drug-trafficking, money-laundering, extortionate credit (known as "loan sharking") transactions, and organized gambling investigations. Coercive and other documentary and recorded aural communications of questioned origin are subjected to forensic linguistic analyses to determine demographic profile information which may be of value in determining their source. Address your request to: FBI Laboratory, Attention: Document Section, Washington, D.C. 20535, or call (202) 324-4452.

CART Computer Analysis and Response Team

The CART program is staffed with experienced computer professionals who are equipped with the hardware and software that enable them to recover information stored in computer systems. CART provides printouts or records extracted from computers and floppy disks. If additional analysis of these records is needed, such as drug-trafficking or money-laundering records, accounting analysis, cryptanalysis, and so forth, printouts are forwarded to the appropriate expert(s) for analysis. Address your request to: Federal Bureau of Investigation, Laboratory Division, CART, Room 3216, Washington, D.C. 20535, or call 202-324-3283/4476 for information.

Today's Crimes

FBI's data indicates that white-collar crimes are the 1990's most significant national crime problem since today's society depends on and is made vulnerable by advanced technology. There are already over 33 million personal computers in the United States, and it is estimated that 60 percent of those computers are networked in some fashion. It was also estimated that in 1991, \$164 million was lost due to computer breakings, double the figure from 1989. The Federal Guidelines for Searching and Seizing Computers, issued by the U.S. Department of Justice, Inter-Agency Working Group states that, "computer searches have added a formidable new barrier because searching and seizing are no longer as simple...." They also recognize that, "while some investigators will be computer literate, only a few will be experts, none could be an expert on every system," and that "in most

situations, you will need an expert to retrieve, analyze and preserve data." As a result of today's mission for the FBI Laboratory, CART is to:

1. Conduct forensic examinations of computer-related evidence,
2. Provide technical investigative assistance,
3. Provide prosecutive and trial assistance,
4. Provide specialized training in the preservation and submission of computer evidence, and
5. Provide international leadership in the area of forensic computer examinations.

Linguistics Examinations

Forensic Linguistic Analysis (Authorship/Speaker Identification)

These examinations involve the application of analytic linguistic methods to written and/or aural evidence, normally done for investigative purposes, not for testimony.

1. Demographic Profiling for determination of age, sex, educational level, geographic, ethnic background, and occupation from vocabulary, syntax, accent, etc.
2. Common Authorship/Speaker Determination:
 - Through comparison of evidence of similar nature (for example, two or more handwritten documents, or two or more tape recordings).
 - Through comparison of evidence of dissimilar nature (for example, comparison of a typed with a handwritten document, or a printed document with a tape).

Psycholinguistic Analysis

These examinations involve the application of analytical psycholinguistic methods to written and/or aural evidence. They are done to provide information of lead value and to assist field commanders in their evaluation of threats posed by kidnapers, extortionists, terrorists, and others who communicate their intent to commit violent acts. Results of psycholinguistic examinations are not intended for use in court. The FBI Laboratory provides the following analyses:

- Psychological and demographic profiling of author/speaker.
- Threat validity assessment.

When requesting linguistic examinations, please furnish the original or good copies of written and/or aural evidence and, if possible, material related to threats, such as information on threatening phone call(s) from unknown caller(s) and threatening letter(s) of known authorship. Also provide the background on the case, including information and description of victims as well as subjects. If more information is needed, please call Linguistics services at (202) 324-4406.

Questioned Documents

Document Examinations

The Questioned Document field includes examinations of handwriting, hand printing, typewriting, mechanical impressions, such as, check writer imprints, embossed seals, rubber stamps, printed matter, photocopies, paper, altered documents, obliterated writing, indented writing, charred documents, plastic bags and others. You may want to consider having documentary evidence processed for latent fingerprints. Document examinations should be done before fingerprint processing because chemicals may preclude some document examinations. Document evidence is

normally photographed by the Laboratory prior to forwarding for fingerprint processing.

Evidence Handling

Documentary evidence should be preserved in the same condition it was found. It should not be folded, torn, marked, soiled, stamped, written on or handled unnecessarily. Documents should be marked unobtrusively for later identification by placing initials and date, or other appropriate markings on them with a pencil. Make notes or log with sufficient information to reconstruct where, when, and by whom each item of evidence was obtained. Place the evidence in appropriate envelopes to protect it from contamination and to preserve fingerprints. Note that prolonged storage of photocopies in plastic envelopes can result in the toner leaching onto the plastic. Chain of custody forms should accompany the evidence, which must be stored in a secure location until submission to the Laboratory.

Original Evidence or Copy?

It is always best to send the original evidence to the lab. Many kinds of examinations, mechanical impressions and indented writing for example, can only be done with the original evidence. The lack of detail in copies makes other examinations such as handwriting and typewriting difficult, although photographs are better than photocopies. Sometimes, however, a copy is the best available evidence. In these cases, copies should be submitted for examination. Also, copies are normally sufficient for reference file searches.

Requesting Examinations

When requesting examinations, include the following information:

- Indicate any previous correspondence submitted for the same case.

- Include the nature of the violation, the name(s) and sufficient descriptive data of any subject(s), suspect(s), or victim(s).
- Identify which of the submitted items are questioned and which are known specimens.
- Indicate which specimens should be processed for latent fingerprints. (See Latent Fingerprint Services, page 35.)
- When known handwriting samples are submitted, advise of personal characteristics of the writer which may affect writing such as nervous behavior, handicap, illness, injury, intoxication, or an apparent effort to disguise writing.

Shipment of Evidence

- Do not place evidence from more than one case in the same box.
- Seal the box with gummed tape and clearly print "EVIDENCE" on the package.
- If any of the evidence in the box (or envelope) is to be subjected to a latent fingerprint examination, also clearly print "LATENT," on the package.
- For more information on collection, shipment, identification, and packaging, see pages 91 through 115.
- If you have any questions, call the Document Section at (202) 324-4452.

Types of Document Examinations

Conclusions on Handwriting and Hand Printing

Writers can be positively and reliably identified with their writings. Other characteristics such as age, sex, and personality cannot be determined with certainty from

handwriting. A handwriting identification is based upon the characteristics present in normal handwriting. It is not always possible, therefore, to reach a definite conclusion in the examination of handwriting.

Some of the reasons for inconclusive results are:

1. Limited questioned writing.
 2. Inadequate known samples.
 3. Lack of contemporaneous writing, such as when a long period of time has elapsed between preparation of the questioned writing and the known samples.
 4. Distortion or disguise in either the questioned writing or the known writing. In this situation, the normal handwriting characteristics are not present.
 5. Lack of sufficient identifying characteristics in spite of ample quantities of both questioned and known writing.
- Use the following guidelines in obtaining known writing samples:
 1. Reproduce the original conditions as closely as possible. Obtain writing in the same wording, names, signatures, and writing style (cursive or printed) as the questioned writing. Approximate writing speed, slant, size of writing, size of paper, and writing instrument.
 2. Obtain samples from dictation until you believe normal writing has been produced.
 3. Do not allow writer to see the questioned writing.
 4. Remove each page from sight as it is completed.

5. Do not give instructions in spelling, punctuation, or arrangement of writing.

6. Use similar writing media, that is similar size paper, similar forms such as check forms, and similar writing instrument. Always get at least some of the samples with a ball point pen.

7. If the questioned writing is extended writing, such as a threatening letter, obtain the full text word for word at least three times. Signatures and less extensive writings, such as checks, should be repeated ten to twenty times. The known samples should correspond to the questioned writing as to style: cursive (written long-hand), upper-case printing or lower-case printing.

8. It is recommended that you also submit genuine signatures of the victim of a forgery.

9. Advise the writer to speed up, slow down, or alter slant, as appropriate, if writing does not appear to be normal. Consider having the writer provide some writing with the awkward hand.

10. Writer and witness should initial and date each page.

11. It is advisable to submit samples of undictated writing from sources such as employment records, correspondence, canceled checks, and court documents in addition to the dictated samples.

• There are three types of forgery:

Traced forgery: Produced by tracing over a genuine signature. This forgery cannot be identified with the writer. A traced forgery can, however, be associated with the original or master signature from which the forgeries were traced if it is located.

Simulated forgery: Produced by attempting to copy a genuine signature. This forgery may or may not be identifiable with the writer depending on the extent to which normal characteristics remain in the signature. Also submit samples of the victim's genuine signature.

Freehand forgery: Produced in the forger's normal handwriting with no attempt to copy another's writing style. This forgery can be identified with the writer.

Typewriter Examinations

Questioned typewriting can be identified with the typewriter that produced it. This identification is based upon individual characteristics which develop during the manufacturing process and through use. Comparison of questioned typewriting with reference standards can determine possible brands or manufacturers.

Carbon film typewriter ribbons can be read for content or specific wording of questioned material. Carbon film ribbons can also be identified with questioned typewritten impressions. Cloth ribbons cannot normally be read.

• For known typewriter samples from a suspect typewriter, use the following guidelines:

1. If a carbon film ribbon is in the typewriter, remove and forward it to the lab. The text of the questioned typewriting may be read from the ribbon. Also send in the correction tape.

2. Insert a new ribbon in the typewriter. Obtain the complete text of the questioned typewriting, including typographical errors, two or three times, unless it is excessively long.

3. Remove the ribbon, place the typewriter in the stencil position, insert

paper with a sheet of carbon paper over it into the typewriter and obtain the entire keyboard two or three times by typing through the carbon paper.

4. Record the make, model, and serial number of the typewriter on the sample, date and initial it for later identification.
5. It is not normally necessary to ship the typewriter itself to the lab. In some cases, after examination of the samples, the examiner will request the typewriter. It should be packed securely to prevent damage during shipment. Typewriter elements (ball or printwheel) should be sent to the Laboratory.

Photocopier Examinations

Photocopies can be identified with the machine producing them, provided that the samples and questioned copies are relatively contemporaneous.

Procedure for obtaining samples from a suspect machine: Make nine copies of a piece of paper with some writing or typewriting on it. Make nine copies of a blank sheet of paper. Make nine copies with no paper on the glass and the cover down.

Two sets of questioned photocopies can be identified as having been produced on the same machine. Possible brands or manufacturers can be determined by comparison with the reference file.

Mechanical Impression Examinations

• Printing

1. Questioned printed documents can be compared with genuine printed documents to determine if counterfeit.
2. Two or more printed documents can be associated with the same printing

source.

3. A printed document can be identified with the source printing paraphernalia such as art work, negatives, and plates.

• Checkwriters

1. A checkwriter impression can be identified with the checkwriter which produced it.
2. Examination of questioned impression can determine brand of checkwriter producing it.

• Rubber Stamps

A rubber stamp impression can be identified with the rubber stamp producing it. The rubber stamp should be forwarded to the Laboratory in the same condition it was found. It should not be cleaned.

• Embossers and Seals

An embosser or seal impression can be identified with the instrument which produced it. The embosser or seal should be sent to the Laboratory.

Paper Examinations

Torn edges can be positively matched. The manufacturer can be determined if a watermark is present.

Paper can be examined for indented writing impressions. Indentations not visible to the eye can be brought up using appropriate instruments. Care should be exercised in preserving the document.

Do not fold or handle. Under no circumstances should you attempt to raise the indentations by rubbing with a pencil. Take care not to add indentations during evidence collection by writing on paper on top of the evidence.

Some watermarks have the date the paper was manufactured.

Altered or Obliterated Writing

Altered or obliterated writing may be deciphered through nondestructive examinations using various techniques.

Carbon Paper

Examination of used carbon paper may disclose context of material written.

Writing Instruments

Chemical analysis can determine if the ink of two or more different writings is the same or different formulation. The same analysis can be conducted with an ink writing and a suspect pen. These examinations do not identify a specific pen, only that the inks are the same formulation.

Ink dating examinations can show the earliest date a particular ink was produced.

Burned or Charred Paper

Questioned entries on charred or burned paper may be revealed with appropriate examination.

Charred paper should be subject to minimal handling to avoid crumbling.

Ideally, charred paper should be protected by a polyester film encapsulation method or shipped to the Laboratory in the original container in which it was burned at the crime scene, i.e., glass bowl or trash can. Contact the Laboratory for more specific instructions.

If above options are not feasible, ship the charred paper between layers of cotton in a rigid container.

True Age of a Document

The earliest date a document could have been prepared may sometimes be determined by examination of watermarks, indented writing, printing, and typewriting.

Chemical analysis of writing ink may determine earliest date the formulation was available.

Reference Files of Known Standards and Questioned Material Office Equipment File

Typewriter Section

Consists of type font samples and information from manufacturers of typewriters and hard type.

Permits determination of possible brands or manufacturers of typewriters from examination of questioned typewriting.

Photocopier Section

Consists of a collection of samples from and information about many brands of photocopiers.

Assists in determining possible brands and manufacturers of a questioned photocopy.

Printer Section

Consists of information collected and samples from printout devices employing the thermal, impact dot matrix, and ink jet processes.

Facsimile Section

Consists of information and samples collected from manufacturers of facsimile machines.

Assists in determining possible brands of a facsimile.

Watermark Standards

An index of watermarks found in paper.

Enable determination of paper manufacturer.

Safety Paper Standards

Consist of samples of a variety of safety papers.

Enable determination of paper manufacturer when used in production of fraudulent documents such as checks and birth certificates.

Checkwriter Standards

Consist of sample impressions from many checkwriters.

Enable determination of checkwriter brand or manufacturer from examination of questioned impression.

Shoe Print and Tire Tread Standards

Consist of collection of sole and heel designs and tire tread designs.

Enable determination of manufacturer of shoes and tire from prints or impressions left at the crime scene.

National Motor Vehicle Certificate of Title File

Consists of samples of genuine state motor vehicle certificates of title, manufacturer's statement of origin, and vehicle emissions stickers.

Assists in determination of authenticity of questioned certificates.

Contains photographs of fraudulent documents to assist in association of questioned material from different cases with a common source.

National Fraudulent Check File

Computerized database contains signature and company names used in negotiating fraudulent checks.

Visual file contains photographs of fraudulent checks to assist in association of questioned material from different cases with a common source.

Anonymous Letter File

The computerized file:

Contains images of kidnaping, extortion, threatening, and other anonymous communications.

Assists in association of questioned documents from different cases with a common source. Assists in identification of the source of questioned letters.

Bank Robbery Note File

It consists of a computerized file that:

Contains images of holdup notes.

Assists in association of notes used in various robberies with a common source.

Assists in identification of the individual preparing bank robbery notes.

Notes found in wastebaskets or on counters not used in a robbery and obviously a prank should not be submitted, unless mitigating circumstances warrant their submission.

Shoe Print and Tire Tread Examinations

The Physical Evidence

Footwear or tire impressions are routinely left at the scene of crimes. In many instances, the examination of shoe print and tire tread impression evidence can result in the positive identification of a suspect or the suspect's vehicle. Impressions of this type are retained by various surfaces in both two-dimensional and three-dimensional forms.

Most athletic shoes have designs of varying depths. Whether the shoes are new or worn, they will leave a two-dimensional impression on a hard surface that represents only portions of their design. Three-dimensional impressions contain characteristics of both the raised and depressed surfaces of the outsole. If the impression is sufficiently deep, it can also contain impressions of the side of the outsole, the side of the midsole, and sometimes, even the upper of the shoe. These types of impressions can be left on almost any surface that a shoe or tire comes into contact with, either transferring materials from the shoe or tire to the surface or to the depressions they can cause in soft ground surfaces like sand, soil, and snow.

Almost every impression that is left by a shoe or tire has value for a forensic comparison. Although most impressions are partial—they do not represent the entire shoe's or tire's surface—a meaningful comparison can be made.

How to Collect Footwear and Tire Tread Impression Evidence

Footwear and tire tread impression evidence should be collected as follows:

Photograph the impressions.

Retrieve, whenever possible, the original item containing the impression from the crime scene. For example, items such as flooring

containing bloody impressions, pieces of glass or paper containing impressions, etc., should always be saved and submitted to the Laboratory.

Lift or cast an impression when it is a three-dimensional impression in soil, sand, or snow, or when the impression cannot be sent to the Laboratory.

Photographing the Evidence

Photographs of impression evidence should always be taken first.

Photograph the general crime scene areas which contain the impression evidence, showing how the impression evidence relates to the overall crime scene.

Take examination quality photographs of impression evidence prior to casting, lifting, or retrieving the original impressed item. Examination-quality photographs are those which will be used by an examiner to compare against the characteristics of the suspect's shoes.

Photographs should be taken as follows:

1. Select a camera. A large negative format camera such as one having a 4x5 inch or 2-1/4 in negative size is preferred but not mandatory. If a 35 mm camera is used, it should be equipped with a normal Macro lens and have manual focusing capability. Instant film cameras should not be used.
2. Place the camera on a tripod with the camera directly over the impression. Adjust the height of the camera so that the impression and ruler will fill the frame, maximizing the use of the film.
3. Use a fine-grained black and white film (T-Max 100) or a fine-grained color film (ISO 125 or less). Although black and white film is typically used, fine-

grained color film should be used when color is required such as in the case of impressions in blood.

4. Place a 6- to 12-inch flat and rigid ruler next to the impression and on the same plane as the impression. If the impression is a three-dimensional impression, place the ruler on the same plane at the bottom of the impression's surface. Avoid sculptured or beveled rulers. Do not use paper scales, metal or cloth tapes, or makeshift scales such as pens, business cards, etc. Use the flat rigid ruler in every photograph.
5. All three-dimensional and most two-dimensional impressions should be photographed with an oblique light source. The flash should have a six-foot extension cord so that the flash can be positioned 4-5 feet from the impression and near the ground. For two-dimensional impressions, the flash should be positioned very close to the ground. For three-dimensional impressions, the height of the flash should be adjusted depending on the depth of the impression.
6. Photographs should be taken with the oblique light positioned from three different sides and at least 100 degrees apart.
7. Bracket the exposures and take several photographs of each impression from each of the three sides.
8. Focus the camera carefully before each exposure. Focus the camera on the impression, not the scale.

Casting Three-Dimensional Impressions in Sand and Soil

Casts should always be made of three-dimensional impressions to supplement the photographs.

Dental Stone or Die Stone should be used to cast footwear and tire tread impressions in soil and sand. Plaster of Paris is no longer recommended as an acceptable casting material for impression evidence. Do not use dental plaster or other plasters. Dental Stone and Die Stone, having some coloration on them, are preferred for photographic reasons and are obtainable from local dental supply houses.

The advantage of using Dental Stone or Die Stone is that they only require approximately six ounces of water per pound of casting material as opposed to the 18 ounces of water required for plasters. Also, the greater hardness of both dental stone and die stone makes it unnecessary to reinforce or add a form to build up the thickness of a cast and, lastly, only 1-1/2 to 2 pounds of Dental Stone or Die Stone casting material are needed to make a shoe impression cast.

To have the casting material ready for use when needed at a crime scene, have two pounds of Dental Stone or Die Stone divided into about 8x12 inch zip-lock bags, flatten the bags to eliminate the air, and store. This procedure not only makes the material available when needed at a crime scene, but provides the advantage of the zip-lock bag where the material can also be mixed, providing a neat, efficient, and easy method of quickly mixing and pouring a cast.

When a cast is needed, follow this procedure:

1. Retrieve a bag from storage, add about ten ounces of water, and massage the mixture through the closed bag. After mixing thoroughly, the resulting mixture should not be watery nor should it be too thick. If the mixture is thick, add one or two ounces of water, but if it is too watery, add more mixture. The ideal mixture should have the consistency of a thin pancake batter.

2. When mixture is thoroughly mixed and is at the proper viscosity, it is ready to be poured into the impression.
3. Open the bag and with the bag at ground level, carefully pour the mixture into or next to the impression, allowing it to flow over the impression. Fill the impression completely so that the mixture actually overflows out of the impression.
4. When the cast is firm but still soft, scratch your initials, the date, and any other information on the back of the cast.
5. Allow the cast to set for at least twenty minutes in warm weather (longer in colder weather) before attempting to lift it.
6. Carefully lift the cast. Do not attempt to clean the cast. Allow the cast to air dry for at least 48 hours. The examiner will clean the cast in the Laboratory.
7. Do not store, wrap, or ship the cast in plastic materials. After air drying for at least 48 hours, wrap in paper or other similar wrapping materials. Package carefully, with suitable packing materials to avoid breakage during storage and shipment.

Photographing and Casting Impressions in Snow

1. First take examination-quality photographs of the impressions in snow as you would do with any three-dimensional impression.
2. Use either a product called Snow Print Wax, which is a red-colored wax aerosol, or a can of gray aerosol body primer, and lightly spray the impression from an angle just enough to "highlight" the ridges of the impression. Be very careful not to hold the spray too close to the im-

pression, since the compressed aerosol spray can damage the impression. Snow Print Wax is only available through the Kinderprint Company, P.O. Box 16, Martinez, CA 94553. Gray aerosol body primer is available at hardware or auto supply stores.

CAUTION: If you use the gray body primer, it will be necessary to shield the "highlighted" impression from the direct sunlight to prevent it from absorbing heat and quickly melting.

3. After "highlighting" the impression, take additional examination quality photographs using a fine-grained color film.
4. If Snow Print Wax is used, the impression can be cast following the instructions on the can. If gray primer is used, cast the impression with two pounds of Dental Stone. Mix mixture in a zip-lock bag until the viscosity of the mixture is slightly thicker than normally mixed. A cooling process should follow by resting the bag in the snow for a minute or two. Then, pour the mixture into the impression. The cast should be covered with a box or newspaper and allowed to set for at least an hour.

Two-Dimensional Impressions

Floors, broken glass, desk tops, bank counter-tops, chair seats, paper items, etc., are often stepped upon during the commission of a crime, retaining dust or residue impressions of shoes. Some of these impressions are clearly visible while others may be partially or totally latent. When searching the

crime scene, the following should be done:

Aggressively search all areas of the crime scene, particularly the points of entry, exit, and occurrence of the crime itself. Residue, dirt, and dust on the surface of the perpetrator's shoes will be deposited by those shoes on cleaner surfaces. Because these impressions may be latent or partially visible, have available a strong oblique light source, and hold the light parallel to the ground. Dim or turn off the light to detect otherwise latent footwear impressions, particularly those on nonporous surfaces.

Electrostatic lifting devices are also invaluable in locating and retrieving dry dust and residue impressions. These kinds of devices are available through the Kinderprint Company and through Foster and Freeman, 25 Swan Lane, Evesham, Worcs., WR11 4PE, United Kingdom.

Take examination-quality photographs of impression(s), using an oblique light source that should be positioned parallel to and next to the ground, four to five feet away from the impression, aimed so that the light grazes the surface of the impression.

Retain, whenever possible, the original impressioned items and submit them to the Laboratory. Protect the impressions so that they will not rub off or otherwise be damaged in handling. Do not wrap in plastic, do not cover with tape, and do not store in plastic bags.

Attempt to enhance or lift the impression only if the original impressioned item cannot be retrieved from the scene and be submitted to the Laboratory.

Impressions made by a wet or damp shoe on a waxed surface, such as a bank counter-top, can sometimes be enhanced by carefully dusting with fingerprint powder. A small portion of the impression should be powdered first to test the success of the powdering technique. If successful, dust the entire print, rephotograph the impression, and lift the dusted impression(s) with a contrasting gelatin or adhesive-lifting material.

If the impression cannot be removed from the scene and cannot be successfully enhanced with powder, attempt to lift the impression with a contrasting gelatin-lifting material.

Gelatin-lifting materials are available from the Lightning Powder Company, 1230 Hoyt Street, S.E., Salem, Oregon 97302-2121.

Laboratory Examination

Shoe and tire reference materials are maintained to assist in the determination of the make or manufacturer of a shoe or tire that made a particular crime scene impression. This may be useful in some cases to help locate suspect(s) or suspect(s)' vehicle(s).

When known shoes or tires are obtained, comparisons are made between those items and the questioned shoe or tire impression regarding physical size, design, wear characteristics, and random accidental cuts and marks.

If sufficient random identifying characteristics are present, a positive identification can be made.

Racketeering Records Analysis

The Racketeering Records Analysis Unit (RRAU) conducts forensic examinations of suspected drug, money-laundering, gambling, loansharking, and prostitution records for the purpose of determining whether they are the records of an illegal business. Unlike legitimate business records, records documenting illegal activity are often coded or clandestine in nature. Further, RRAU attempts to determine the scope and organization of the business as revealed in the records. Additionally, Examiners provide expert testimony in criminal and civil trials and hearings concerning their analysis of the records. Due to the unique nature and wide scope of these examinations, it may be appropriate to contact RRAU at (202) 324-2500 prior to submitting records (particularly voluminous records) in order to resolve any questions that may arise.



Gambling examinations include the interpretation of records such as these

Types of Specialized Assistance and Examinations Available

Drug Records

are examined to determine the overall scope of the business, to include the hierarchy, type of drugs being distributed, gross sales, gross and/or net weights or quantities, price structure, and other pertinent information. An analysis of legally obtained telephone conversations or electronic intercepts can also be performed in selected cases.

Money-laundering

records are examined to determine the scope of the money-laundering operation, including the amount laundered, the process utilized to launder the funds, and the illegal activity involved in the money-laundering operation.

Racketeering Records are examined to determine the roles of the suspects, their salaries, commissions, or share of the operation's profit, the dates and amounts of wagers placed, loans made, and their corresponding annual percentage rates, and income from video gambling operations.

Gambling examinations include the interpretation of records obtained from sports and horse bookmaking businesses, numbers or lottery operations, and other gambling businesses. Analysis of legally obtained telephone conversations or electronic intercepts can also be performed.

Loansharking Records are examined to determine the amount of the loan, amounts paid in accrued interest and principal, number of loans, and true annual rate of interest computed by the actuarial method.

Prostitution Records are examined to determine the scope of the business, including the number of employees, their roles, gross and net revenues, and other financial and organizational information.

Expert testimony regarding these examinations as well as modus operandi testimony is available for drug and racketeering cases.

Cryptanalysis examinations involve the analysis of clandestine drug and racketeering documents suspected of containing encrypted information, such as telephone numbers, names and addresses, and records of financial transactions. Potentially encrypted materials suitable for submission include:

- Communications containing symbols or having unusual literal or numerical orientation.
- Correspondence, notebooks containing cryptic notations.
- Documents containing marked letters or numbers.

Material to be furnished to the Laboratory

Cryptic handwritten records are obtained during the investigation of drug and racketeering cases. Occasionally, a particular kind of paper (such as water-soluble and flash paper) is encountered in racketeering businesses. Flash paper is considered to be a "hazardous material."

If flash paper must be stored, exercise extreme caution, avoid storage near any other combustible material, and as soon as possible, seal in polyethylene envelopes and place in a refrigerator.

Before forwarding any flash paper for examination, call the Laboratory for shipping instructions.

- Tapes and related transcripts of legally obtained telephone conversations or electronic intercepts.
- Partially destroyed material such as charred, shredded, or torn records.
- Computer data, floppy disk, or an entire computer system suspected of containing records of a drug or racketeering business.

DNA



Scientific Analysis Services

Instrumental analysis of various chemicals and drugs



Drugfire Ballistic comparison of questioned cartridge cases.

The FBI Laboratory Division, Scientific Analysis Section (SAS) is divided into units which provide a variety of services and/or examinations. Each unit concentrates on a specialized area of forensic expertise to ensure that the most comprehensive examinations are performed on the evidence submitted. The SAS also provides highly specialized support. To facilitate this support, many files are maintained and used for cross-reference. Because of the highly technical nature of the examinations and services provided, you may contact the Scientific Analysis Section, calling 202-324-4416, or direct your inquiry to any of the seven units: Chemistry-Toxicology, DNA Analysis/Serology, Elemental and Metals Analysis, Explosives, Firearms-Toolmarks, Hairs and Fibers, and Materials Analysis, which services are described next.

Chemical - Toxicological Examinations

The Chemistry-Toxicology Unit provides expert forensic assistance concerning a wide variety of evidence types such as pharmaceutical and controlled substances from narcotics cases and other sources, accelerants from arson scenes, explosives used by a terrorist or safecracker, miscellaneous stains, inks used in fraudulent documentary transactions, dyes from bank security devices and other sources, and a variety of petroleum products from homicides, sexual assaults, chemical frauds, and general crime scenes. These services are available in all criminal matters and in civil matters in which the Department of Justice has an interest. If you need further information call (202) 324-4318.

Toxicology

This kind of examination discloses the presence of drugs and/or poisons in biological tissues and fluids. The toxicological findings show whether the victim of a crime died or became ill as the result of drug or poison ingestion, or whether the defendant(s) or victim(s) in a criminal matter were under the influence of drugs at the time of the commission of a crime.

Types of Poisons

Because of the large number of potentially toxic substances, it is necessary (unless a specific toxic agent is implicated prior to examination) to screen biological samples for classes of poisons.

Examples of these classes and the drugs and chemicals within these classes are as follows:

- Volatile compounds, e.g., ethanol, carbon monoxide, chloroform, etc.

- Heavy metals, e.g., arsenic, mercury, thallium, lead, etc.

- Inorganic ions, e.g., cyanide, azide, chloride, bromide, etc.

- Nonvolatile organic compounds, e.g., most drugs of abuse and other pharmaceuticals as well as pesticides and herbicides.

Background Information Useful to the Laboratory Examiner

- Copy of autopsy or incident report.
- Symptoms exhibited by the subject(s) and/or victim(s) at the time of a crime or by the victim prior to his death.
- List of any drugs known or thought to have been consumed by or prescribed for the subject(s) and/or victim(s) of a crime.
- Any known or suspected environmental (home or office) exposure to toxic substances by the subject(s) and/or victim(s) of a crime.

Biological Specimens to be Submitted for Toxicological Exams

The specifics of a given case will determine what and how much of given biological specimen should be submitted to the laboratory. These variables include whether or not the identity of a toxic agent is known, the route of administration, the time after exposure that biological samples are collected, whether victims and/or subjects are living or deceased, etc. Call the Chemistry-Toxicology Unit for specific instructions that may be essential for the submission of specimens.

Storage, Packaging, and Shipment of Biological Samples to the FBI Laboratory

Each biological specimen must be placed individually in labeled glass tubes, plastic

cups, or heat-sealed plastic bags which must be adequately sealed.

Specimens must be kept refrigerated or frozen during storage or shipment, and packaging should ensure that no breakage, leakage, or contamination would occur when transmitting the evidence to the Laboratory via the fastest available and practical means.

Prior to packaging and shipping evidence, call the Laboratory for specific instructions.

Pharmaceutical Examinations

Examinations should establish the identity of constituents in stolen pharmaceutical cases, and/or switching of pharmaceuticals in hospital's drug-of-abuse theft cases, etc.

Information Helpful to the Laboratory

- Name of stolen pharmaceutical.
- Data on use of pharmaceutical.
- Identity of replacement drugs, if applicable.

Collection and Preservation

- If possible, submit in original container.
- Package each item separately.
- Initial all containers and packaging.

Information Determined by the Laboratory

- Quantity of tablets or capsules, if in that form.
- Weight of pharmaceutical, if applicable.
- Confirmation of active ingredients.
- Quantity of active ingredients, if necessary.

Drug Examinations

Drug examinations establish drug presence, trace quantities in nondrug crimes; establish the trace presence of drugs of abuse on clothing, luggage, money, or in automobile, boat, or aircraft interiors; or establish the trace presence of drugs of abuse for probable cause hearings in the seizure of assets or contraband, etc.

Collection and Preservation

- Wrap each item separately and securely.
- If small enough, heat-seal each item in polyester plastic bags.
- If clothing, carefully fold each item upon itself before packaging to keep trace contents intact.

Information Determined by the Laboratory

- Qualitative analysis of drugs of abuse and other components of interest.
- Total weight and quantitative analysis of drugs of abuse, when possible.

Arson Examinations

Arson examinations help to determine the presence of accelerants or other substances introduced to a fire scene to facilitate destruction. The reasons for arsons may be:

Civil disobedience
Crime coverage
Insurance fraud
Pyromania
Revenge

Indicators

Multiple fires in unrelated areas are indicators to look for in fire scenes, being the arson devices:

Candle plants
Cigarettes in matchbooks
Molotov cocktails
Fused chemical masses
Electronic devices
Accelerant plants

Fire trails

Cloth or paper trails
Burn trails on carpeting
Deep charring trails in hardwood
Removal of property (No typical remains of household goods in debris.)

Examples of Types of Evidence

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

Ashes
Carpets
Clothing
Flooring
Molotov cocktails
Padded furniture
Plasterboard
Soil

Preservation of Evidence

Because most readily flammable liquids are volatile and are easily lost through evaporation, preserve evidence as follows:

Use airtight containers.

Clean metal cans (preferable).

Clean glass jars (well packed to prevent breakage).

Heat-sealable polyester bags.

Properly identify specimen and ensure that initials are on the specimen or

container.

Interpretation of Laboratory Results

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

Limitations

Tests do not generally identify the specific brand of gasoline or fuel oil due to weathering, common intermixing of commercial brands, and lack of distinguishing characteristics between brands.

General Chemical Analyses

Definition: Qualitative and quantitative analysis of miscellaneous chemical evidence.

Sources of Materials

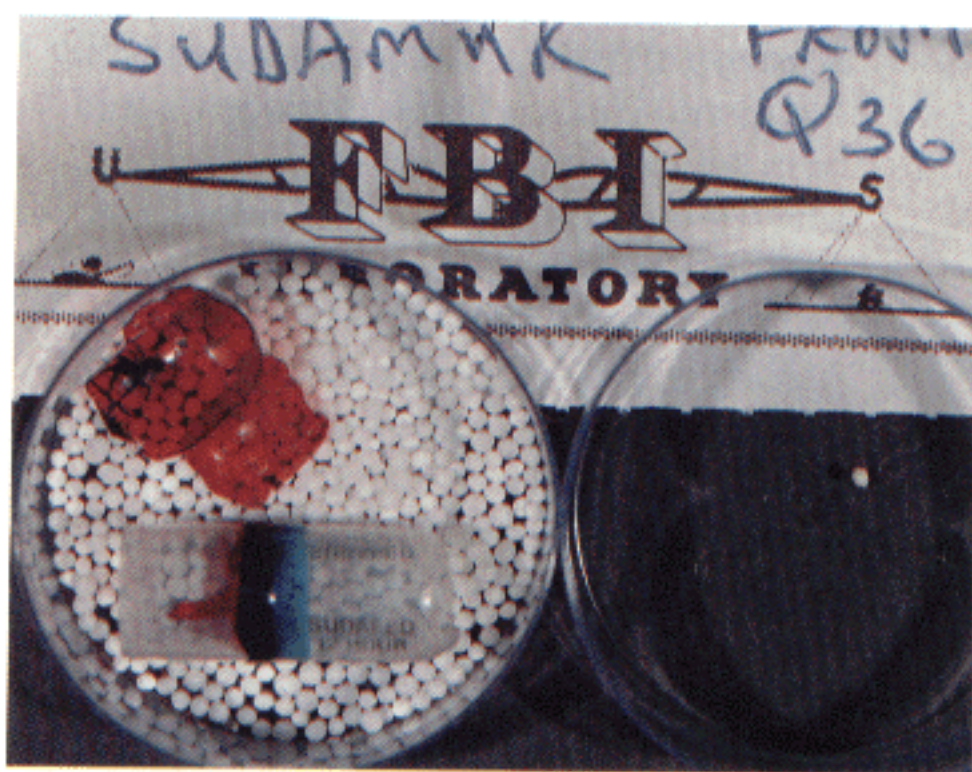
Malicious Destruction Cases: Destruction of structural surfaces, paint surfaces, lawns, and other valuables by the use of chemicals.

Assault Cases: Use of caustic or debilitating chemicals on assault victims, lubricants used in sexual assault cases, miscellaneous unknown chemicals found at assault scene, etc.

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

Scope of Writing Ink Analysis: Comparison of the formulation of questioned and/or known ink specimens including typewriter ribbon inks and stamp pad inks.

Limitations on Comparisons: 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.



Tampering with Consumer Products

Ink Dating: Standard ink reference files necessary for possible association of a questioned ink with a manufacturer are not maintained in the FBI Laboratory. However, the Secret Service in Washington, D.C., does maintain a standard ink library.

FBI requests should be sent directly to the FBI Laboratory. Other agencies should contact the Secret Service Laboratory directly.

Limitations on Dating

A limited number of cases have been successfully matched to a standard ink not in existence on the date the document was allegedly prepared. The Laboratory cannot determine how long writing ink has been on a document.

Tampering with Consumer Products: To determine nature of adulterant, alterations to containers, adhesives, and inks used in

extortion notes, etc. Tampered products (see picture left) may be food stuffs, pharmaceuticals, topical ointments, and ophthalmic preparations, etc.

Contact the Laboratory directly regarding shipment of adulterated products.

Miscellaneous chemical examinations such as:

- Tear gas and dyes in bank robbery packets (see picture below).
- Flash and water-soluble paper in gambling and espionage cases.
- Verification of stolen chemicals in Interstate Transportation of Stolen Property (ITSP) and Theft from Interstate Shipment (TFIS) cases.
- Comparison of food products.



Dyes in bank robbery packets

DNA Analysis/Serology Examinations

The DNA Analysis Units I and II conduct forensic DNA and serology examinations for the identification and characterization of blood, semen, and saliva on items of evidence. For information, you may call either DNA Analysis Unit I at (202) 324-4360 or DNA Analysis Unit II at (202) 324-5436. Correspondence and evidence should be sent to:

Director
Federal Bureau of Investigation
10th Street & Pennsylvania Avenue, N.W.
Attention: FBI Laboratory,
DNA Analysis Unit
Washington, D.C. 20535

Forensic serology involves the identification and characterization of blood and other body fluids on items associated with a crime or crime scene. Evidence from violent crimes such as murder, rape, robbery, assault, and hit-and-run usually bear body fluid stains that should be submitted for examination.

Blood Examinations Aid Investigations

In locating the possible crime scene, the identification of human blood, similar in type to that of the victim, can assist investigators in identifying the crime scene.

In discovering a crime, the identification of human blood on a highway, sidewalk, porch, or in a car may be the first indication that a crime has occurred.

In identifying the weapon used, the identification and grouping of human blood found on a club, knife, or hammer can be of considerable probative value.

In proving or disproving a suspect's alibi, the identification of human blood on an item belonging to a suspect who claims that the blood is of animal origin refutes suspect's alibi.

In eliminating suspect(s), the determination that the type of human blood on item(s) is different from that of the victim's type may exculpate the suspect. Blood similar to that of the suspect's can help corroborate a suspect's claim of having a nosebleed or other injury.

Information Available from Blood Tests

Blood tests can determine whether visible stains do or do not contain blood:

1. The appearance of blood can vary depending on the age of the stain and the environmental insults such as temperature, light, and humidity to which the blood was subjected.
2. Chemical and microscopic analyses are necessary to positively identify blood.

Blood tests can determine whether blood is of human or nonhuman origin and, if non-human, the specific animal family from which it originated.

The characterization of blood grouping systems includes red blood cell enzyme and serum protein systems (which are analyzed by electrophoresis, e.g., PGM, Hp, and Gc).

Limitations of Blood Examinations

Blood examinations do not reveal the age or the race of the person from whom the blood was obtained. It is also impossible to identify human blood as having come from a particular person by using conventional serological techniques. (DNA cannot identify a particular person, either.)

Collection, Identification, and Wrapping of Bloodstained Evidence

Garments and fabrics:

1. The investigator's identifying marks should be placed directly on the fabric in ink, as far away from stained areas as possible.
2. Garments or stains which are moist must be completely dried before they are wrapped, or putrefaction of the blood will occur.
3. The garment or item should be air-dried at room temperature in a secure, well-ventilated room. The items should not be exposed to direct sunlight or heat.
4. Once dried, wrap each item separately in a closed paper container, such as a paper bag.
5. Place the bag containing the item in the coldest, driest facility possible (e.g., freezer, refrigerator) until it is sent to the Laboratory.

Blood on large solid surfaces such as walls, floors, or automotive surfaces:

1. Scrape off any bloodstain of sufficient size. Place scrapings into a folded piece of druggist's paper. Thoroughly seal with cellophane tape. Initial, date, label, and place in a larger container.
2. Do not collect scrapings in envelopes.
3. Remove stains of limited size (i.e., too small for scraping) by either cutting away that section of the surface bearing the stain or dismantling the stained object and submitting that portion of the object bearing the stain.

4. Securely pack large objects to prevent the frictional removal of stains which could occur during shipment.

5. Do not use moist swabs to collect dried stains unless all other means of collection have been exhausted.

Blood on pieces of glass:

1. Submit pieces if stains are too small for removal by scraping.
2. Insulate the specimens in the package to avoid breakage in transit.
3. Mark the item itself or the container holding the scrapings.

Blood in dirt or sand:

1. If blood is encrusted on the surface, remove the crusts and enclose in separate pillboxes to avoid additional contamination during shipment. Submit the remainder of the specimen in a separate circular, ice-cream-type container.
2. Mark containers appropriately.

Liquid blood samples:

1. Submit samples from the victim and suspect.
2. Collect at least five cubic centimeters of blood in a sterile container bearing the donor's name, contributor's case number, and investigator's identifying marks.
3. Do not use preservatives or anticoagulants except when DNA analysis is requested (see DNA section).
4. Package the sample to protect it from breakage.

5. Do not add refrigerants and/or dry ice to the sample or package.
6. Seal the stopper with tape to prevent leakage resulting from altitude when shipped by air.
7. Refrigerate the sample prior to submitting to the Laboratory, but do not freeze.

Blood Evidence Transmittal Letter

The letter of request should contain the following information:

A brief but complete statement of facts concerning the case.

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

Whether or not animal blood might be present.

Whether or not stains have been washed out (laundered) or diluted with other body fluids (urine, vaginal fluids, sweat, etc.).

Any available information concerning the victim's and/or suspect's disease (e.g., aids, tuberculosis, venereal disease, etc.).

Semen, the Other Body Fluid

The identification of semen by chemical and microscopic means on vaginal smears, swabs or on a victim's clothing may be of value in corroborating the victim's claims.

Collection, Identification, and Packaging of Body Fluid-Stained Evidence

Semen Samples:

1. Any item or material bearing suspected semen stains should be air-dried, marked with dates and initials, and packaged separately in breathable containers (e.g., paper bags).
2. It is not necessary to submit known semen samples from suspects in rape cases because the information necessary to make comparative analyses can be obtained from the suspect's known blood samples.
3. All specimens, except the liquid blood samples, should be frozen during the period between packaging and submission to the Laboratory.

The Rape Case - Special Evidence Considerations

In light of recent developments in forensic DNA technology (see DNA Examinations in the opposite column), the collection and preservation of serological evidence in a rape case warrants special consideration. The forensic serologist can often provide the investigator with information beyond the fact that "semen is present" on an item.

The proper samples should be preserved and submitted to the Laboratory in a timely manner.

Collect body cavity swabs (as described below) from the victim as expeditiously as possible following the assault. Once dried and packaged, freeze these swabs until they are submitted to the Laboratory.

The following serological evidence should be obtained from the victim in a rape case:

1. Swabs and slides to be used for semen identification and analysis.
 - a. Two to four vaginal swabs representing both vaginal and cervical

samples plus any smear slides prepared from these swabs.

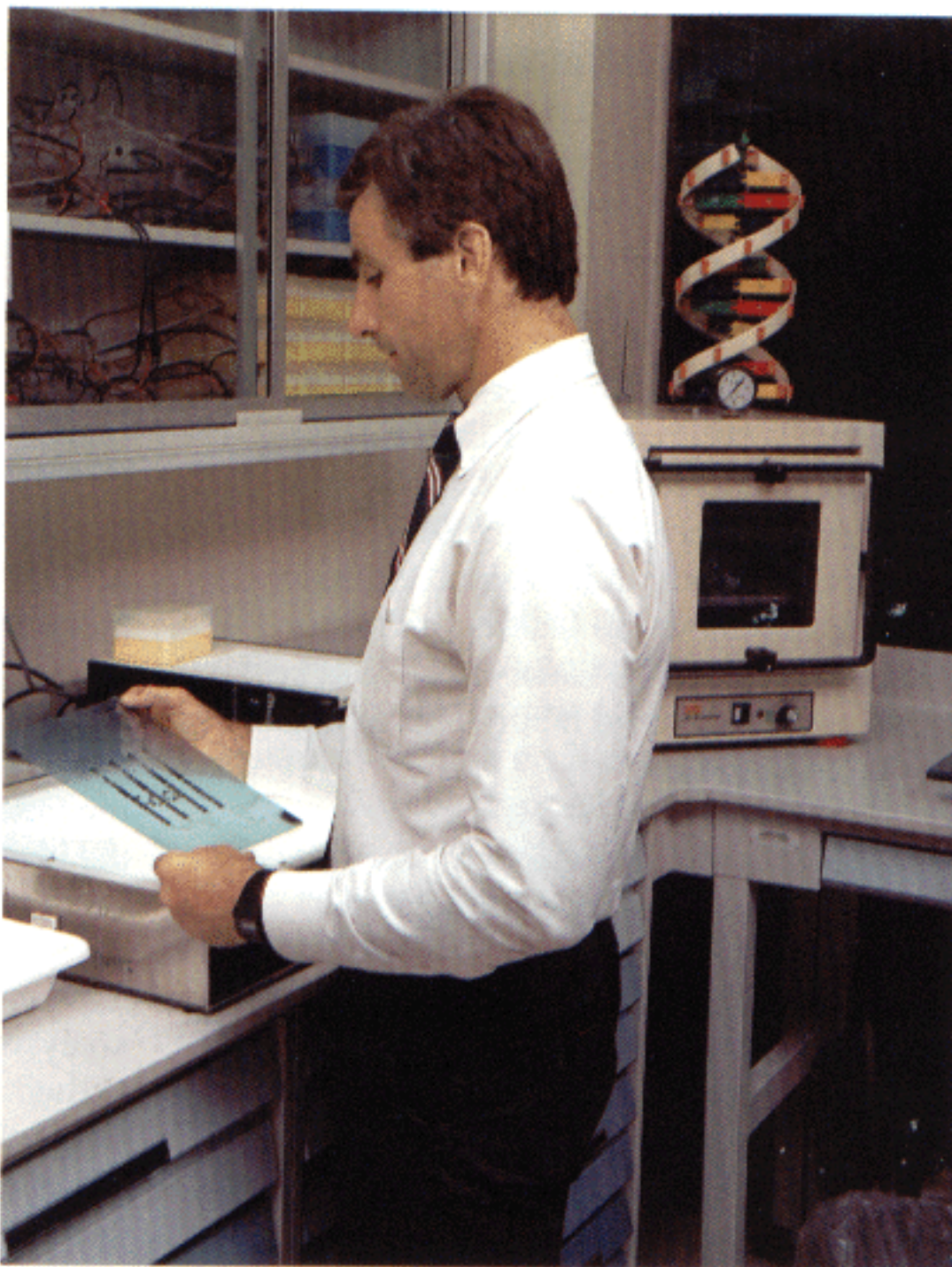
- b. Two oral swabs and associated smear slides, if any.
 - c. Two anal swabs and associated smear slides, if any.
 - d. Two unstained control swabs.
- 2. Known blood samples as described previously.
 - 3. Items which might logically be expected to bear probative semen stains (i.e., panties, pants, dress, etc.).
 - 4. Hair and fiber evidence as discussed elsewhere in this handbook.

Serological evidence to be collected from the suspect should include:

- 1. Known blood samples.
- 2. Two penile swabs if the suspect is apprehended prior to his being able to bathe.
- 3. Suspect's clothing.

DNA Examinations

Deoxyribonucleic acid (DNA) is analyzed in body fluids and body fluid stains recovered from physical evidence in violent crimes.



A Laboratory examiner studies the final DNA result

DNA analysis is conducted utilizing the restriction fragment length polymorphism (RFLP) method or other appropriate DNA methods. Evidence examined consists of known liquid and dried blood samples, portions of rape kit swabs and extracts, and body fluid stained clothes from victim/suspect of homicide, sexual assault, and serious aggravated assault cases.

The results of DNA analysis of questioned body fluid stains are compared visually and by computer image analysis with the results of DNA analysis of known blood samples as a means of excluding or including an individual as the source of a questioned stain. As such, this technique is capable of directly associating the victim of a violent crime with the subject or the subject with the crime scene.

The implementation of this technique in the FBI Laboratory represents a significant advance in forensic serology. (Note: DNA analysis does not positively identify a single individual as a source and is, therefore, not like a fingerprint.)

Follow the instructions set forth under serology examinations for the collection, handling, and submission of body fluid-stained evidence, with the following exceptions. Body fluid-stained evidence submitted to the FBI Laboratory for serological and/or DNA analysis should be completely air-dried before packaging and submission.

Blood samples from the victim should be collected by medical personnel in two vacutainer tubes, one containing EDTA for DNA analysis and the other containing no preservative for serological analysis. These blood samples should be submitted to the laboratory without delay. Keep the dried-stain evidence frozen in the event of a delay in submission.

The FBI Laboratory has implemented a selective case acceptance policy for DNA examinations. In general, this policy states that the FBI Laboratory will accept evidence for DNA analysis from current, violent personal crimes where appropriate standards for comparison are available. The policy is specified as follows:

FBI Cases

Physical evidence submitted for DNA analysis in connection with FBI investigations will be examined as requested. It requires a known blood sample from the victim and suspect for comparison purposes.

Non-FBI Cases

DNA analysis on state and local cases will be limited to homicide, sexual assault, and serious aggravated assault cases in which a suspect has been identified. It requires a known blood sample from the victim and suspect for comparison purposes. In certain cases, the FBI Laboratory will accept evidence for DNA analysis even though a suspect has not been identified. These exceptions include serial homicide/rape cases and sexual assaults on young children.

Requests for DNA analysis on previously adjudicated cases should not be submitted to the FBI Laboratory, but should be referred by the investigating agency to one of the private DNA testing laboratories.

Law enforcement agencies requesting DNA analysis are encouraged to submit evidence to their local crime laboratory for traditional serological testing prior to submitting samples to the FBI Laboratory for DNA testing.

Reexamination Policy

It is the policy of the FBI Laboratory that no examination be conducted on evidence which has been previously examined by another expert. However, the FBI Laboratory will accept evidence samples for DNA analysis even though another crime laboratory may have conducted traditional serological tests on the evidence.

This exception will only be made if that crime laboratory does not have the capability to perform the DNA tests and if the submitted samples are determined to be of a quantity and condition conducive to DNA analysis. The local forensic laboratory should contact either DNA Analysis Unit I or II prior to submission of this kind of evidence.

Examinations of Explosives

The Explosives Unit conducts examinations of Improvised Explosive Device (IED) remains, commercial explosives, blasting accessories, military explosives, ordnance items, including toolmark and bomb components. The Explosives Unit may assist in processing bombing crime scenes and handling of explosives. To request assistance or information, call the FBI Laboratory, Explosives Unit at (202) 324-2696. Send correspondence, evidence, or samples to:

Director
Federal Bureau of Investigation
Attn.: FBI Laboratory, Explosives Unit
10th Street and Pennsylvania Avenue, N.W.
Washington, D.C. 20535

Examinations of Bomb Remains

Bomb remains are examined to identify bomb components such as switches, batteries, detonators, tape, wire and timing mechanisms. Also identified are fabrication techniques, unconsumed explosives, and overall construction of the bomb. Instrumental examination of explosives and explosive residues are carried out by the Materials Analysis Unit in conjunction with bomb component examinations.

Toolmark Examinations

All bomb components are examined for toolmarks, where possible. Tools utilized in the construction of the bomb are identified for investigative purposes.

Reference Files

The Explosives Unit also maintains extensive reference files on commercial explosives, blasting accessories, and bomb components. These files contain technical data that include known standards of military

and commercial explosives, time fuses, detonators, batteries, tape, switches, and radio control systems.

Handling Explosives

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

Shipping Explosives

Explosives are classified as hazardous materials. Special packaging is required, and the amount to be shipped is regulated. Call the Explosives Unit **each and every time** an explosive is to be shipped for examination. The shipping instructions furnished must be strictly adhered to for meaningful forensic examination as well as safety.

Examinations of Explosives by the Materials Analysis Unit

Examinations in cases involving IEDs are performed by the Materials Analysis Unit (see page 71) to assist the Explosives Unit in the determination of:

- Whether unknown substances are high explosive, low explosive, or incendiary in nature.
- Whether recovered explosives are consistent with known explosive products by compositional analysis.

Sometimes, the type of explosive can be determined by examination of residues from the scene of a bombing. It should be noted that most residues remaining after the detonation of an explosive charge are water soluble. For this reason, these residues must be protected against exposure to excessive moisture. Also, other residues evaporate quickly, necessitating the immediate sealing of collected debris in new, airtight

paint cans.

Postblast Investigation Guidelines

The processing of bombing crime scenes, in spite of often massive destruction, must be conducted on the theory that everything at the scene, prior to the explosion, is still present unless vaporized by the explosion. While complex, it is possible to determine the cause of an explosion from the components found at the scene.

Purpose of Postblast Investigation

The purpose of the postblast investigation process is to determine what happened, how it happened, and to gather evidence.

Special Considerations

The following steps are to assist in the preparation, supervision, and evaluation of activity connected with a bombing crime scene. The topics covered are not meant to be all inclusive, and no attempt has been made to comment on the many aspects of a bombing investigation. A comprehensive course of instruction in postblast crime scene processing is available through the Explosives Unit in the Post-Blast Investigator's School. For further information, contact the Explosives Unit.

Formulate a Plan of Action

Formulate a plan adapted to the particulars of the bombing crime scene. This plan should include consideration of the creation of an on-scene control center; establishment of a chain of command; assignment of various tasks such as evidence collection, photography, fingerprint processing, and crowd control; protection of the crime scene; acquisition of necessary equipment; periodically evaluating progress; providing pertinent information to the public; and public safety.

Control Center

Consider establishing an on-scene control center, particularly after a large bombing which may require days or even weeks to complete the investigation of the crime scene. The control center should coordinate efforts among investigative personnel, representatives of other agencies, and utilities, as well as handle inquiries from sightseers, persons associated with the scene, relatives of victims, and the press. One person should be in overall command of the bombing investigation, another person over the management of the crime scene search efforts, and yet another controlling the collection and handling of evidence. These three individuals must maintain close coordination and continually exchange information on an expeditious basis. The crime scene manager should report directly to the person in charge of the entire investigation.

Safety

Evaluate safety conditions at the outset of the crime scene search and on a continuing basis throughout the search. Consider the possibility of additional devices, a device that has failed to function, the presence of live explosives in the debris, the presence of utilities (gas, electrical, etc.) in the vicinity of the blast, structural damage to buildings and, most importantly, the safety of crime scene personnel, residents, and the public. **Only public safety or military explosive ordnance disposal personnel should handle suspected IEDs.**

Protection of the 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 the detonation of an explosive are

water soluble, the crime scene should be protected as much as possible from exposure to excessive moisture such as rain, snow, broken water/sewer pipes, etc.

Crime Scene Photography

Take appropriate photographs to give an accurate photographic representation of the crime scene. These photographs should be made immediately before, periodically during, and at the completion of the crime scene processing. Properly identify each photograph as to location and orientation; coordinate the photographs with diagrams, maps and/or blueprints; and consider the necessity of aerial photographs. (For more details, see Miscellaneous Photographic Examinations atop page 78.)

Crime Scene Specialists

If there are no available trained specialists to handle and process bombing crime scenes, make arrangements to obtain such specialists. Although the basic principles 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 bombing crime scene. These specialists need not be qualified bomb disposal specialists. They should be the first persons to be selected for the evidence and crime scene search coordinator positions.

Equipment

Promptly make arrangements to obtain the necessary equipment to move debris and material at the scene. Although the equipment needed at a crime scene varies from incident to incident, the following is a typical representation of the necessary basic equip-

ment:

Hand Tools: Shovels, rakes, brooms, bolt cutters, wire cutters, sledge hammers, hammers, screwdrivers, wrenches, chisels, hacksaws, magnets, flashlights, knives, 50' measuring tapes, and traffic wheel-measuring devices.

Personal Equipment: Hard hats, safety goggles, face masks or respirators, work and rubber gloves, foul weather clothing, coveralls, and work shoes.

Heavy Equipment: Dump truck, front-end loader, bulldozer, crane, and shoring materials.

Other Equipment: Screens for sifting debris, wheelbarrows, metal trash cans, power saws, cutting torch equipment, ladders, portable lighting equipment, metal detectors, plastic sheeting, photographic equipment, and rappelling equipment.

Crime Scene Kit: Usual equipment used for the collection, preservation, and identification of physical evidence.

Vehicle: If the suspected target or container was a vehicle, if possible, bring to the scene an identical vehicle to assist in identifying fragmented or distorted items.

Search for Evidence

Bear in mind that the search for evidence at a bombing crime scene is critical; it may contain important evidence for identifying the bomber(s) and/or assisting 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.

It is extremely important that the area be photographed before a search begins, and when evidence is located.

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 evidence was recovered. A diagram of the crime scene is always useful.

Do not stop the search after a few items have been found. Valuable evidence may be overlooked.

Avoid the tendency to concentrate only on obvious explosive-related physical evidence such as: safety fuse, blasting caps and leg wires, explosive residues, or unconsumed explosives as this may result in overlooking other valuable evidence. Look for evidence such as: fingerprints, hair and fibers, soil, blood, paint, plastic, tape, tools and/or toolmarks, metals writing paper, printing, cardboard, wood, leather and tire tread-shoe print impressions which may produce a lead in the investigation.

Conduct a well-organized, thorough, and careful search to prevent the necessity of a second search. However, have a secure disposal site for debris, should a second search be necessary.

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, sides, and bottom of the crater, making sure to dig into the substrata. Soil samples should also be taken away from the scene for comparison purposes. If the crater is in another type of material, take samples from similar areas.

Sift small debris through a 1/4" wire screen onto an insect-type screen. Usually, these screens are placed on 2-foot square

wooden frames constructed from 2x4 inches lumber.

X-ray the bodies of victims who were in close proximity of the explosion site, for possible physical evidence and, if possible, have the evidence removed. Victims' clothing should be retained as residues may be present on the clothing.

Search a sufficient distance from the seat of the explosion. Evidence has been found up to several blocks away from large explosions. A basic rule of thumb is to extend your perimeter half the distance past the site where the most remote piece of evidence was located.

Determine the probable flight path of bomb components to prevent needless searches.

Search trees, shrubbery, telephone poles, and the roofs, ledges and gutters of buildings. Instances have occurred where physical evidence was carried away on the tires of vehicles responding to the crime scene.

Establish a search pattern for large areas. A line of searchers 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 searchers on the line should be rotated. Charting the areas to be searched will ensure a thorough search pattern.

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.

Firearms-Toolmarks Services

The Firearms-Toolmarks Unit conducts forensic firearms examinations, muzzle-to-garment distance determinations, and examinations of silencers as well as examinations related to toolmarks, lock mechanisms, and number restorations. If you need information, please call (202) 324-4378. Send evidence or samples to:

Director
Federal Bureau of Investigation
Attn: FBI Laboratory,
Firearms-Toolmarks Unit
10th Street and Pennsylvania Ave., N.W.
Washington, D.C. 20535

Firearms Identification

Firearms identification is the forensic science discipline that identifies a bullet, cartridge case or other ammunition component as having been fired by a particular firearm to the exclusion of all other firearms.

Conclusions

Examinations may positively conclude that the bullet or cartridge case was or was not fired by a particular firearm. Exams may also conclude that there are not sufficient individual microscopic marks of value on the bullet or cartridge case for identification purposes or that the condition of the firearm precludes the possibility of making an identification.

Types of Examinations

Examinations of bullets: Include the microscopic marks that are produced by the rifling in the barrel of the firearm. The diameter of the bullet and the marks left may aid in determining the caliber, manufacturer and model of the firearm and if the bullet had not been fired in a particular firearm. If there are sufficient individual microscopic

marks of value on the bullet, it may be identified as having been fired from a particular firearm.

Examinations on cartridge cases or shotshell casings: Include the microscopic marks produced by the breech face, firing pin, chamber, extractor and ejector. These individual microscopic marks may identify the cartridge case or shotshell casing as having been fired in or loaded and ejected from a particular firearm. Aside from microscopic marks, cartridge cases found at the scene can determine caliber-type of firearm used and possibly the model of firearm. Shotshell casings at the scene can tell the gauge of shotgun and possibly the original factory load of the shotshell.

Examinations of shot pellets, buckshot or slugs: Recovered from a victim or from a crime scene may identify the size of shot used. Examinations of slugs may identify the manufacturer and gauge of shotgun used.

Examinations of wadding: Taken from the victim or from a crime scene may identify the manufacturer, the wadding and gauge of shotgun used. In some cases, such as with plastic wadding, a positive identification can be made to a particular firearm.

Examinations of (unfired) cartridges or shotshells: Can determine the specific type of firearm for which the ammunition was intended. Examination may also identify whether the ammunition was loaded into and/or extracted from a particular firearm.

Lead Analyses: Bullet lead composition analyses of ammunition may be valuable when the bullet or bullet fragment does not bear any microscopic marks of value for identification purposes. Lead samples from the bullet and/or fragment are compared with ammunition recovered from the suspect's possession. Analysis may determine that the composition of the bullet and/or fragment is identical to the com-

position of the recovered ammunition. Although circumstantial, lead composition information is often useful to link a suspect to a shooting, and similar information may be determined from an analysis of shot-pellets and slugs.

Examinations for gunshot residues: On evidence, such as clothing, can be conducted for muzzle-to-garment distance determination. Microscopic exams and chemical processing of the area surrounding the hole to produce patterns of gunshot residues are compared to test patterns that are shot using the suspect firearm and ammunition like that used in the crime. These tests can only be conducted if a suspect firearm is recovered, and the type of ammunition used is identified.

Shot pattern examinations: Can be conducted for muzzle-to-garment distance determination if a suspect shotgun is recovered and type of ammunition (shotshells) used is identified.

Examinations of suspected silencers: Can be conducted to determine if their sound suppressing abilities fall within the federal definition of a "firearm silencer" or "firearm muffler."

Trigger pull examinations: Can be conducted to determine the amount of pressure necessary to fire a firearm.

Alteration examinations: Can be conducted to determine, if a firearm has been altered to fire in the automatic mode and if the firearm actually can fire in the automatic mode.

Function examinations: Can be conducted to determine if a firearm is capable of firing as it was designed and if all safeties are properly operating.

Examinations can be conducted to determine if a firearm can be made to fire accidentally, that is, without pulling the trigger.

Gun parts can be examined to determine what type of firearm they belong to and whether or not they may belong to a particular firearm.

Submission of Evidence

Firearms, bullets, cartridge cases and shotshell casings can be sent Registered mail through the United States Postal Service. Items should be wrapped or packaged separately and properly identified as to item number within the shipping container. All firearms must be unloaded, and ammunition that is removed from the firearm should be packaged and identified as such.

Transmittal letter should indicate where the victim was shot. Articles of clothing submitted for gunshot residue examination should be:

- Carefully handled upon removal from subject,
- Air-dried before submission,
- Wrapped or bagged individually in paper, and
- Properly identified (each package should have item number and subject name).

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:

- Surface Shipments - UPS
Items should be placed in a cardboard box with appropriate label and invoices marked "United Parcel Service" along with a UPS "Hazardous Materials" label.
- Air Shipments - Federal Express
Cardboard box with appropriate label and invoices marked "Federal Express,"

shipper's certification for restricted articles and "Small Arms Ammunition" stamped on outside of box.

Marking Specimens for Identification

Firearms should be identified with a string tag containing contributor information. If necessary (although discouraged) markings on the firearm should be inconspicuous, such as within the trigger guard.

Markings on bullets, cartridge cases and shot-shell casings should be avoided. If needed, bullets are to be marked on the nose or base with care given to possible trace evidence or impressions on the nose. Cartridge cases and shotshell casings are to be marked inside the mouth or on the side near the mouth.

Reference Files

The Standard Ammunition File (SAF), containing over 15,000 specimens and maintained in the FBI Laboratory, is used to compare submitted evidence against domestic and foreign standards to determine the manufacturer, as well as the cartridge and bullet type, of the questioned specimens.

The Reference Firearms Collection contains over 5,000 firearms (3,000+ handguns and 2,000+shoulder firearms). This collection is maintained for such uses as:

- Locating serial numbers,
- Replacing inoperable firearms parts, and
- Identifying firearms and firearms parts.

The Reference Fired Specimen File contains test bullets and cartridge cases obtained from firearms that have been submitted to the FBI Laboratory. This file is maintained as a reference for the types of marks that are produced by known makes and models of firearms.

Terminology

Caliber

In general, caliber denotes the nominal bore diameter of a barrel, that is, the approximate diameter of the bore of the barrel. The diameter is measured in hundredths of an inch (.357), or in millimeters (5.56), which, in regards to caliber, would correspond to .38 caliber family and .22 caliber family respectively.

Caliber designations are then expanded one step further to name each different cartridge size or shape within the caliber family. While some cartridges will interchange, the majority of cartridges are specific for a firearm that is chambered for that specific cartridge. Some examples are:

Descriptive words: Cartridges in the .38 caliber family would include the .38 Smith & Wesson, .38 Special, .357 Magnum, and the 9mm Luger.

Original Powder Charge: The 30-40 Krag is a .30 caliber cartridge that was originally loaded with 40 grains of powder.

Manufacture or Designer's name: Some self-explanatory cartridges would include the 6mm Remington, the .270 Winchester and the .257 Roberts.

Velocity designation: The .250-3000 is a .25 caliber cartridge that develops a muzzle velocity of 3000 feet per second.

Year of adoption: The 30-06 Springfield is a .30 caliber cartridge that was developed for use by Springfield Armory in 1906.

Caliber and length of case in Millimeters: Most foreign and some American commercial manufacturers identify their cartridges by caliber and cartridge case length, both listed in millimeters, such as the 6.5x55mm Swedish. This cartridge is of the 6.5mm caliber

family with a cartridge case length of 55mm.

General Rifling Characteristics

When a firearm barrel is manufactured, the manufacturer cuts or impresses grooves inside the barrel. When a bullet is fired down the barrel, the high area or land areas of the bore grip the bullet and impart a spin on the bullet, much in the manner of a football spiraling through the air. These land and groove impressions are impressed into the bullet. A bullet can be microscopically examined to determine these General Rifling Characteristics (GRCs) of the firearm that it was fired from. The GRCs consist of the number of lands and grooves present, the width of the lands and grooves, their direction of twist (right or left) and the caliber. From these measurements, a list of possible firearms that could have fired the bullet can be developed.

Disposition of Weapons

Non-FBI Cases: To ensure proper disposal of a firearm at the conclusion of your investigation, refer to your agency's regulations.

FBI Cases: In accordance with the FBI 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 four procedures is followed:

- A Court Order signed by the presiding judge making disposition in the Bureau case.
- A written waiver of ownership signed by the individual who had custody and control of the firearm at the time of seizure.
- Abandoned/forfeited/seized property (ensure forfeiture guidelines are followed),
- Bureau-owned property, such as bought with case funds, etc.

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."

Toolmark Identification

Toolmark identification is a microscopic side-by-side comparison that attempts to link a particular tool with a particular mark to the exclusion of any other tool produced. Such a singular identification can be accomplished by comparing both class characteristics (those marks left by a particular group of tools, such as a screwdriver blade that is one fourth of an inch wide) and the unique microscopic marks that could only have been left by one individual tool and no other.

The term "tool" is used in a very broad sense. It could mean a screwdriver blade, vice grips, a knife or a pry tool. It could also be the comparison of a piece of paint on a tool with the surface upon which that tool was used. Further, it could be the comparison of two pieces of rubber that have been pulled apart from each other, as can happen in a car stripping operation. The tools that can be compared in these types of examinations are only limited by the

imagination of the police officer or laboratory examiner.

Conclusions

- Examinations may positively conclude that a tool did or did not produce a toolmark. Exams may also conclude that there are not sufficient individual characteristics remaining within the toolmark to determine if the tool did or did not produce the questioned toolmark.
- Class characteristics could not eliminate a particular tool and subsequently, the tool could have been used to produce a certain mark.

Toolmark Examinations

Examination of the toolmark can determine:

- Type of tool used (class characteristics).
- Size of tool used (class characteristics).
- Unusual features of tool (class or individual characteristics).
- Action employed by the tool in its normal operation, and/or in its present condition.
- Most importantly, if the toolmark is of value for identification.

Types of Toolmark Examinations

Fracture Matches

Fracture examinations are conducted to ascertain if a piece of material from an item such as a metal bolt, plastic automobile trim, knife, screwdriver, wood gunstock, rubber hose, 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 if questioned items are metallic in composition (see Types of Examinations on page 57).

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.

Plastic Replica Casts of Stamped Impressions

Plastic replica casts of stamped numbers in metal, such as altered vehicle identification numbers, can be examined and compared with each other as well as with suspected dies.

Locks and Keys

Locks and keys examinations can be conducted to associate locks and keys with each other. Such associations are useful in establishing a conspiracy or link of commonality between or among individuals. It is often possible to illustrate this through their possession of keys which will operate a single, lockable instrumentality (e.g., vehicle, safe house, padlock, etc.). Laboratory examination of a lock can determine whether an attempt has been made to open a lock without the operating key.

- Key without Lock

1. A key can be decoded to determine the manufacturer from a lock and code.

2. A determination can be made as to whether or not any number of keys were cut to operate a common lock.

3. A determination can be made as to whether a key is an original or a duplicate.

- Lock without Key

1. Locks can be decoded to determine manufacturer and code.

2. Operating keys can be cut which will operate the lock.

3. A determination can be made as to whether an attempt has been made to compromise the lock (open it without the use of the operating key).

- Lock with Key

1. A determination as to whether a key will operate a particular lock.

2. In obtaining and submitting lock and key evidence, identify type of lock and key and their function. Consideration should be given to the following:

- If possible, submit operating key with lock.

- In cylinder locks, remove the entire lock assembly, including the strike plate into which the locking bolt is thrown. While strike plates are usually in door frames, locks are usually in doors.

- In automobile locks, remove lock cylinders from doors, trunk and ignition.

- Do not insert keys to operate locks

unless necessary to prevent destruction in lock removal.

- In cases where the lock has been partially destroyed, look for and collect internal lock parts, e.g., lock pins, wafers, etc., that could be found at the scene.

Restoration of Obliterated Markings

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, such as wood, plastics, and fiberglass. 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.

Obtaining Evidence in Toolmark Cases

If possible, submit the actual toolmarked area for direct comparison. (Note: In toolmark cases, the Laboratory will routinely make a plastic replica cast of the toolmark for a possible future comparison with marking stamps.)

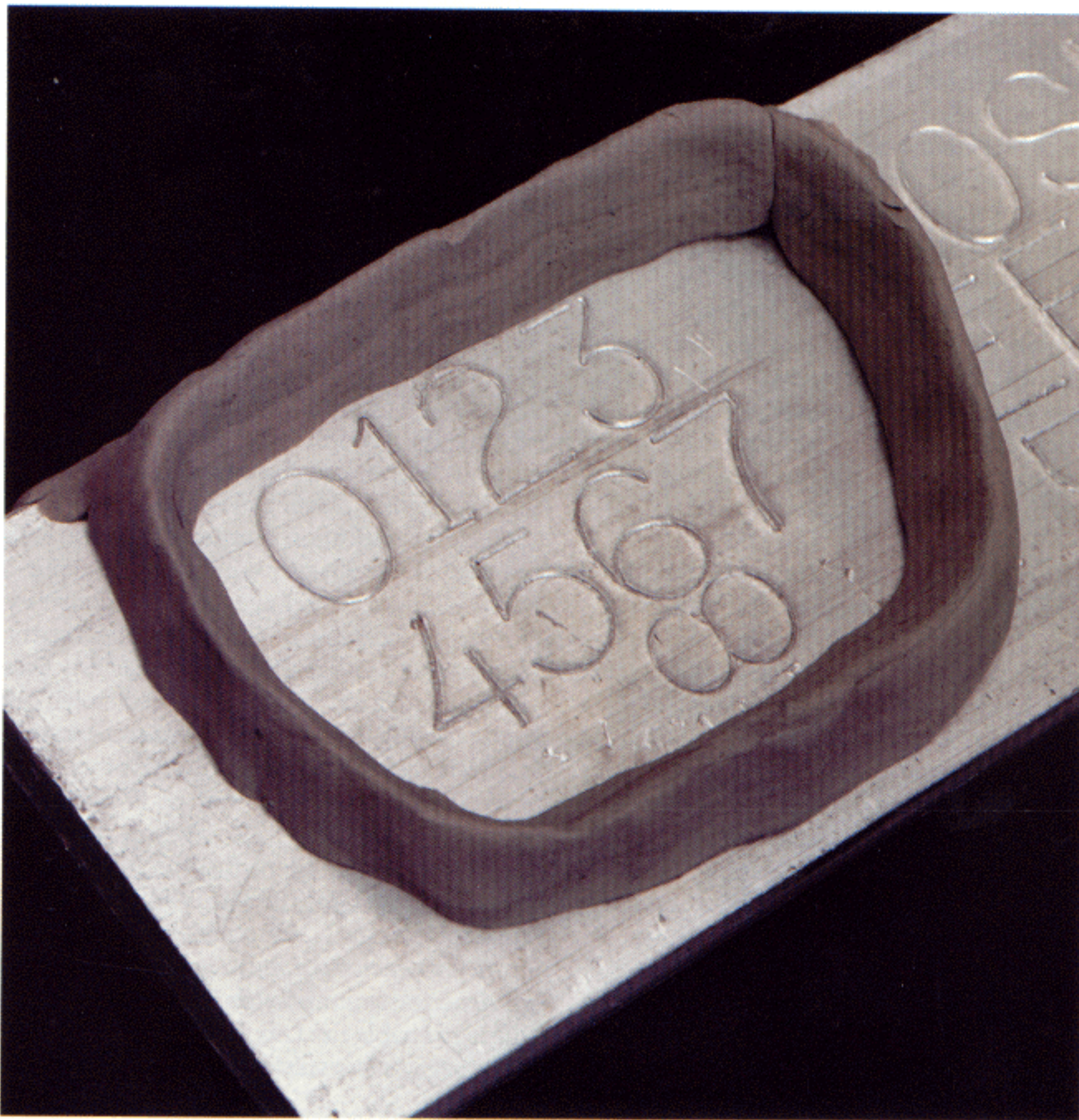
If it is not possible to submit the original item of evidence, prepare and submit a cast of the toolmark, preferably in plastic. The instructions on how to prepare a plastic replica cast/impression are furnished below.

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

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

Do not place the tool against the toolmark for size evaluation to avoid contamination.

Plastic Replica Cast/Impression



Stamped numbers in metal ready for a plastic cast/impression

Instructions for making a plastic cast/impression of stamped numbers in metal:

Take all casts/impressions before attempting any number restoration (see Restoration of Obliterated Markings, page 62, for further information).

Use a suitable plastic replica kit to take a cast/impression. For best results, different formulas may be used in different temperature conditions. If possible, move the item to a heated area or garage.

Since the plastic replica will duplicate any foreign material left in the stamped characters, the number one priority is cleaning the number area of foreign matter. Remove paint and dirt with a suitable solvent (acetone, gasoline or a commercial paint remover).

You may use a soft brush, such as a toothbrush, to help clean down to the bottom of the stamped impression area, but never use a wire brush as this will produce extraneous marks which scratch the numbers and make identification of the stamps impossible.

It is permissible to use "Naval Jelly" to remove rust from the stamped numbers.

Build a dam around the stamped characters to retain the plastic while it hardens.

The dam material should be soft and pliable, such as caulking cord, "Play Dough," or modeling clay. Ensure there are no voids around the dam to prevent leaking.

Following instructions in the kit, mix the liquid and powder from the kit for one minute in the plastic jar which contains the powder and pour into the prepared dam.

The plastic liquid should take no longer than 1/2 hour to harden. Wait until the cast is cool to the touch before removing it. If the cast has a lot of paint and rust, take additional casts and submit the best one to the Laboratory.

Submitting Toolmark Evidence

Pack to preserve the evidence and prevent contamination. Pay particular

attention to the part of the tool which could have made the mark.

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

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

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

Reference Files

National Automobile Altered Numbers File (NAANF): The FBI Laboratory maintains in the NAANF 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.

National Vehicle Identification Number Standard File (NVSE): The FBI Laboratory maintains in the NVSE 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.

Hairs and Fibers Examinations



Removing fibers for microscopic examination

Hairs and fibers examinations aid the investigation by placing the suspect at the scene of the crime, identifying the scene of the crime, identifying the weapon or the instrument of the crime, identifying hit-and-run vehicles, and corroborating witness' testimony. Questions concerning the collection, packaging and submission of this type of evidence should be directed to the Hairs and Fibers Unit, telephone (202) 324-4344. Evidence or samples should be sent to:

Director
Federal Bureau of Investigation
Attn.: FBI Laboratory, Hairs and Fibers Unit
10th Street and Pennsylvania Avenue, N.W.
Washington, D.C. 20535

Examinations are valuable in that they assist in placing the suspect at the scene of the crime:

- Hairs or fibers found on victim's and suspect's clothing in crimes of violence such as rape, assault, and murder.
- Hairs or fibers from suspect found at the scene of crimes such as burglaries armed robberies and car thefts.

Identifying the scene of the crime:

- Hairs or fibers left at the scene of crimes such as murder, rape, and kidnapping.

Identifying the weapon or the instrument of a crime:

- Hairs or fibers on knives or clubs.

Identifying hit-and-run vehicles:

- Hairs or fibers adhering to suspect automobile.

Examinations are also valuable in that they corroborate the witness' testimony.

Hair Examinations

Examinations provide information whether animal or human:

- If animal, the species from which it originated (dog, cat, deer, cattle, etc.).
- If human, the race, body area, how removed from the body, damage, and alteration (bleaching or dyeing) may be determined.

Examinations can determine whether or not a hair could have originated from a particular person based on microscopic characteristics present in the hair.

- Does not provide absolute personal identification.

Fiber Examinations

Examinations identify the type of fiber:

- Animal (wool)
- Mineral (glass)
- Synthetic (man-made)
- Vegetable (cotton)
- Determination as to whether or not questioned fibers are the same type and/or color and match in microscopic characteristics with those fibers of a suspect's or victim's garments.
- Not positive evidence, but good circumstantial evidence.

Fabric Examinations

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

Cordage/Rope Examinations

the crime may be compared with similar suspect rope.

- Composition, construction, color and diameter can be determined.
- Manufacturer can sometimes be determined, if a tracer is present.

Botanical

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

Anthropological

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

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 - Types Examinations

The presence of a suspect at the crime scene can often be established from a comparison of wood from clothing, vehicle, or possessions with wood from the crime scene. Specific source:

- Side or end matching
- Fracture matching.
- Species identification.

Miscellaneous Examinations

These examinations include the following:

- Fabric impressions.
- Glove prints.
- Feathers.
- Clothing manufacture's source information through label searches.

Materials Analysis Examinations

These examinations entail the use of instrumentation such as infrared spectroscopy, X-ray diffractometry, capillary electrophoresis, high performance liquid chromatography, gas chromatograph/mass spectrograph, etc., to identify or compare the chemical compositions of paints, plastics, explosives, cosmetics, tapes, soil, glass and related materials. Other services include metal analyses, metallurgy, and bullet lead comparisons by elemental analysis (see page 57). Also available are methods to mark materials, but they are not presented in this handbook. Questions can be directed to the Materials Analysis Unit at (202) 324-4341. Send evidence to:

Director
Federal Bureau of Investigation
Attn: FBI Laboratory,
Materials Analysis Unit
10th Street and Pennsylvania Ave., N.W.
Washington, D.C. 20535

Cosmetics, Paints, Plastics, Polymers, and Tapes

Cosmetics

Unknown or suspected cosmetics and/or makeup can be compared with a potential source in assault cases such as rape, etc. The investigator should be alert to the possible transfer of such materials between victim and suspect.

Automobile Paints

It is possible to establish the color, year, and make of an automobile from a paint chip by use of the National Automotive Paint File which contains original paint systems 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, Honda, Subaru, Nissan and Toyota.

A very careful search of the accident or crime scene and the victim's personal effects should be made to locate small chips because:

- Paint fragments are often found in the clothing of a hit-and-run victim. Therefore, the victim's clothing should be obtained and submitted to the Laboratory whenever possible.
- 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. Occasionally it is better to submit an entire component such as fender or bumper if the paint transfer is very minimal.

Nonautomobile Paints

Paint on safes, vaults, windowsills, 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.

Plastics, Polymers, and Tapes

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

- Trim from automobiles, depending upon the uniqueness of the composition, are compared with plastic remaining on the property struck in a hit-and-run type case. In some instances where the manufacturer's part number is present on the trim, the specific year and make can be determined.

- Plastics comprising insulation on wire used in bombings or other crimes are compared with known or suspected sources of insulated wire.
- Plastic/rubber tapes from crime scenes are compared with suspected possible sources.
- Polymers used in surgical cloth-backed tape are compared with known sources.
- Miscellaneous plastic material from crime scenes is compared with possible sources.
- A positive identification may be made with the end of a piece of tape left at the scene of the crime and a roll of suspect tape. If no end match is possible, composition, construction, and color can be compared as in other types of examinations to associate the question tape with the known.

General Notes to Investigators

If paint samples are to be obtained from any painted surface, if possible, chip the paint from the surface down to the foundation/substrate 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 multiple layers of paint on a questioned and known specimen rather than only the top top layer in the known specimen for comparison/identification purposes.

Be extremely careful in obtaining, packing and marking small paint chips and other small particles of evidence. Be sure they are placed in a leakproof container such as a pillbox or screw-top vial.

1. Do not stick small paint particles on adhesive tape. Small particles have to be removed from the adhesive, laboriously cleaned, and prepared for sophisticated instrumental analyses. Contamination at the time of pro-

curement could prevent a meaningful analysis.

2. Do not put small particles in cotton. It is difficult to remove the particles from the cotton.
3. Do not send small particles in an envelope, unless protected in a "druggist" fold to prevent small particles from leaking and contaminating other evidence.

Mineralogy Examinations

Mineralogy includes many materials, mostly inorganic, crystalline or mineral in nature. 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, industrial dusts, safe insulations, minerals, abrasives, other debris and precious stones/gems.

Soil, Glass and Building Materials

A mineral can generally be thought of as a naturally occurring, inorganic compound having a definite chemical composition and a well-defined crystal structure. Materials such as soil, glass, and a variety of building products either consist of or directly derive from rocks and minerals. Quartz and feldspars are common components in most soils, but quartz sand is the principal ingredient in common window glass and Portlandite is the man-made mineral found in hardened concrete. Additionally, wallboard, safe insulation, industrial abrasives, gemstones and other related products are fundamentally minerals.

Forensic Utility of Soil

Soil is generally considered to be the natural accumulation of weathering rocks, min-

erals and decomposing plants. The formation of soil is a dynamic process influenced by geologic parent material, relief, climate, biological activity, and time.

Soil may be developed in place or after being deposited by wind, water or/and man. Additionally, and of forensic significance, soil may contain man-made materials such as fragments of brick, roof shingle stones, paint chips, glass, et cetera. These man-made materials improve characterization and, consequently, may strengthen the association between specimens.

Collecting Soil Samples

Soil varies laterally, across the land surface from place to place. Changes may be abrupt, occurring within a few meters, or gradual, over tens of meters. Soil also varies vertically, as a function of depth.

Changes in soil regarding either of these dimensions are sensitive to influences by nature and man. For this reason, it is necessary to properly sample and document the exact location where each sample is collected.

If the questioned soil is suspected as having come from the surface, that is, soil recovered from the tread pattern of a shoe, known specimens should be collected from like places. Because the factors that affect soil formation are governed by time, the timeliness of collection is critical. Use a hand drawn or detailed commercial map to illustrate where specimens are collected and their spatial relationships.

Collect a sufficient number of known soil specimens at the crime scene and from the general area. This is to ensure that the examiner has an adequate representation of soil variability. Establishing the uniqueness of a soil at a particular location to the exclusion of another also strengthens the association between specimens.

Do not overlook alibi soil specimens. Obtain alibi soil samples for comparison. This might include soil from a location that the suspect could assert was the source of the questioned soil discovered on the evidence.

For example, the suspect might contend that the soil recovered from a shovel, used to dig a grave, came from his garden. If the soil from the suspect's garden is examined and found to be dissimilar, it can be eliminated as a possible source.

The amount of soil suitable for comparison can limit the significance of the comparison. Understandably, the investigator has no control over the amount of questioned soil available for comparison in most cases, but has substantial control over the amount and number of known specimens that are collected. Generally, thirty-five milliliters of soil is sufficient, the approximate volume, coincidentally, contained by a thirty-five millimeter film canister.

The number of samples is dictated by the nature of the crime and investigation. Before packaging a sample of soil, air dry it overnight at room temperature (because packaged moist soil can induce the growing of plants, and plant nutritional demands can alter soil characteristics; consequently, undermining the effort and value of collection and comparison). Then, package, seal, and properly label it.

A forensic soil examination is a comparison between two or more soils to determine if they share a common origin. The examination is conducted by comparing color, texture and composition. These characteristics are locality dependent and sensitive to a variety of influences. Differences in any of these characteristics tend to disassociate two soils; therefore, properly sampling and documenting an adequate number of specimens greatly increases the likelihood of associating soils that share a common origin.

Glass

The American Society for Testing and Materials (ASTM) defines glass as "the inorganic product of fusion which has cooled to a rigid condition without crystallizing." However, conceptually, and for practical purposes, glass can be regarded as a hard, rigid, brittle solid that is usually translucent to transparent.

The examination of glass can be divided into several categories based on its optical, physical and chemical properties.

Fracture Analysis

Given that glass behaves like a brittle solid when broken, the resulting fracture or perforation may yield valuable information regarding the type and general speed of the responsible object, and sometimes, the general direction of impact, also referred to as the angle of incidence.

With regard to the type and general speed of the object, there are two general categories: fractures and perforation that are characteristic of objects travelling at what can be described as a "high velocity," and those believed to have been travelling at a relatively "low velocity."

High velocity impact fractures and perforations are usually characteristic of the projectile being propelled by a means other than "arm thrown," namely, a bullet from a firearm, a rock from a slingshot, a BB from an airgun and the like. These fractures and/or perforations typically produce an individual hole with small and limited radial fractures. They morphologically resemble a "cone," with a greater amount of glass absent on the opposite side of the impact.

Low velocity impacts, conversely, are characterized by an increased number of well developed radial fractures, usually

accompanied by concentric fractures surrounding the point of impact.

There are a number of variables that contribute to the resulting characteristics of the fracture: the size and hardness of the projectile, its shape and density and the distance between the "shooter" and the window, which relates to the projectile's initial and terminal velocities. Also, the thickness and type of glass affect the type of fracture or perforation to be sustained by the window. Accordingly, the interpretation of the fracture can depend upon reasonable assumptions that are likely developed through other aspects of the investigation.

When large pieces of glass are recovered from two different locations, there exists the possibility that pieces from each source may be physically fitted together. This type of association is considered "individual" or single source, to the exclusion of another source. It is possibly the strongest association between glass specimens.

Submitting Glass Specimens

Glass specimens, depending on their size, should be properly preserved. Large sheets or containers should be packaged in hard, sturdy, shock absorbing containers.

Smaller particles travel well in 35 mm film canisters. All specimens should be sealed, and known and questioned specimens should be isolated from each other to prevent cross-contamination in the case of damage and leak age during shipment. When the size of recovered glass is too small for fracture fitting, optical and compositional analytical techniques will be employed to compare the specimens.

The omnidirectional nature of breaking glass serves law enforcement by typically transferring glass particles from the window to the suspect's hair and/or clothing and,

subsequently, to the soles of his/her shoes. Particles may also become embedded in the object used to break the glass. Accordingly, the proper preservation and examination of these specimens may associate a suspect with the crime scene long after they have departed.

Typical window glass can be compositionally considered a soda - lime- silicate; soda, referring to the sodium component, derived (in part) from salt lime contributes calcium and comes from limestone, silicate refers to the element silicon which quartz sand provides— this is a simplified/idealized formula.

The complete elemental composition is responsible for a variety of glass properties. Some are desirable ones to facilitate the manufacturing process, others tailored to end use properties like transparency. There are numerous elements that, although minor in proportion, significantly contribute to the product.

Historically, refractive index (RI) determinations have been used to compare small particles of glass (particles as small as specks of finely ground black table pepper).

The RI of glass is dependent upon its composition and temperature. The temperature of the specimen is controlled by the laboratory, its composition established by the manufacturer as per the recipe given desired properties. By determining the RI of glass particles, the examiner can indirectly infer something about the composition.

If two particles share the same RI, they likely have similar compositions and, hence, could have been produced by the same manufacturer at the same time.

If particles are of sufficient size, similar to that of very coarse sand (1-2 mm) they can be analyzed compositionally. Specific elements can be identified in concentrations measured

in parts per million (PPM). When specimens are compositionally indistinguishable there is increased scientific certainty that they share the same origin.

Building Materials

Building materials encompass a variety of construction-related products, and selected building materials are generally natural or man-made mineral and/or rock products.

Hardened concrete can be differentiated from other seemingly similar samples by comparing its color, texture and composition, to include its aggregate. A wide variety of mineral aggregates are used that may help restrict the number of possible sources from which a piece of concrete block or similar building material could have originated.

Wallboard is principally gypsum. When discovered on tools or clothing it can support the modus operandi as observed from the crime scene. Additionally, the composition of wallboard can vary from type to type and manufacturer to manufacturer, hence, it too can sometimes be somewhat specific regarding its origin.

Similar reasoning applies to other mineral-based building materials. Refer to pages 91 through 115 for protocols regarding collection, preservation, and handling to ensure that all of the forensic benefits can be obtained once the evidence is received by the Laboratory.

Explosives

Instrumental analyses of explosives and explosive residues are conducted to determine:

- From unknown substances, if they are high explosive, low explosive, mixtures of explosives, or incendiary mixtures.
- From confiscated or unknown

explosives, if they are (by compositional analysis) consistent with known explosive products or homemade mixtures like those used in previous bombings.

- From explosive residues, the type of explosive(s) used to cause the explosion.

While some explosive residues are water soluble and they must be protected against rain or excess of moisture, other residues evaporate quickly. They should be collected as soon as possible in airtight containers and submitted to the Laboratory in a timely fashion. Explosive residues can be deposited on metal, plastic, wood, paper, glass, etc.

The presence of a trained explosives chemist at crime scenes is very important, but if not possible, evidence collected for residue analysis must never be touched by "unprotected" hands and must be packaged in clean containers.

This policy should be followed by bomb technicians conducting bombing crime scene investigations. They are usually contaminated with explosives because they are not only in contact with explosives during their training exercises but also within their working environment. If you have any questions, call us at 202-324-4341.

Metallurgy Examinations

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

Examinations for Comparison Purposes

To determine if two metals or two metallic objects came from the same source or from each other, the Laboratory must evaluate surface characteristics, microstructural characteristics, mechanical properties, and composition.

Surface Characteristics: Are evaluated from macroscopic and microscopic features exhibited by the metal surface on 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.

Microstructural Characteristics: Are revealed by optical and electron microscopy of the internal structural features of a metal. 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.

Mechanical Properties: Describe the response of a metal to an applied force or load, e.g., strength, ductility, and hardness.

Composition: Determines 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 with substantial elemental variations, small metal samples or particles may not be representative of the composition of the bulk metal.

Examinations for Informational Purposes

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

- 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.

- 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.

- Rusted or corroded metal.

To determine the length of time a metal has been exposed to the environment, it is necessary to submit information concerning the environmental conditions surrounding the item when it was recovered.

- Cut or severed metal.

1. Methods by which a metal could be severed are by sawing, shearing, milling, turning, arc cutting, flame cutting (oxy-acetylene torch or "burning bare"), etc.

2. Relative skill of the individual who made the cut.

- 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.

- Nonfunctioning watches, clocks, times 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).

- 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.

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

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.

- Objects with questioned internal components.

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

- Items with obliterated identification markings.

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, call for restoration procedures when processing items too large or heavy for submission to the Laboratory.

The FBI does not provide gunshot primer residue examinations, but some state laboratories do. The instructions on collection of residues, provided next, are for information only. If you have any questions about this subject, call us at 202-324-4391.

Gunshot Primer Residues on the Hands of Suspects

When a person discharges a firearm, primer residues are deposited on that person's hands in varying amounts. These amounts are dependent upon the type, caliber, and condition of the firearm and the environmental conditions at the time of the shooting. Residue samples may be collected from a suspect's hands and analyzed for the presence of the chemical elements antimony, barium and lead, which are components of most primer mixtures. The

technique used to analyze these hand samples is dependent upon the type of samples collected from the suspect's hands.

Washing of the hands and various other activities on the part of the suspect may remove the residue; therefore, it is imperative to obtain samples as soon after the shooting as possible. Samples obtained more than five hours after a shooting are generally of little value and normally will not be analyzed.

Samples obtained from the hands of victims of close-range shootings (within approximately 10 feet) are generally of no value. It is not possible to differentiate between residues deposited on the hands of a suspect and victim of a close-range shooting; therefore, samples from the hands of victims are not normally accepted for analysis.

Sampling Procedures

There are two types of analyses for gunshot primer residues, "bulk" and "particle."

Use commercially prepared kits.

Do not attempt to fabricate sampling kits without specific knowledge of the potential hazards that such kits can introduce into the analysis.

Avoid touching the hands of the person from whom the samples are being taken.

• Bulk Analysis Sampling Procedure

1. Remove the pair of swabs from the package labeled "Right Back," being careful not to touch the cotton tips. Using the dispensing bottle provided, moisten each swab with two or three drops of five percent nitric acid solution.

2. Thoroughly swab the portion of the back of the thumb, forefinger and connecting web area of the right hand and return the swabs to their package.

Note: Thorough swabbing is accomplished by swabbing for approximately 15 seconds with each swab and rotating the swab so as to utilize all surfaces of the cotton tip.

Do not swab any portion of the fingerprint pattern area during this step.

3. Repeat step one using the swabs from the package labeled "Right Palm."
4. Thoroughly swab the palm area of the right hand and return swabs to their package.
5. Perform the same procedure on the left hand.
6. Prepare the swabs from the package labeled "Control" as in step one. Return swabs to their package without touching them to any surface.
7. If an expended cartridge case is available, prepare the swab labeled "Cartridge Case" as in step one, then swab the base of the inside of the expended cartridge case.
8. Mark all samples for identification and seal the kit.

• Particle Analysis Sampling Procedure:

Particle collection kits consist of sticky disks which are dabbed on the same general areas of the hands as described above. There are variations among kits and instructions for sample collection will be included in each kit.

The kit selected must be compatible with requirements of the instrumentation used in

the analysis. Sample kits submitted to the laboratories may need to be compatible with the CamScam Electron Microscope System or any other system.

Tri-Tech Inc.
**GUNSHOT RESIDUE
EVIDENCE COLLECTION KIT**

FROM

SUBJECT'S NAME: _____
OFFICER'S NAME: _____
OFFICER'S BADGE NUMBER: _____
AGENCY'S NAME: _____
AGENCY CASE NUMBER: _____

CHAIN OF POSSESSION

RECEIVED FROM: _____
DATE: _____ TIME: _____ AM
RECEIVED BY: _____
DATE: _____ TIME: _____ PM
RECEIVED FROM: _____
DATE: _____ TIME: _____ AM
RECEIVED BY: _____
DATE: _____ TIME: _____ PM
DELIVER SEALED KIT TO CRIME LABORATORY AS SOON AS POSSIBLE

FOR CRIME LABORATORY PERSONNEL ONLY

CRIME LABORATORY CASE NUMBER: _____

Commercially prepared kit from:
Tri-Tech Inc.
5108 Revere Road
Durham, North Carolina 27713
telephone 1-800-438-7884

Latent Fingerprint Services



The Latent Fingerprint Section (LFPS) examines evidence for latent fingerprints, palm prints, and footprints, both in the Laboratory and, in special circumstances, at the crime scene. The LFPS also conducts lip print examinations and responds, when requested, to the scenes of disasters to aid in identifying the deceased victims. In addition, this Section provides training to local, state, and federal law enforcement personnel in all aspects of latent fingerprint work and conducts research to evaluate new technologies, procedures, and equipment. If you have any questions, please call the Latent Fingerprint Section at (202) 324-2163.

Latent Print Examinations of Evidence

The LFPS examines lifts, negatives, photographs, or original objects for latent prints of value for comparison purposes and also com-

pares latent prints with any submitted known prints or named individuals whose prints are contained in the FBI's criminal and civil files. In unknown subject cases, the LFPS conducts computerized searches of latent prints in FBI criminal files.

- At the time of the original examination, Specialists prepare photographs and negatives of latent prints of value which are retained for any future comparisons.
- There is no need to re-submit the original evidence when making subsequent requests for comparisons.
- All original evidence is returned to the contributing agency unless directed by the contributing agency to make some other disposition.

In certain situations, the LFPS conducts examinations even though the evidence has been subjected to the same technical examination by other experts.

Expeditious examination of the specimens is available; however, priority treatment should be requested only when absolutely necessary.

Developing Latent Prints

Caution!

When preparing or utilizing latent print development processes, take all appropriate safety precautions. Refer to the container labels and the manufacturer's safety data sheets (MSDS) for all chemicals before coming into contact with these materials. Use appropriate protective equipment when processing for latent prints, including the use of fingerprint powders.

LFPS maintains based and portable lasers, as well as alternative light sources, for the detection of latent prints. If possible, examine all evidence with a laser or alternative light source for the presence of inherent latent print fluorescence, before utilizing any other method of latent print development.

After examination of nonporous or nonabsorbent surfaces, such as glass, metal, painted or varnished wood, ceramic tile, etc., with a laser, the LFPS uses fumes from cyanoacrylate glue, and then the application of fingerprint powders.

The FBI recommends the use of gray and black powders since other colors can be more difficult to photograph.

When powdering for latent prints, choose a color of powder to contrast with the color of the surface being examined, with the exception of highly reflective surfaces, such as mirrors and polished chrome. For photographic purposes, the FBI recommends using only gray powder on reflective surfaces.

Do not apply powder to obviously greasy, wet, or bloody surfaces, or to prints left in dust or putty. Photograph these types of prints. Allow any wet surfaces to fully dry before attempting to apply fingerprint

powders. Blood prints should also be dry before application of any blood reagent, such as amido black, DAB, etc.

Chemical dye staining of nonabsorbent surfaces with a fluorescent product, such as rhodamine 6G, RAM, etc., followed by a laser or alternative light source examination, may enhance the quality of latent prints already developed or make additional latent prints visible.

Use a solution of gentian violet to develop latent prints on the adhesive side of tape after the nonadhesive side has been appropriately examined.

Use chemical processes for most porous or absorbent surfaces such as paper, cardboard, or unfinished wood. Iodine fuming, DFO (followed by laser or alternative light source examination), ninhydrin, physical developer, and silver nitrate are some of the processes utilized to develop latent prints.

A zinc chloride solution may enhance weak or poor quality ninhydrin-developed prints. In order for this enhancement process to be productive, the specimen must be exposed to laser light or an alternative light source after treatment.

Preservation of Latent Prints

Preservation of latent prints dictates that a permanent record, such as photographic negatives and photographs, be ready for comparison and prosecutive purposes.

Photographing: It is recommended that all latent prints of value be photographed. If possible, photograph latent prints developed with fingerprint powders before lifting.

Lifting: Transparent tape, black or white rubber lifting tape, or a suitable substitute are generally used to lift latent prints.

When transparent tape is used, the color of the backing card should be in contrast to the color of the powder used.

Fingerprint Cameras and Photography of Latent Prints

- Many cameras can be used to photograph latent prints. A primary consideration in selecting a camera would be its adaptability to one-to-one photography. If a small format camera (35mm) is used, necessitating less than one-to-one photography, a scale must appear in each exposure.
- Include within each photograph an identifying tag indicating the object on which the latent print was developed, the method of development, and the case or file number.
- Take at least two photographs of each latent print with variations in exposure times.
- At a crime scene, maintain a photographic log of each shot, including needed dates, initials, and other data pertaining to the crime scene.

Transmitting Evidence to the Latent Fingerprint Section

- Place nonporous items in individual nonporous protective coverings, such as thick transparent envelopes. Stabilize each item within each protective covering to avoid any movement or friction during shipment. Send it Registered Mail, unless it is a hazardous or explosive material.
- Place porous items in a protective covering, such as a paper envelope. Cardboard cartons need not be shipped in assembled position, but may be flattened out and covered with a protective wrapper. If the material is not hazardous or explosive,

send it by Registered Mail.

If possible, place lifts in one container and send them by Registered Mail.

If evidence is exclusively for latent fingerprint examination, direct it to:

Director
Federal Bureau of Investigation
Attention: FBI Laboratory
Latent Fingerprint Section
10th Street and Pennsylvania Ave., N.W.
Washington, D. C. 20535

If evidence requires additional examination, other than those provided by the LFPS (firearms, DNA, document, etc.), direct it to:

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

Examination of Fingers and/or Palms and Feet of Deceased Individuals

The following conditions/restrictions apply to submissions of human fingers and/or palms and feet: A written certification that the deceased did not have AIDS, i.e., the deceased has been tested for AIDS. If the test is positive, or the body parts are from an individual known to have AIDS, **they should not be submitted.**

If the test result is negative, the body parts may be submitted. If the body is badly decomposed for an AIDS test to be conducted, this fact should be stated in the communication accompanying the body parts.

When submitting fingers, skin, hands or feet, place them in an unbreakable airtight container with a 70 percent solution of alcohol and state this fact in the accompanying correspondence.

Do not submit entire hands, unless there is a special need to do so. Amputate and place each finger in an individual container, appropriately labeled (right thumb, right index, etc.).

Using special techniques, FBI Fingerprint Specialists will attempt to derive a ten-finger classification which permits a file search through the fingerprint file. While adequate for identification purposes, fingerprints of value obtained from decomposed bodies are often not classifiable.

If unable to determine the ten-finger classification needed for a search of fingerprint files, the LFPS will preserve all prints of value. These prints will be compared with persons named by the contributor, if their prints are found in the FBI's criminal or civil files.

Additionally, if less than ten fingerprints are obtained (sufficiently legible for classification) and the necessary physical descriptions of the deceased, i.e., race, sex, approximate age, etc., are furnished, an automated search of the FBI's criminal fingerprint files will be conducted in an effort to identify the deceased.

All human remains such as hands, fingers, or feet, must be returned to the contributor, inasmuch as the FBI has no facilities or authority for disposal of such items.

When investigating a deceased person, follow these procedures:

- Take inked fingerprints and palm prints for comparison with latent prints.
- If legible inked prints are not obtainable, sever hands (with proper authority, such as from a local coroner or medical examiner) and forward in accordance with previously stated shipping instructions.

Latent Print Testimony

FBI Latent Fingerprint experts testify in court to their findings for federal civil and criminal matters, and for duly constituted state, county, and municipal law enforcement agencies in connection with official investigations of criminal matters.

Use the LFPS' report in lieu of FBI expert, if legal considerations permit, at any pretrial action, such as a preliminary hearing or grand jury presentation.

The sample report on the next page reflects the results of a latent print examination of evidence submitted by a local law enforcement agency.

FBI Disaster Squad

- Travels to the disaster site and fingerprints deceased victims.
- Assists in identifying deceased victims.
- Requires consent from ranking official of federal, state, or local law enforcement agency having jurisdiction, coroner/medical examiner, or other government official.
- Requests for assistance should be made through nearest FBI field office.

Advanced Latent Fingerprint Schools

The LFPS provides Latent Fingerprint Specialists to teach advance latent fingerprint schools for local law enforcement. Submit your request to the local FBI field office in your jurisdiction. The FBI will furnish technical equipment while the law enforcement agency must provide space. A minimum of 15 and a maximum of 25 students must be in attendance.



FEDERAL BUREAU OF INVESTIGATION
WASHINGTON, D. C. 20535

Date: March 22, 19—

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

FBI File No. 95 A-HQ 7 777 777

Lab No. E-73821

REGISTERED

Reference: GUY PIDGIN;
EMPALL MERCHANDISE MART
RIGHT CITY, STATE
MARCH 16, 19—
BURGLARY

Your No. 12-741

Re: Letter March 17, 19—

Specimens: Piece of metal, Q5
Ten transparent lifts
Fingerprints of Guy Pidgin, FBI #213762J9

Four latent fingerprints of value were developed on the piece of metal, Q5. Twelve latent fingerprints of value appear on five of the lifts. 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 latent prints are not the fingerprints of Pidgin.

Photographs of the unidentified latent prints are available for any future comparisons you may request. The remaining latent prints are not the fingerprints of Pidgin.

(Continued on next page)

Mr. James T. Wixling

March 22, 19—

Should you desire the assistance of one of the FBI's fingerprint experts in the trial of this case, we should be notified in ample time to permit the necessary arrangements. This report should be used, however, if legal considerations permit, in lieu of the appearance of our expert in any pretrial action such as a 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, that is, that the impressions in question are those of one and the same individual. The services of our representative should be utilized in a manner that would minimize our expert's time away from Headquarters.

The lifts and the fingerprints of Pidgin, which should be retained for possible future court action in this case, are enclosed.

The result(s) of the other requested forensic examination(s) and the disposition of the remaining specimen(s) will be furnished in a separate report.

Enclosures (11)

Forensic Science Research and Training Center (FSRTC)



The Forensic Science Research and Training Center (FSRTC) provides quality research and training programs, as well as operational assistance and information exchange, in the forensic sciences and bombing matters to the FBI, other federal, state, and local law enforcement, public safety agencies, and crime laboratories. The FSRTC is divided into two units, the Research Unit, and the Training Unit, which are discussed in further detail below. If more information is needed, contact the Forensic Science Research and Training Center, Quantico, Virginia, telephone (703) 640-1181 or (703) 640-1123.

Forensic Science Research and Training

Forensic science research improves the examination techniques which involve technical methodologies used to support field operations. Programs sponsored by the Forensic Science Research Unit (FSRU) include the following:

Counternarcotics/counterterrorism technology development.

DNA research for human identification includes:

1. Technical development for the Combined DNA Indexing System (CODIS),
2. Technical Working Group on DNA Analysis Methods (TWGDAM).

General forensic chemistry research.

Participation in the Technical Support Working Group, National Security Council's Policy Coordinating Committee on Terrorism.

Foreign Visitors and Training Programs:

1. FBI Director's Honors Internship Program and the University of Virginia Intern Program.
2. Visiting Scientist Program for scientists from state, local, and international laboratories.

Forensic science training increases the awareness of the probative value of physical

evidence among all law enforcement personnel, enhancing at the same time the analytical skills and technical capabilities of crime laboratory personnel from federal, state, and local crime laboratories.

A wide spectrum of forensic science training courses is offered. They range from basic courses in the collection and preservation of bombing, arson, and general physical evidence, and extend to advanced methodology in instrumental analysis and biochemistry. Class sizes range from approximately 8 to 40 students for the different courses. The following courses are included in the program:

Administrative Advanced Latent Fingerprint

Advanced Aspects of Forensic DNA Analysis

Advanced Techniques of Document Examination for Laboratory Personnel - Typewriters and Other Printing Devices

Amplified Fragment Length Polymorphism Analysis in the Forensic Laboratory

Atomic Absorption for Primer Residues

Chromatographic Methods in Forensic Science

Collection and Preservation of Physical Evidence

Crime Laboratory Forensic Photography

Detection and Examination of Footwear Impression Evidence

Detection and Recovery of Human Remains

Forensic/Laboratory Application of DNA Typing Methods

Forensic Infrared Spectrometry Seminar

Fundamentals of Document Examination for Laboratory Personnel

Gunpowder and Primer Residues

Instrumental Analysis of Paints & Plastics

Introduction to Hairs and Fibers

Laboratory Examinations in Arson Matters

Latent Fingerprint Photography

Latent Prints - Contemporary Approaches

Law Enforcement Polygraph

Police Arson Crime Scene Investigation

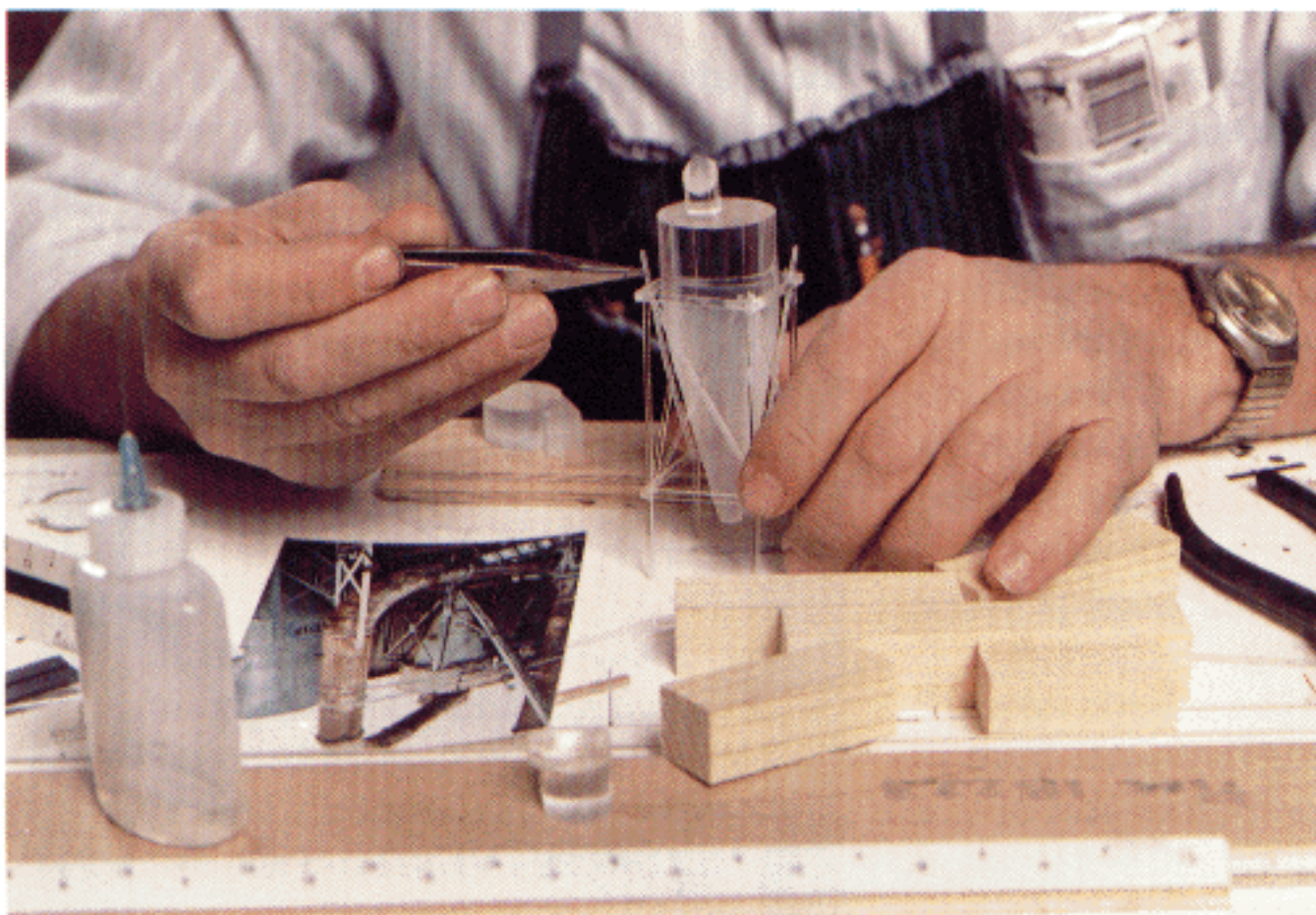
Police Composite Artist

Police Photography

Post-Blast Investigators' School

Specialized Techniques in Firearms Identification.

The Forensic Science Training Unit publishes the Forensic Science Training Program catalog, listing all the courses with accompanying dates, course descriptions and application. In addition to the forensic science training program, conducted at the FBI Academy, short courses are also taught throughout the country for local and state law enforcement agencies and police training academies. These courses are given by the training staff of the Forensic Science Training Unit when scheduling allows them to be away from their assigned instructional duties at the FBI Academy. The courses available include three-day workshops in specialized areas of photography, and one-week courses in collection and preservation of physical evidence and latent fingerprint matters. These courses are coordinated through the local FBI field offices.



Special Projects Services

(Above)

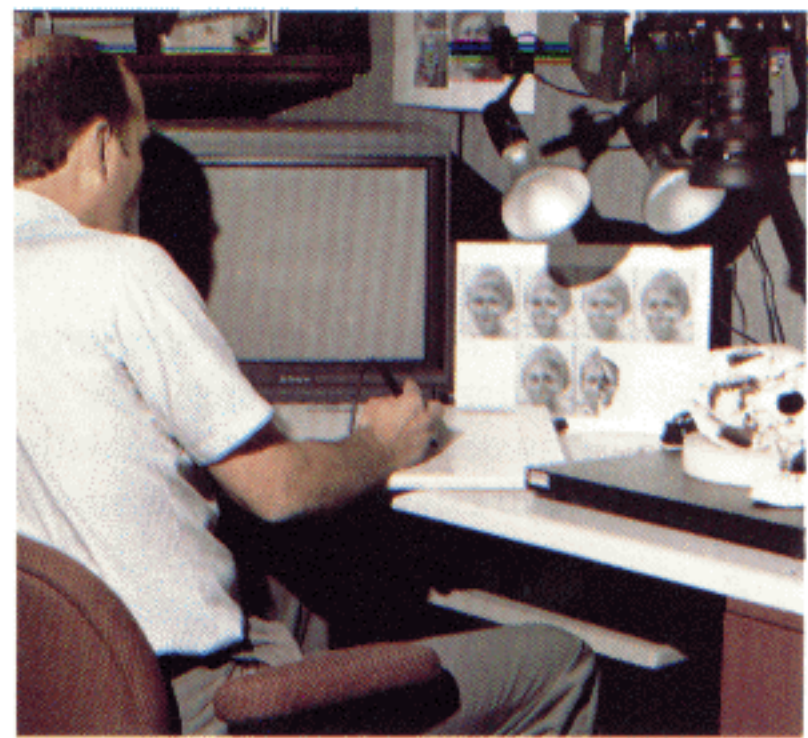
Visual Information Specialist preparing a three-dimensional-trial model

(Right)

Superimposition of skull and photograph to match facial and skeleton features

(Below)

Trial exhibit for courtroom presentation



(Below) Artist-composite drawing used to match witness' description of suspect



The Special Projects Section's five units: Graphic Design, Photographic Processing, Special Photographic Services, Structural Design/Visual Production, and Video Enhancement provide services which are described in the following pages. If you need assistance, call us at (202) 324-4220.

Graphic Design Services

Graphic Design includes high quality, sophisticated graphics used for investigative, prosecutive, and related purposes. These graphics include charts, maps, diagrams, technical renderings, and scale architectural and engineering drawings which are used as demonstrative evidence, two- and three-dimensional crime scene diagrams, artist composite drawings, photographic retouches, facial age progressions, computerized photo-imposition, two- and three-dimensional facial reconstructions, Administrative Inquiry - Shooting Inquiry graphic support, computer animation, and a wide array of investigative graphic support for active investigations.

Photographic Processing Services

The Photographic Processing Services include providing imaging and photographic reproduction for the FBI and certain other law enforcement agencies through prior arrangement. Services range from production of 35 mm slides from computer files, outputting digital files to photographic material, processing of photographic film, processing of microfilm and microfiche, production of photographic prints from 4x6 to 40x60 inches, enlargement of images of shoeprints, etc., to precise scale as well as mass production of photographic images for distribution, briefings, etc.

Special Photographic Services

The Special Photographic Services include Forensic Photography, Crime Scene Documentation, Bank Surveillance Films, Digital Image Processing, and Miscellaneous Photographic Examinations.

- Forensic Photography consists of specialized techniques such as infrared, ultraviolet, and monochromatic photography to assist in rendering visible, latent photographic evidence which is not otherwise visible to the unaided human eye. Examples of this type of evidence include, alterations and obliterations to documents, invisible marking, and indented writing.

- Crime Scene Documentation consists of specialized photography that can be both general and applied for precision measurements in inaccessible crime scene locations.

- Bank Surveillance Films are the most common types of examinations in Bank Robbery cases. These examinations provide the following information:

1. Comparison of clothing recovered from the subject to clothing depicted in the bank robbery film. This also applies to items carried by the bank robber and compared to items recovered from the subject.
2. Determination of the bank robber's height include various methods such as photogrammetry and re-photographing the crime scene.
3. Comparison of facial features of the bank robber depicted in the surveillance film with known photographs of the subject.

- Digital Image Processing includes the enhancement of poor quality photographic negatives. However, they will usually provide limited improvement in general image quality. The best results are achieved when examining lettering on a hat, license plate numbers, or similar problems.

• Miscellaneous Photographic examinations include the use of numerous techniques. Each photographic examination is unique, and much intelligence can be obtained from analysis of photographic evidence. The negative, print, camera, and image can all provide both evidence and intelligence which can greatly assist an investigation or prosecution. The examination of film/negatives can be utilized for the following:

1. To determine if a negative was exposed by a specific camera,
2. To determine if a photograph has been altered,
3. To determine the date of manufacture of Polaroid film, and
4. To prepare a print from the old style "throw away" negative.

Structural Design/Visual Production Services

Structural Design specialists design and produce three-dimensional visual material, including scale trial and training models. These specialists also travel to the field to gather information for model construction or to provide operational support. Many requests have short deadlines and are sensitive in nature. Visual Information Specialists are available to testify in court when necessary.

Visual Production services include the preparation of items that are used during trials, conferences, and also used as investigative aid.

- Engraved items for presentation,
- Custom plastic moulding of items

for three-dimensional-trial models,

- Mounting of charts and photos for trial and display,
- Silk screening.

Video Enhancement Services

The Video Enhancement Services include the examination, enhancement and processing of evidentiary videotapes and the reconstruction of physically damaged videotapes submitted in connection with a criminal or intelligence investigation. Experts prepare enhanced or processed photographs or videotapes and provide testimony regarding the techniques or technology used in the examination.

- Video image processing and enhancement,
- Photographic prints from video imagery,
- Reconstruction of damaged videotapes,
- Crime scene documentation,
- Synchronization of surveillance audio to videotapes,
- Video demonstrative evidence,
- English subtitles of surveillance videotapes in foreign language,
- High speed video.

Technical Services



Engineering Section

Introduction

The Information Resources Division (IRD), Engineering Section (ES) develops, procures, and deploys many types of technical equipment used to support the FBI's investigative activities. The ES also conducts examinations of electrical and electronic items, analyzes magnetic recordings, provides expert testimony regarding findings, and provides technical assistance in special situations such as kidnaping cases and airline disasters. Address your request for examinations to: Federal Bureau of Investigation, Engineering Research Facility, Audio/Video Signal Processing Program, Building 27958 A, Quantico, Virginia 22135, or call (703) 630-6722 for information. When requesting examination(s) of evidence, please include the information requested on page 81.

Specific Forensic Services

Audio/Video Tape Analysis

- Determines authenticity in response to allegations of tampering and/or alteration of an audio or video recording made by a defense expert but the legitimacy of the recording cannot be established through chain of custody and testimony. Submit the audio recorder, accessories used to make the questioned recording, and the original recording.

- Identifies, compares, and interprets nonvoice sounds on original tape recordings, including telephone dialing, gunshots, and radio transmission signatures. Submit only the original recordings.

- Identifies the speaker. The spectrographic (voiceprint) technique is used to compare the recorded voice of an unknown individual with a known recorded sample of a suspect's voice. Submit verbatim known samples with no less than 20 comparable words and original recordings.

Speaker identification is conducted solely for investigative guidance. No court testimony is provided. Findings regarding speaker identification by the spectrographic method are not considered conclusive, because of the limited scientific research regarding the reliability of the examination under the varying conditions of recording fidelity, interfering background sounds, restricted frequency ranges, voice disguise, sample size, and other factors commonly encountered in investigative matters.

- Sound recording comparisons to provide an aural examination that determines if a recovered "bootleg" tape recording contains the same material as a copyrighted commercial tape.

- Tape duplication provides standard format copies from unusual or obsolete tape or disc recordings.

- Tape enhancement is a process for selective suppression of interfering noise on audio recordings or the audio track of video recordings, which improves the voice intelligibility. Submit only the original recordings.

- Video tape analysis is a process to improve visual clarity and make high quality still photographs of images from original video recordings using digital signal processing. Also conducted are comparisons of known and suspect video recordings for copyright violations, authenticity examinations, and video standard conversion.

- Repair/restoration of damaged audio and video tapes to allow proper play back.

Electronic Devices Analysis

- **Electronic Device Examination**

1. Identifies passwords assigned to data contained in electronic memory devices and electronic organizers.
2. Identifies countermeasures equipment used in suspected criminal activity for detecting of wire taps and "bugging devices."
3. Provides support to the Explosives Unit of the Laboratory Division by analyzing timing circuits, radio frequency circuits, and other electronic means of detonating explosive devices.
4. Provides analyses of the electronic components in hoax bomb devices

to determine origin of parts and components.

- **Interception of Communications**

1. To identify devices attached to telephone lines which monitor, record, or transmit telephone conversations as a radio signal to a remote location (known as Wire Taps) and determines their operating characteristics.
2. To identify devices which allow a room conversation to be monitored by a remotely activated microphone on a telephone line (known as Infinity Transmitters).
3. To identify telephones which have been modified to monitor a room conversation when the telephone is not in use (known as Compromised Telephones).
4. To identify miniature transmitters, concealed microphones and recorders designed to surreptitiously intercept oral communications (known as Bugging Devices) and determines their operating characteristics.
5. Examination of VideoCipher Satellite descramblers to determine if they have been modified to allow the unauthorized decryption of satellite cable programming (known as Satellite Descramblers).

- **Miscellaneous Devices Examination**

1. Identifies devices used to defeat burglar alarm systems.
2. Identifies radio transceivers, scanners, tracking devices, and the frequencies used.
3. Identifies electronic devices of unknown use or origin believed to have been used

in the commission of a crime.

Include the following information with your request for examination(s) of evidence:

- Indicate any previous correspondence submitted to the FBI which is related to your requested examination.
- Include the name(s) of the subject(s), suspect(s), or victim(s); violation; and investigative case number.
- Describe the evidence enclosed or submitted under separate cover. If evidence was recorded, describe the problem.
 1. Send evidence via U.S. Postal Service (USPS) by Registered Mail. If you choose the Federal Express or another overnight carrier, use their "protective signature," "security signature," or other type of service which provides the same protection as the USPS registered mail.
- Indicate the type of examination requested. If appropriate, state how many copies are needed and their format (i.e., DAT, standard audio cassette, VHS video).
- Indicate if expeditious handling is required, the reason, and the exact date the examination should be completed.
- Include the name and telephone number of the person to be contacted should a question arise concerning the examination. Instead of the post office box of the contributor, include full street address where to return evidence.

National Center For The Analysis of Violent Crime



National Center for the Analysis of Violent Crime (NCAVC) Services

NCAVC is a law-enforcement-oriented behavioral science and data analysis center designed to consolidate research, training, and investigative/operational support functions for the purpose of providing expertise to any duly constituted law enforcement agency confronted with unusual, bizarre, and/or repetitive violent crime. The NCAVC is composed of two units: Investigative Support and Behavioral Science Services. Questions or requests may be addressed to: National Center for the Analysis of Violent Crime, FBI Academy, Quantico, Virginia 22135, telephone (703) 640-6131.

The NCAVC, Investigative Support Unit offers three programs: Violent Criminal Apprehension (VICAP), Criminal Investigative Analysis (CIAP), and the Arson and Bombing Investigative Services (ABIS) programs.

The VICAP provides the following services:

- A nationwide clearinghouse for the collection, collation, and analysis of solved or unsolved homicides, missing persons, and unidentified bodies.
- A people-based computer-assisted homicide database designed to match cases exhibiting similar characteristics, identify cases that are part of a series, and locate other

cases committed by one offender.

- Notification to agencies with matching cases.
- Preparation of case matrices to compare and contrast detailed information among a group of cases.
- Preparation of offender time lines detailing the travels, date, and location of a known offender for comparison with similar, unsolved cases in the immediate geographical area.
- Organization and facilitation of multi-agency meetings, either on-site or at Quantico, where investigators with cases suspected to be part of a series sit down and compare physical evidence, modus operandi, offender behavior, and other case variables in order to link cases, identify cases that are part of a series, identify cases committed by one offender, and determine prosecutive strategies.

- Operational and administrative suggestions for multiagency task forces, serial offenses, and major violent crime investigations.

The CIAP provides consultation on major violent crimes including arson, child abduction, computer crime, homicide, rape, sexual sadism, and threats with particular emphasis on:

- Traits and characteristics (profiles) of unknown offenders.
- Personality assessments.
- Investigative strategies.
- Interviewing techniques.
- Search warrant affidavit assistance.
- Prosecution strategy.
- Expert testimony.
- Equivocal Death Evaluations.

The ABIS Program is a joint effort of the FBI and Bureau of Alcohol, Tobacco and Firearms (ATF) to provide criminal investigative analyses (profiles) of serial arsonists and bombers to federal, state, local, and foreign law enforcement agencies. Other services provided by ABIS include:

- Investigative Techniques.
- Interview Strategies.
- Prosecutorial Strategy.
- Expert Testimony.

Criminal Investigative Analysis

NCAVC provides services to the law enforcement community through the FBI field offices. If interested, contact the NCAVC Coordinator in the nearest FBI field office.

Expert Testimony

NCAVC members provide expert witness testimony on cases involving the Analysis of Violent Crime.

Research

NCAVC conducts research into violent crime from the law enforcement perspective, attempting to gain insight into criminal thought processes, motivations, and behavior. The research involves examining the crimes associated with a particular criminal as well

as developmental history and background of the offender. Experts with behavioral science backgrounds, professional staff members, and consultants conduct intensive interviews with incarcerated criminals using research protocols.

Insights gained through the research are refined into innovative investigative techniques that are applied to the casework to increase law enforcement's effectiveness against the violent criminal.

Briefings and Consultations

The NCAVC shares information with foreign representatives through special briefings on NCAVC programs and services.

Seminars, Conferences, and Specialized Training

The NCAVC conducts seminars or conferences on issues such as Violence Against the Aging, Community Policing, and Police Psychology. Other specialized training in such areas as death investigation and sex crimes is offered at the Academy and around the country. FBI Training Coordinators in each field office can be contacted for current schedules of training.

Student Internships

The NCAVC offers summer internships for college students through the FBI Honors Internship Program (HIP). The NCAVC also works with colleges and universities for interns during the school year.

Bomb Data Center



The FBI Bomb Data Center (BDC) provides state-of-the-art training and develops technology for public safety bomb disposal technicians, provides operational support to law enforcement agencies during special events and/or crisis management situations, and gathers and disseminates information pertaining to bombing matters. The BDC is responsible for the following programs: Foreign Cooperation, Operational Support, Publications, Research, and Technical Training.

The Foreign Cooperation Program involves the dissemination and gathering of bombing incident statistics and technical information which is shared during bombing seminars with participating foreign authorities. The BDC also disseminates information to foreign bomb data centers through FBI offices abroad.

The BDC provides Operational Support which includes on-scene support, state-of-the-art equipment, and technical personnel who manage critical situations during special events and crisis.

The BDC prepares and disseminates explosive-related publications and criminal bombing incident summaries to local, state, federal, and foreign agencies.

The BDC provides technical research and development into advanced equipment and safer render-safe procedures and techniques.

The BDC oversees the technical training program by administering and funding the Hazardous Devices School, in Huntsville, Alabama, where public safety bomb disposal personnel receive both basic and refresher training. The BDC also offers Regional Seminars for bomb technicians and bomb crime scene investigations.



DOT Labels Identifying Hazardous Materials

Packing and Shipping Evidence . . .

Today's mandatory regulations help ensure that there will be no problems encountered in the shipment of hazardous materials. Regulations are enforced by agencies empowered by specific legislation such as the U.S. Code of Federal Regulations (CFR).

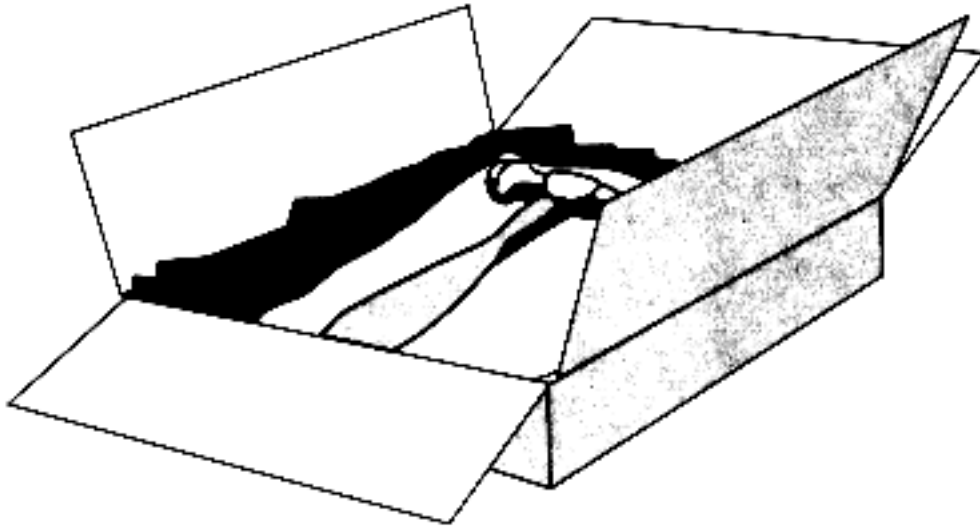
The following pages contain excerpts of Title 29, Occupational Health and Safety Administration (OSHA); Title 42, Department of Health and Human Services; Title 49, Department of Transportation (DOT); International Air Transport Association (IATA); and shipping, handling, and labeling rules for hazardous and nonhazardous materials.

For information on shipping regulations for blood, urine and other liquid diagnostic specimens containing etiologic agents, contact IATA, 1001 Pennsylvania Ave., N.W., Washington, D.C., 20004, telephone (202) 624-2977. When using the U.S. Postal Service, it is advisable to contact the Postal Inspector in your jurisdiction since the U.S. Postal Service has specific restrictions for mailing. For information on shipments that are sent to the FBI Laboratory, call the FBI Laboratory before shipping.

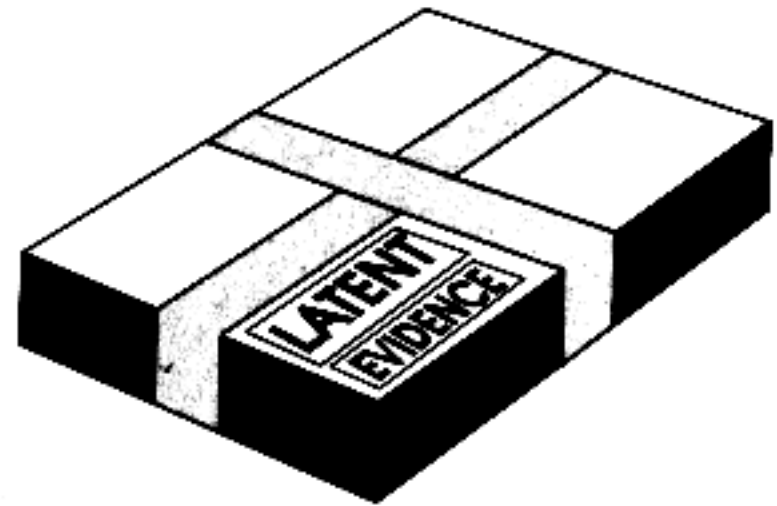
Inquiries concerning the Code of Federal Regulations may be addressed to the Director, Office of the Federal Register, National Archives and Records Administration, Washington, D.C., 20408 (telephone 202-512-1557). The sale of the Code of Federal Regulations is handled by the Superintendent of Documents, Government Printing Office, Washington, D.C. 20402, telephone (202) 783-3238. Additional information on the subject can be found on following pages.

Proper Sealing of Evidence

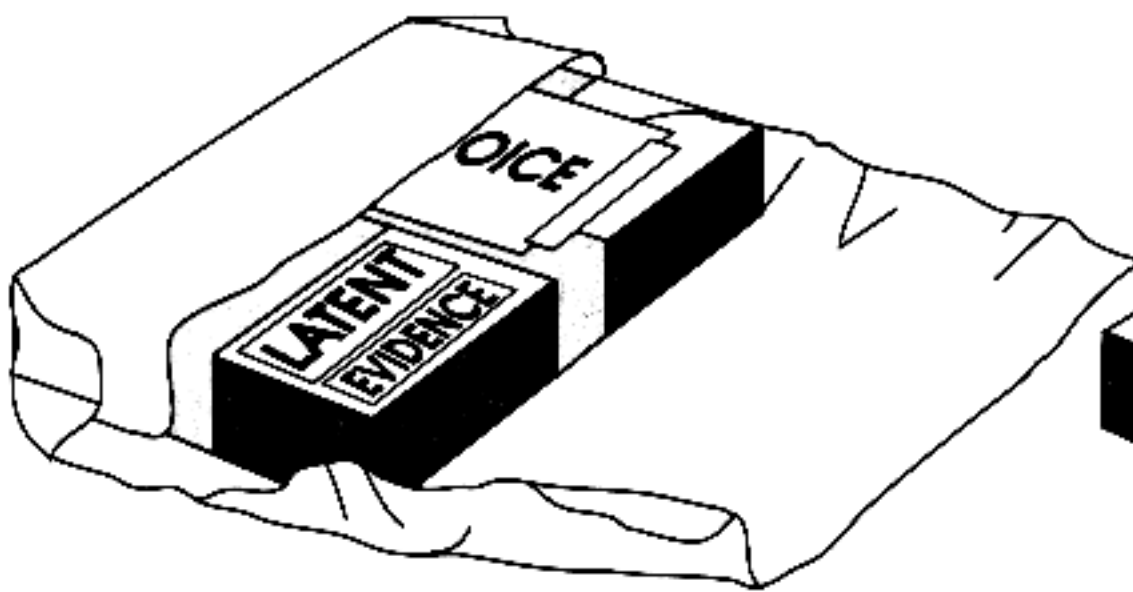
A package containing evidence must have an invoice letter, and it is imperative to have access to this invoice without breaking the inner seal of the package. This must be done to comply with regulations that establish that examiners must receive any kind of evidence as it was sealed and packed by the sender. The first person to receive a package may not be the examiner. The method (shown below) permits access to the invoice without breaking the inner seal.



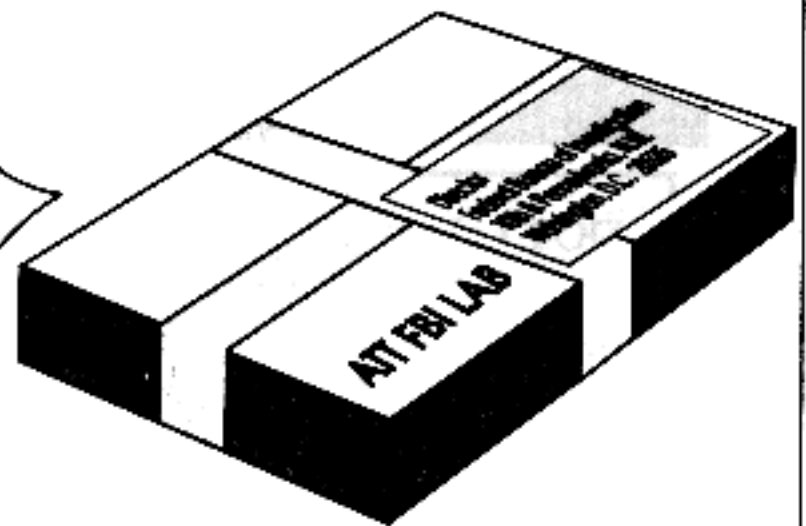
1. Pack bulk evidence securely in box.



2. Seal box and mark it "evidence."



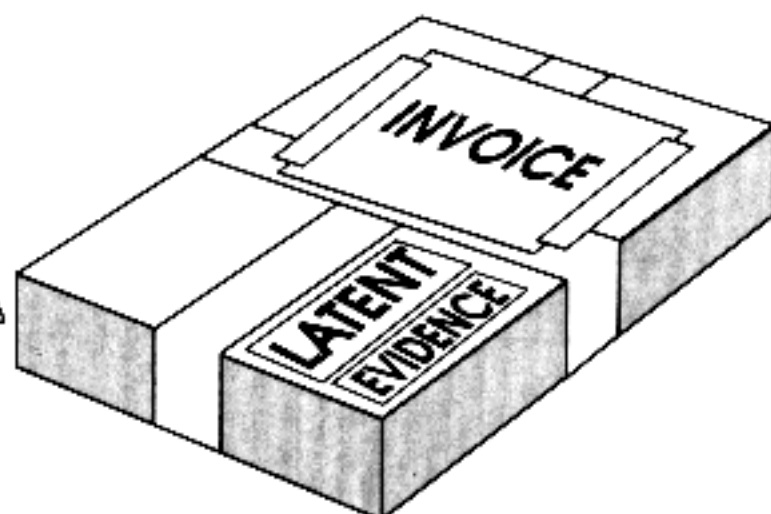
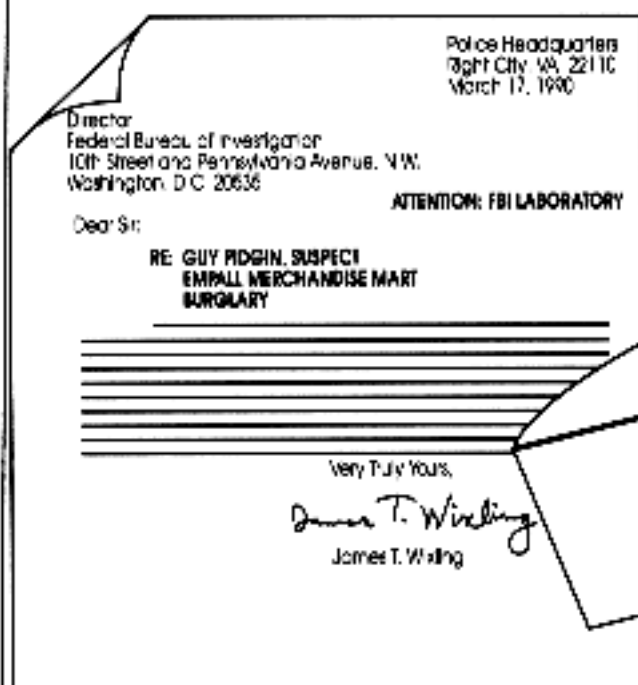
5. Wrap sealed box in outside wrapper and seal with gummed paper.



6. Address to:

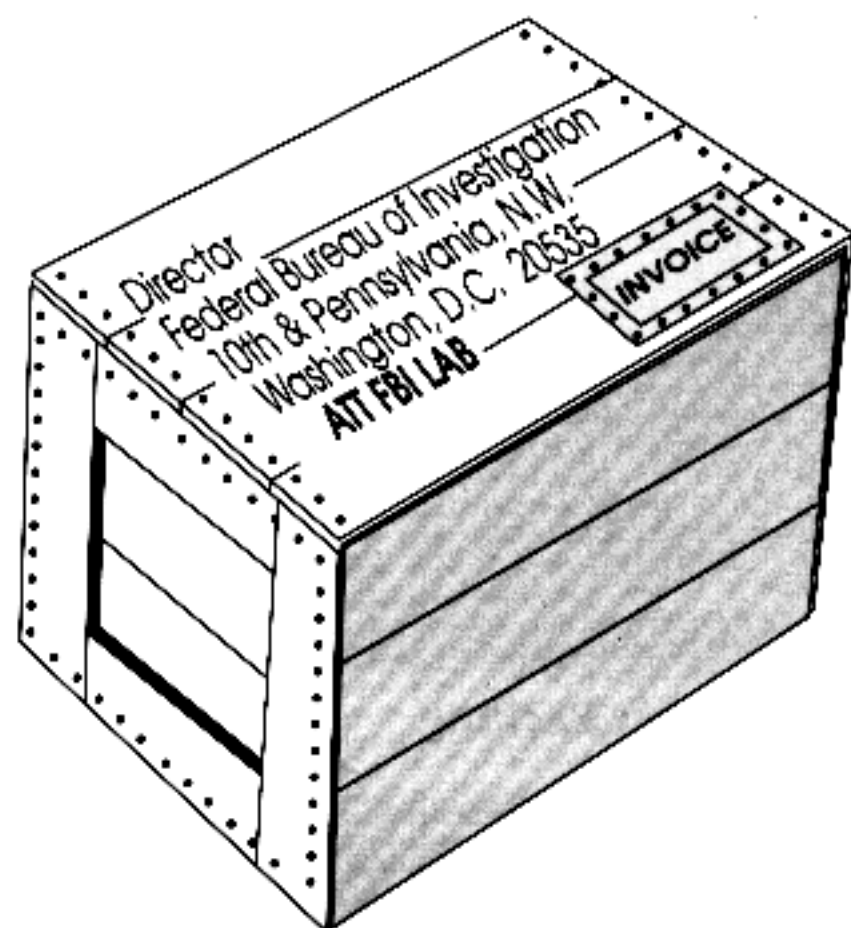
Director
Federal Bureau of Investigation
Attention: FBI Laboratory
10th Street and Pennsylvania Ave., N.W.
Washington, D.C. 20535

Place the label under a clear yellow plastic cover or yellow tape ONLY on packages containing evidence.



3. Place copy of transmittal letter in envelope and mark it "INVOICE."

4. Stick envelope to outside of sealed box.



7. If packaging box is wooden, tack invoice envelope to top under a clear yellow plastic cover or yellow tape.

8. REMARKS:

If evidence to be sent falls into the category of Hazardous Materials, call for instructions. Telephone numbers can be obtained through the Table of Contents (page vii).

Please use clear yellow plastic cover or yellow tape **ONLY** for packages containing evidence.

Packaging and Labeling of Etiologic Agents

The Interstate Shipment of Etiologic Agents (42 CFR, Part 72) was revised July 21, 1980, to provide for packaging and labeling requirements for etiologic agents and certain other materials shipped in interstate traffic. For further information on any provision of this regulation contact: Centers for Disease Control, Office of Health and Safety, 1600 Clifton Road, Atlanta, Georgia 30333. Telephone: (404) 639-3883.

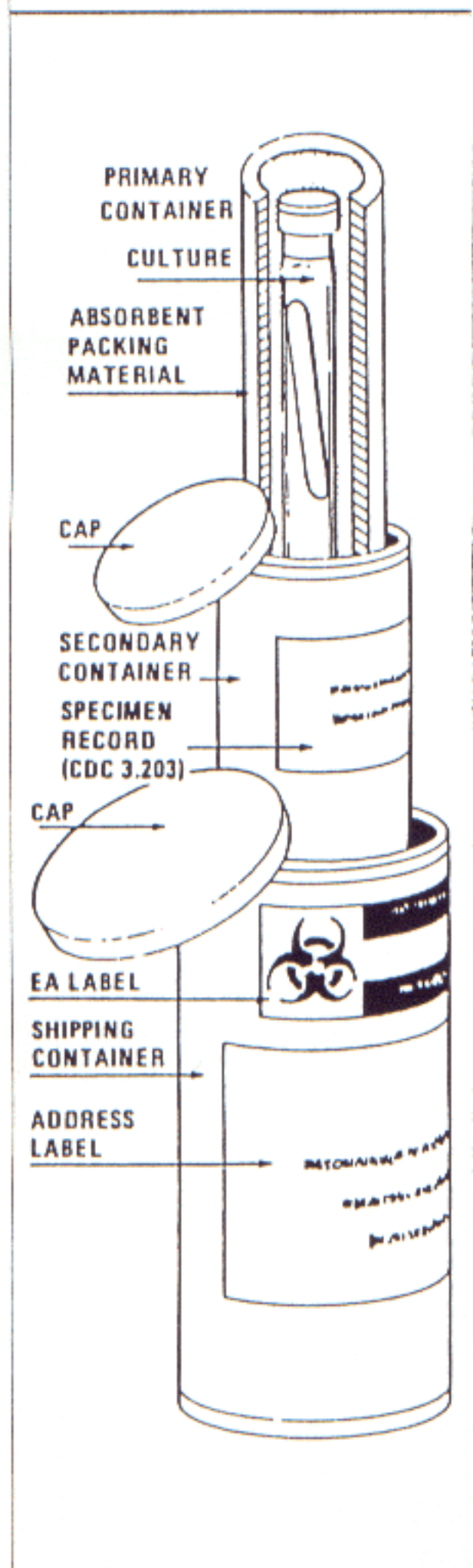
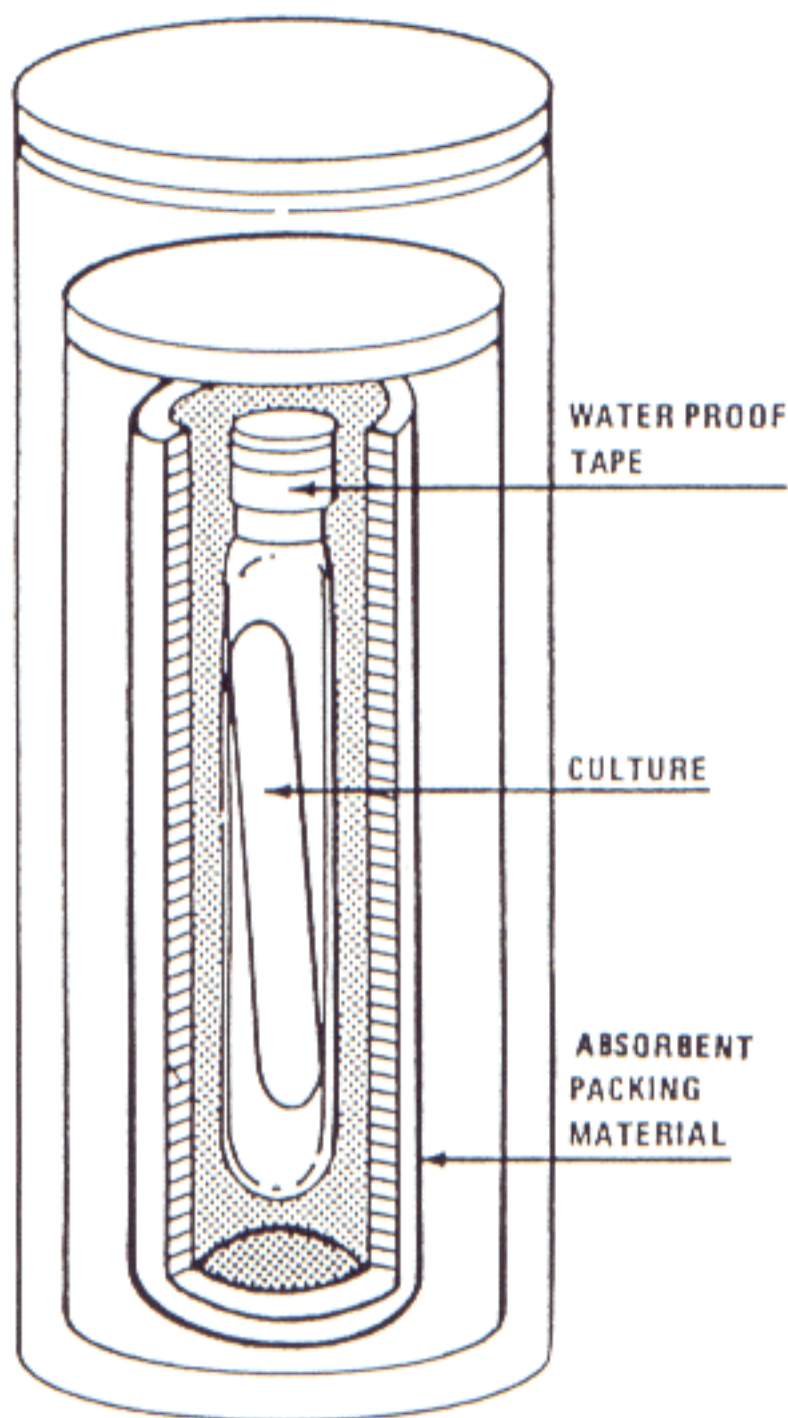


Figure 1



Cross Section of Proper Packing
Figure 2

Figures 1 and 2 show the packaging and labeling of etiologic agents in volumes of less than 50 ml in accordance with the provisions of subparagraph 72.3 (a) of the cited regulation.

If dry ice is used, place it outside secondary container.

Figure 3 illustrates the color and size of the label, described in subparagraph 72.3 (d) (1 - 5) of the regulations, which shall be affixed to all shipments of etiologic agents.

Figure 3
(Red on White)



STANDARD FORM 420 JUNE 1973
PRESCRIBED BY DEPT HEW (4.2 CFR)
420-101

ETIOLOGIC AGENTS

**BIOMEDICAL
MATERIAL**

IN CASE OF DAMAGE
OR LEAKAGE

NOTIFY DIRECTOR CDC
ATLANTA, GEORGIA
404/633-5313

Federal Express Corporation

For information write: P.O. Box 727, Dept. 4634, Memphis, TN 38194, or call 1 - 800-238-5355. For shipments between the United States and Puerto Rico call 1-800-247-4747.

United Parcel Service (UPS)

For information write: 1506 Joh Avenue, Baltimore, MD 21227, or call 1-800-346-0106.

Federal Express or U.S. Postal Service Letter Envelopes

1) Remove adhesive tape cover and seal flap. 2) Put two horizontal strips of Nylon Reinforced Filament Tape around the entire envelope (at least once over the seams).



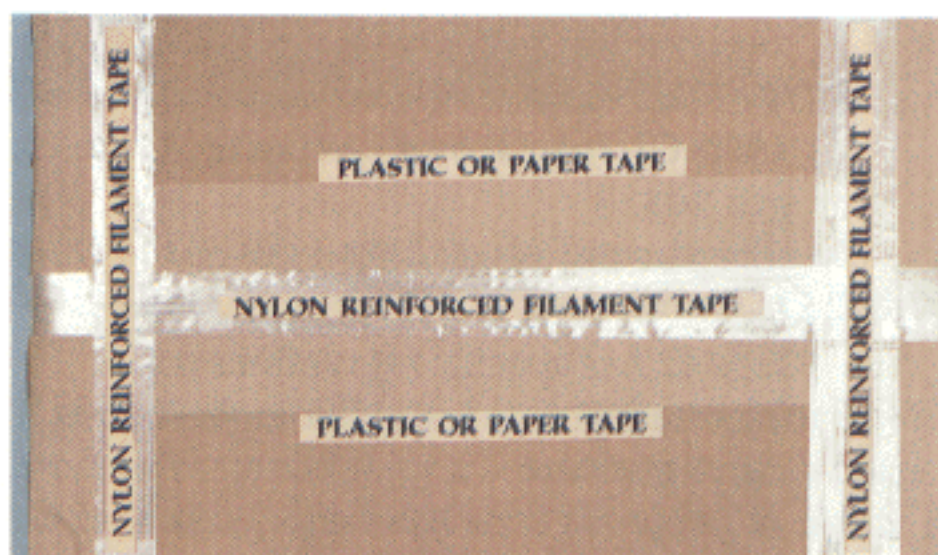
FRONT



BACK

Standard
Opaque
Boxes Pack-
aging Con-
tainers
Shipped Via
Federal

Express or U.S. Postal Service



1) Seal with plastic tape or adequately moistened paper tape over flaps so that it appears "Mummy Wrapped."

2) Put at least three strips of Nylon Reinforced Filament Tape around the entire container at least once.

General Information

Prior to sealing a packaging container, all unused space in the container must be filled with brown wrapping paper, bubble wrap, or any other acceptable packaging filler to prevent the material from shifting and breaking open in transit.

For sealing, use extra gummed paper tape or nylon-reinforced filament tape. However, be aware that some shippers insist on the use of one of these two kind of tapes.

Packaging containers (i.e., envelopes, boxes, tubes, etc.) must be reinforced with continuous nylon-reinforced filament tape placed around the container (see page 95).

Standard opaque packaging containers must be sealed with plastic or gummed paper tape so that it appears "mummy wrapped." Thereafter, at least three continuous strips of nylon-reinforced filament tape must be placed around the container (see page 95).

Allow application and retention of adhesive stamps, postage meter impressions and postal endorsements made by hand stamp, ball-point pen, or number two pencil. The use of masking, cellophane, nylon-reinforced, and/ or plastic tape on the outer finish of registered mail is prohibited.

Packaging containers must not be reused for shipment purposes. Standard opaque packaging containers may be reused only when the container is structurally sound, with no holes, tears, or missing flaps. Obsolete address mailing labels and markings must be removed or covered prior to shipment.

Shipments must have the sender's and recipient's complete telephone number.

All packages must pass the National Safe Transit Association Project 1A Testing in addition to any regulations set forth

by the Title 49 (Code of Federal Regulations).

The U.S. Department of Transportation (DOT) and the International Air Transport Association (IATA) define "Dangerous Goods" as "Hazardous Materials."

Boxes containing Hazardous Materials require specific DOT Diamond Labels on at least two sides of the package. For more information write or call Federal Express or UPS.

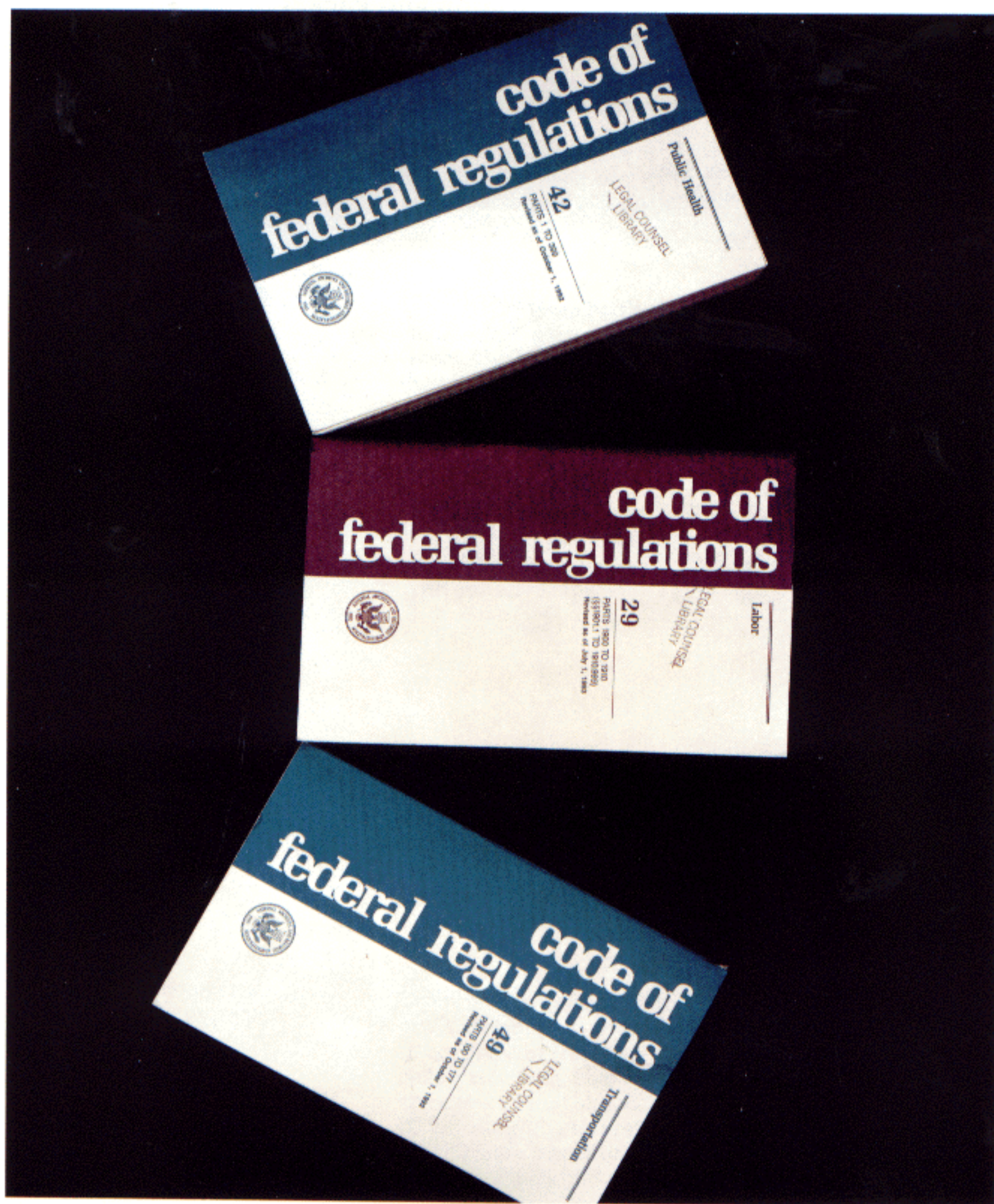
The IATA mandates: training and periodic recertifications for persons handling Hazardous Materials/Dangerous Goods, and the IATA Dangerous Goods Regulations and U.S. Department of Transportation Emergency Response Guidebook, two manuals that must be readily available at workplaces where employees handle Hazardous Materials/Dangerous Goods.

Title 29 - U.S. Department of Labor Occupational Safety and Health Administration (OSHA),
200 Constitution Ave., N.W. Washington, D.C. 20210, telephone: (202) 219-8151

Title 29, Part 1910 sets forth specific safety and health standards as they relate to the workplace.

Title 42 - U.S. Department of Health and Human Services,
Office of Health and Safety,
1600 Clifton Road, Atlanta, Georgia 30333
telephone: (404) 639-3883

Title 42 has specific regulations for Interstate Shipment of Etiologic Agents, see page 94.



Title 49 - U.S. Department of Transportation

400 7th Street, Southwest, Washington, D.C. 20590, telephone: (202) 366-4000

CFR Title 49, Section(s) and/or Subpart(s) for D-Marking specify that the person who offers hazardous material(s) for transportation must mark each package in the manner required by this title, a telephone number is provided to obtain specific directions.

Collection, Shipment, Identification and Packaging Charts

Specimen	Amount Desired		Send By
	Standard	Evidence	

Abrasives

Not less than
one ounce.

All

Registered mail
or equivalent

Acids

10 ml.

All to 100 ml.

Call Chemistry-
Toxicology Unit at
(202) 324-4318 for
instructions.

Alkalies:

Caustic Soda,
Potash,
Ammonia, etc.

10 ml. of liquids.
10 g. of solids.

All to 100 ml.
All to 100 g.

Call Chemistry-
Toxicology Unit at
(202) 324-4318 for
instructions.

Ammunition
(Live Cartridges)

Call Firearms-
Toolmarks Unit at
(202) 324-4378 for
instructions.

**Anonymous Letters,
Extortion Letters, and
Bank Robbery Notes**

All original
documents.

Registered mail
or equivalent

Identification	Wrapping and Packing	Remarks
<u>Outside container:</u> type of material, date obtained, investigator's name or initials.	Use film cannister or plastic vial. Seal to prevent any loss.	Avoid use of envelopes.
Same as above.	Use plastic/glass bottle. Pack in sawdust, glass, or rock wool. Use bakelite or paraffin-lined bottle for hydrofluoric acid.	Label acid, corrosive, etc.
Same as above.	Use plastic or glass bottle with rubber stopper held with adhesive tape.	Label alkali, corrosive, etc.
Same as above.	Call Firearms-Toolmarks Unit at (202) 324-4378 for instructions.	Unless specific examination of the cartridge is essential, do not submit.
Initial and date each document, if advisable.	Use proper enclosure. Place in envelope and seal with "Evidence" tape or transparent cellophane tape. Flap side of envelope should show: (1) wording "Enclosure(s) to FBIHQ from (name of submitting office)," (2) title of case, (3) brief description of contents, (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.

Collection, Shipment, Identification and Packaging Charts

Specimen	Amount Desired		Send By
	Standard	Evidence	
Blood:			
1. Liquid Known Samples	One tube each (sterile) 5cc-10cc blood only. No preservatives.	All	Registered mail or equivalent
2. Small quantities:			
a. Liquid Questioned Samples		All	Registered mail or equivalent
b. Dry stains Not on fabrics		As much as possible.	Registered mail or equivalent
c. For toxicological use		20 cc of blood and preservative mixture.	Registered mail or equivalent
3. Stained clothing, fabric, etc.		As found.	Registered mail or equivalent
Bullets (projector without cartridge)			
		All found.	Registered mail or equivalent
Cartridges (live ammunition)			
		All found.	Call Firearms-Toolmarks Unit at (202) 324-4378 for instructions.
Cartridge Cases (shells only)			
		All	Registered mail or equivalent

Identification	Wrapping and Packing	Remarks
<u>Outside test tube</u> : use adhesive tape. Name of donor, date taken, doctor's name, investigator's name or initials.	Wrap in cotton/soft paper. Place in mailing tube or suitable strong mailing carton.	Submit immediately. Don't hold awaiting additional items for comparison. Do not freeze, keep refrigerated until mailing. Do not add refrigerants and/or dry ice to sample during transit. Label "Fragile."
Same as above.	Same as above.	<u>If unable to expeditiously furnish sample</u> : Dry on non-porous surface, scrape off or collect (use eye droppers or clean spoon), transfer to non-porous surface or absorb in sterile gauze and let it dry.
<u>Outside pillbox or plastic vial</u> : label with type of specimen, date secured, investigator's name or initials.	Seal to prevent leakage.	Keep it dry. Do not use envelopes.
Same as liquid samples.	Medical examiner should use a standard blood collection kit.	Preservative desired (identify preservation used). Refrigerate. Can freeze.
<u>Use tag or mark directly on clothes</u> : type of specimens, date secured, investigator's name or initials.	Wrap each article separately. Label outside package as to contents. Place in strong box to prevent shifting of contents.	If wet when found, dry by hanging. DO NOT USE HEAT TO DRY. Avoid direct sunlight while drying. Do not use preservatives.
Initials on base, nose or mutilated area.	Pack tightly in cotton or soft paper in pill, match, or powder box. Place in box. Label outside of box as to contents.	Unnecessary handling obliterates marks.
Initials on outside of case near bullet end.	Same as above.	Live ammunition is dangerous. Handle with care.
Initials preferably on inside near open end and/or on outside near open end.	Same as above.	Spent cartridge cases.

Collection, Shipment, Identification and Packaging Charts

Amount Desired

Specimen

Standard

Evidence

Send By

Casts

(Dental or Die Stone
Casts of Tire Treads
and Shoe Prints)

Send in suspect's shoes
and tires. Photographs
and sample impres-
sions are usually not
suitable for comparison.

All shoe prints and
entire circumference
of tires.

Registered mail
or equivalent

Checks

(fraudulent)

All

Registered mail
or equivalent

**Check Protector, Rub-
ber Stamp, and/ or
Date Stamp Known
Standards** (if possible,
send actual device)

Obtain several copies in full word-for-
word order of each questioned check-
writer impression. If unable to forward
rubber stamps, prepare numerous sam-
ples with different degrees of pressure.

Registered mail
or equivalent

Clothing

All

Registered mail
or equivalent

Codes and Ciphers
(found on items of
racketeering cases)

All

Registered mail
or equivalent

Documents

(charred or burned)

All

Registered mail
or equivalent

Drugs:

1. Liquids

All

Registered mail
or equivalent

**2. Powders, Pills,
and Solids**

All to 30 g.

Registered mail
or equivalent

Identification	Wrapping and Packing	Remarks
<u>On back of cast before it hardens</u> , write location and date taken, and investigator's name or initials.	Wrap in paper and cover with suitable packing material to prevent breakage.	Label "Fragile." Plaster of Paris is no longer recommended, see page 30 for more information.
See Anonymous Letters on pages 98/99.	See Anonymous Letters on pages 98/99.	Advise what parts are questioned or known. Furnish physical description of subject.
Place name or initials, date, name of make and model, etc., on sample impressions.	See Anonymous Letters on pages 98/99.	Do not disturb inking mechanisms on printing devices.
Mark directly on garment or use string tag indicating type of evidence, date obtained, investigator's name or initials.	Wrap each article individually. Place in strong container with identification written on outside of package.	Do not cut out stains, leave clothing whole. If wet, hang in room to dry before packing.
See Anonymous Letters on pages 98/99.	See Anonymous Letters on pages 98/99.	Furnish to Racketeering Records Analysis Unit.
<u>Outside container</u> : indicate if fragile, date obtained, investigator's name or initials.	Pack in rigid container between layers of cotton.	If moisture is added use atomizer, otherwise, not recommended.
Affix label to bottle in which found, including date it was found and investigator's name or initials.	Make sure container does not leak. Seal with tape to prevent any loss.	Mark "Fragile." If possible, use heat-seal plastic bags.
<u>Outside of pillbox</u> : affix label with date found and investigator's name or initials.	Seal with tape to prevent any loss.	If powders, pills, or solids are found in paper bags, place them in plastic bags to prevent any loss.

Collection, Shipment, Identification and Packaging Charts

Specimen	Amount Desired		Send By
	Standard	Evidence	

Drug Records/ Wire Taps	All original documents, tapes, and transcripts.	Registered mail or equivalent
------------------------------------	---	----------------------------------

Money Laundering Records	See Drug Records on page 33.	
-------------------------------------	------------------------------	--

Racketeering Records/Wire Taps	All original documents, tapes, and transcripts.	Registered mail or equivalent
---	---	----------------------------------

1. Prostitution Records	See Racketeering Records on page 33.	
------------------------------------	--------------------------------------	--

2. Loan sharking Records	See Racketeering Records on page 33.	
-------------------------------------	--------------------------------------	--

3. Video Gaming Devices	See Racketeering Records on page 33.	Call Racketeering Records Analysis Unit (RRAU) at (202) 324-2500 for instructions.
------------------------------------	--------------------------------------	--

EXPLOSIVES: Detonators, Blasting Caps, Detonating Cord, Black Powder, Smokeless Power,
(202) 324-2696, for shipping instructions. (For an emergency after regular hours,

Fibers	Entire garment or other cloth item.	All	Registered mail or equivalent
---------------	--	-----	----------------------------------

Firearms (unloaded weapons)		All	Registered mail or equivalent
--	--	-----	----------------------------------

Identification	Wrapping and Packing	Remarks
Initial and date each document. If too voluminous, initial and date the box containing the documents.	<u>Documents</u> : follow the instructions for Anonymous Letters. <u>Wire tap tapes</u> : label each tape. <u>Mark packages</u> : "MAGNETIC TAPES, DO NOT X-RAY."	Indicate kind of examination(s) requested: Latents, Handwriting, Chemistry-Toxicology, All of the above.
Same as drug records on page 33.	Same as drug records.	
Same as drug records on page 33.	Same as drug records.	
Same as drug records on page 33.	Same as drug records.	
Same as drug records on page 33.	Call Racketeering Records Analysis Unit (RRAU) at (202) 324-2500 for instructions.	Field examinations may be more feasible, particularly on multiple machines.
Record serial numbers on each machine. Include date and investigator's name or initials.		

High Explosives and Explosive Accessories, call the Explosives Unit, FBI Laboratory, call (202) 324-3000.)

Outside container or on the object fibers are adhering, include date and investigator's name or initials.

Use folder paper or pillbox. Seal edges and openings with tape.

Do not place loose in an envelope.

Identify gun with a string tag bearing complete description. Mark inconspicuously and have investigative notes reflecting how and where gun is 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 on pages 98/99, if applicable.

Collection, Shipment, Identification and Packaging Charts

Specimen	Amount Desired		Send By
	Standard	Evidence	

Flash Paper	One sheet.	All to 5 sheets.	Call Racketeering Records Analysis Unit (RRAU) at (202) 324-2500 for instructions.
--------------------	------------	------------------	--

Gasoline	10 ml.	All to 10 ml.	Call Chemistry- Toxicology Unit at (202) 324-4318 for instructions.
-----------------	--------	---------------	--

Gems		All	Insured registered mail or equivalent
-------------	--	-----	--

General Unknown:

1. Solids (non-hazardous)	10 gms.	All to 10 g.	Registered mail or equivalent
----------------------------------	---------	--------------	----------------------------------

2. Liquids (non-hazardous)	10 ml.	All to 10 ml.	Registered mail or equivalent
-----------------------------------	--------	---------------	----------------------------------

Glass Fractures		All	Registered mail or equivalent
------------------------	--	-----	----------------------------------

Glass Particles	All of bottle or headlight. Small piece of each broken pane.	All	Registered mail or equivalent
------------------------	---	-----	----------------------------------

Identification	Wrapping and Packing	Remarks
<u>Outside container:</u> label indicating date and investigator's name or initials.	Place in individual polyethylene envelopes, double-wrap in manila envelopes, and seal with paper tape the inner wrapper.	Fireproof, place in vented location away from any other combustible materials and, if feasible, place in watertight container immersed in water. Mark inner wrapper "Flash Paper," "Flammable."
<u>Outside container:</u> label indicating type of material, date, and investigator's name or initials.	Use an all-metal container packed in wooden box.	An all-metal container should be used for its fireproof qualities.
<u>Outside container:</u> label indicating date and investigator's name or initials.	Use jeweler's box or place in cotton in pillbox.	
<u>Outside container:</u> label indicating date and investigator's name or initials.	Same as Drugs, see pages 102/103.	Call Chemistry-Toxicology Unit at (202) 324-4318 for instructions.
Same as Liquid Drugs, see pages 102/103.	Same as Liquid Drugs, see pages 102/103.	Same as above.
Separate questioned from known. Mark which is the interior or exterior of glass removed from frame.	Wrap each piece separately in cotton. Pack in sturdy container to prevent shifting and breakage. Identify contents.	Avoid chipping. Mark "Fragile."
<u>Outside container:</u> Label indicating date and investigator's name or initials.	Place in film canister or plastic vial. Seal and protect against breakage.	Do not use envelopes, paper, or plastic bags.

Collection, Shipment, Identification and Packaging Charts

Amount Desired

Specimen

Standard

Evidence

Send By

Gunshot Residues

- | | | |
|---|-----|-------------------------------|
| 1. Cotton applicator swabs with plastic shafts. (Do not use wood shafts). | All | Registered mail or equivalent |
| 2. On cloth
Only to determine weapon to target distance. | All | Registered mail or equivalent |

Hair	Twenty-five full-length hairs from different parts of head and/or pubic region.	All	Registered mail or equivalent
-------------	---	-----	-------------------------------

Handwriting and Hand Printing Known Standards			Registered mail or equivalent
---	--	--	-------------------------------

Insulation

- | | | | |
|---------------|---------------------------------|-----|-------------------------------|
| 1. Glass Wool | 1" mass from each suspect area. | All | Registered mail or equivalent |
| 2. Safe | Sample all damaged areas. | All | Registered mail or equivalent |

Latent Fingerprints (see Latent Fingerprint Section page 35).

Matches	One to two books of paper. One full box of wood.	All	Federal Express, UPS, or equivalent
----------------	--	-----	-------------------------------------

Medicines	See Drugs on pages 102/103.		
------------------	-----------------------------	--	--

Metal	1 lb.	All to 1 lb.	Registered mail or equivalent
--------------	-------	--------------	-------------------------------

Identification	Wrapping and Packing	Remarks
<u>Outside container:</u> Date and name or initial. Label as to name of person and which hand (left/right).	Place swabs in plastic containers.	Do not use glass containers.
<u>Outside container:</u> Indicate date, obtained from whom, description, name or initials.	Dry and package individually in <u>unused</u> brown wrapping paper or brown grocery bag.	Do not mix items. Use more than one bag, or wrap different items separately.
<u>Outside container:</u> Type of material, date, and investigator's name or initials.	Folded paper or pillbox. Seal edges and openings with tape.	Do not place loose in envelope.
Indicate from whom obtained, voluntary statement included in appropriate place, date obtained, and investigator's name or initials.	Same as Anonymous Letters, see pages 98/99.	Same as Anonymous Letters, see pages 98/99.
<u>Outside container:</u> type of material, date, name or initials.	Use pillbox or plastic vial. Seal to prevent any loss.	Avoid use of glass containers and envelopes.
Same as above.	Same as above.	Same as above.
<u>Outside container:</u> label indicating type of material, date, and investigator's name or initials.	Pack in metal container and in larger package to prevent shifting. Pack matches in box or metal container to prevent friction between matches.	Keep and label: "Keep away from fire."
<u>Outside container:</u> label indicating type of material, date, and investigator's name or initials.	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.

Collection, Shipment, Identification and Packaging Charts

Specimen	Amount Desired		Send By
	Standard	Evidence	

Oil	10 ml. together with specifications.	All to 10 ml.	Federal Express, UPS, or equivalent
------------	--------------------------------------	---------------	-------------------------------------

Obliterated, Eradicated, or Indented Writing		All	Registered mail or equivalent
---	--	-----	-------------------------------

Organs of the Body		200 g. of each organ.	Call Chemistry-Toxicology Unit at (202) 324-4318 for instructions.
---------------------------	--	-----------------------	--

Paint: 1. Liquid	Original unopened container up to 1/4 pint, if possible.	All to 1/4 pint.	Registered mail or equivalent
----------------------------	--	------------------	-------------------------------

2. Solid (paint chips or scrapings)	At least 1/2 sq. in. of solid, with all layers represented.	All. If on small object, send object.	Registered mail or equivalent
-------------------------------------	---	---------------------------------------	-------------------------------

Plaster Casts - Tire Treads and Shoe Prints (see pages 102/103).

Plastic Replica Casts of Stamped Impressions (see page 63).

Powder Patterns (see pages 102/103). (For Gunshot Residues see pages 108/109.)

Rope, Twine, and Cordage	One yard or amount available.	All	Registered mail or equivalent
---------------------------------	-------------------------------	-----	-------------------------------

Identification	Wrapping and Packing	Remarks
----------------	----------------------	---------

Same as above.

Use metal container with tight screw top. Seal to prevent leakage.

DO NOT USE DIRT OR SAND FOR PACKING MATERIAL. Keep away from fire.

Same as Anonymous Letters, see pages 98/99.

Same as Anonymous Letters, see pages 98/99.

Advise whether bleaching or staining methods may be used. Avoid folding.

Outside container: Victim's name, date of death, date of autopsy, name of doctor, investigator's name or initials.

Plastic or glass containers. Metal lids must have liners.

Call Chemistry-Toxicology Unit at (202) 324-4318 for instructions.

Outside container: Type of material, origin if known, date, investigator's name or initials.

Use friction-top paint can or large-mouth, screw-top jar. If glass, pack to prevent breakage. Use heavy corrugated paper or wooden box.

Protect spray can nozzles to keep them from going off. Avoid contact w/adhesive materials. Wrap to protect paint smears. Do not use envelopes, paper/plastic bags, or glass vials.

Same as above.

If small amount, use round pillbox or small glass vial with screw top. Seal to prevent leakage. Do not use envelopes. Do not pack in cotton.

Avoid contact with adhesive materials. Wrap so as to protect smear. If small amount: seal round pillbox, film canister, or plastic vial to protect against leakage/breakage.

On tag or container: Type of material, date, investigator's name or initials.

Wrap securely.

Collection, Shipment, Identification and Packaging Charts

Specimen	Amount Desired		Send By
	Standard	Evidence	

Safe Insulation, readily transferred to tools and clothing, is found between walls of fire-resistant safes, in vaults, and in safe cabinets (pages 108/109).

Saliva Samples	1.5" diameter stain in center of filter paper.	All	Registered mail or equivalent
-----------------------	--	-----	-------------------------------

Shoe Print Lifts (impressions on hard surfaces)	Photograph before making of dust impression.	All	Registered mail or equivalent
---	--	-----	-------------------------------

Soils and Minerals	Samples from areas near pertinent spot.	All	Registered mail
---------------------------	---	-----	-----------------

Tape (Adhesive Tape)	Recovered roll.	All	Registered mail or equivalent
--------------------------------	-----------------	-----	-------------------------------

Tools/Toolmarks	Send in the tool. If impractical, make several impressions on similar materials as evidence using entire marking area of tool.	All	Registered mail or equivalent
------------------------	--	-----	-------------------------------

Identification	Wrapping and Packing	Remarks
----------------	----------------------	---------

Outside envelope and on filter paper: 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 drugstores. Allow to dry.

On lifting tape or paper attached to tape: date, investigator's name or initials.

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.

Outside container: type of material, date, investigator's name or initials.

Use pillbox or plastic vial.

Avoid glass containers and envelope.

Same as above.

Place on waxed paper, cellophane, or plastic.

Do not cut, wad, distort, or separate tapes that are stuck together.

On object or on tag attached to an opposite end from where toolmarks appear: date recovered and investigator's name or initials.

After marks have been protected with soft paper, wrap in strong wrapping paper, place in strong box, and pack to prevent shifting.

If necessary to remove item from its source by cutting, indicate where item was cut.

Collection, Shipment, Identification and Packaging Charts

Amount Desired

Specimen

Standard

Evidence

Send By

**Typewriting,
known standards**

For instructions on
known standards:
see Documents
page 27.

Registered mail
or equivalent

Urine

Preferably all urine
voided over a period
of 24 hours.

All

Registered mail
or equivalent

Vaginal Samples

1. Slides
(microscope)

Minimum of two
slides.

Minimum of two
swabs.

Registered mail
or equivalent

2. Swabs

Two unstained
swabs from same
package as stained.

Registered mail
or equivalent

Water

100 ml.

100 ml.

Registered mail
or equivalent

Wire

3 ft. (Do not kink).

All (Do not kink).

Registered mail
or equivalent

Wood

One foot or
amount available.

All

Registered mail
or equivalent

Identification	Wrapping and Packing	Remarks
----------------	----------------------	---------

On specimens: serial number, brand, model, etc., date recovered, and investigator's name or initials.

Same as Anonymous Letters on pages 98/99.

Examine ribbon for evidence of questioned message.

Outside container: name of liquid, date taken, investigator's name or initials.

Use plastic specimen container. Seal tight with lid.

Make sure that package does not leak.

Outside envelope and on filter paper: type of sample, name of donor, date of collection, and collector's name or initials.

Use commercial slide box.

Slide box available at hospitals. Doctor should not fix slides. No cover slips. Air-dry.

Same as above.

Seal in envelope.

Allow swabs to dry before packaging.

Same as Urine.

Same as Urine.

Same as Urine.

On label or tab: describe type of material, date, investigator's name or initials.

Wrap securely.

Do not kink wire. (See also tool/toolmarks on pages 112/113.)

Same as above.

Wrap securely.

Index

A

Abrasives page 44
Collection Chart pages 98-99

Acids page 44
Collection Chart pages 98-99

Alkalies page 44
Collection Chart pages 98-99

Ammunition (Live) page 58
Collection Chart pages 98-99

Anthropological Identifications page 66

Arson page 45

Assault Cases page 46

Audio/Video Tape Analysis page 80

B

Bank (Surveillance Films) page 77

Biological Specimens
 (For Toxicological Examinations) page 44

Blood
 (Examination, collection, etc.) page 48
 (Blood evidence transmittal letter) page 50
Collection Chart pages 100-101

Bloodborne Pathogen Safety page 6

Body
 (Fingers/palms/feet of deceased) page 37
 (Fluids) page 50
 (Organs, collection chart) pages 110-111
 (Protective Equipment) page 11

Bomb
 (Bomb Data Center) page 84
 (Explosives) page 53

(Safety) page 5

Botanical Examinations page 66

Building Materials page 68

Bullets page 57
Collection Chart pages 100-101

C

Capillary Electrophoresis page 67

Cartridges
 (Shotshell casings, buckshot/slugs) page 57
Collection Chart pages 100-101

Cases (FBI and non-FBI) page 52

Casts
 (Casting) page 30
 (Plastic for Stamped Impressions) page 63
Collection Chart pages 102-103

Centers
 (Explosives) page 54
 (For the Analysis of Violent Crime) page 82
 (Bomb Data) page 84

Charts (Evidence) pages 98-115

Chemical
 (Services) page 44
 (General Analyses) page 46
 (Safety) page 9

Chromatography
 (Gas) page 46
 (Material Analysis) page 67

Codes and Ciphers (Cryptanalysis) page 34

Computer (CART) page 22

Confined Space Safety page 10

Cordage/Rope Examinations	page 66
Cosmetics	page 67
Court Order, Disposition of Weapons ..	page 60
Crime Scene	page 14
(Basic Safety Guidelines)	page 3
(Crime Scene/Mass Disaster)	page 4
(Removal of Hazardous Materials)	page 6
(Personal Protective Equipment)	page 11
(Postblast investigation guidelines)	page 54

Criminal Justice Information Services (CJIS)	
History, Current Operation, Standard Forms for Submitting Identification Data, Search of Fingerprint Cards, Name Checks to Locate Identification Records, Fugitive Program, Automated Improvements, Revitalization, and Enhanced Services	page 85

Cryptanalysis (Codes and Ciphers)	page 34
---	---------

D

Decontamination (Nondisposable)	page 8
Definitions (of Evidence)	page viii
Dental-Die Stone (Substitute for Plaster)	page 30
Detonators (Explosives)	page 53
Devices (Electrostatic lifting)	page 32
Digital Image Processing	page 77
Disaster Squad	page 38
DNA Examinations	page 48
Document (Examinations)	page 23
(Services)	page 21
(Shipment of Evidence)	page 24
Collection Chart	pages 98-99

Drugs (and Pharmaceuticals)	page 45
Collection Chart	pages 102-103

Dyes (In bank robbery packets)	page 47
---	---------

E

Electronic Devices	page 80
Engineering Services	page 79
Etiologic Agents	page 94

Evidence	
(Biological)	page 44
(Body Fluids)	pages 49-50
(Collection of Physical..)	page 18
(Explosives)	page 53
(Footwear)	page 29
(Latent Fingerprint)	page 37
(Packing and Shipping)	page 91
(Photographing the..)	page 29
(Shipping Explosives)	page 53
(Technical)	page 81
(Submission of Firearms)	page 58

Explosives	
(Examinations)	page 53
(Instrumental analyses of)	page 71
(Safety)	page 5

F

Fabric Examinations	page 66
FBI and Non-FBI Cases (DNA Analysis)	page 52
Fibers (and Hairs Examinations)	page 65
Collection Chart	pages 104-105

Files	
Standard Reference Files and Collections, and Files of Questioned Material	page ix

Reference Files of Known Standards Typewriter,
Photocopier, Printer, and Facsimile Sections
..... page 27

Watermark Standards,
Safety Paper Standards,
Checkwriter Standards,
Shoe Print and Tire Tread Standards,
National Motor Vehicle Certificate of Title,
National Fraudulent Check,
Anonymous Letter, and Bank Robbery Note
..... page 28

(Automobile altered numbers and Vehicle
Identification Number) page 64
(Standard Ammunition File, SAF) page 59

Fingerprint
(Safety) page 9
(Search) page 88
(Services) page 35

Fire (trails) page 46

Firearms-Toolmarks
Examinations, Identification, Terminology,
Disposition (the Court Order) pages 57-64

Flash Paper page 34
Collection Chart pages 106-107

Footwear page 29
Collection Chart pages 102-103

Forensic
Forensic/Technical Services page 20
Forensic (FSRTC) Services page 41
Forensic Utility of Soil page 68

G

Gasoline page 44
Collection Chart pages 106-107

Gems page 68
Collection Chart pages 106-107

Glass page 70
Collection Chart pages 106-107

Gelatin-lifting material page 32

General
(Rifling Characteristics) page 60
(Collection Chart of the Unknown) pages 106-107

Gunshot
(Residues Examinations) page 58
(Primer Residues) page 74

H

Hairs and Fibers Examinations page 65
Collection Chart pages 104-105

Handwriting/printing page 24
Collection Chart pages 108-109

Hazardous Materials (Removal) page 6

I

Impressions
(In Sand/Snow/Soil) page 30
(Made by wet shoe, etc.) page 32
Collection Chart pages 102-103

Infrared Spectroscopy page 67

Ink Analysis page 47

Inorganic Examinations page 74

Insulation
(Glass Wool and insulation) page 68
Collection Chart pages 108-109

Introduction
FBI Services, Terminology, Purpose of Physical
Evidence, Nature of Physical Evidence, Standard
Reference Files and Collections, and Files of
Questioned Material
..... page vii

L

Latent Fingerprint	
(Safety)	page 9
(Services)	page 35
Lead Analyses	page 57
Linguistics	page 22
Live Ammunition	page 58
Locks and Keys	page 61

M

Matches	page 45
Collection Chart	pages 108-109
Materials Analysis	page 67
Mechanical Impression	page 26
Collection Chart	pages 114-115
Medicines or Drugs	pages 103-104
Metals Examinations	page 54
Collection Chart	pages 108-109
Minerology	
(Inorganic/crystalline/minerals)	page 68

N

Notes (on paint)	page 68
(Background information)	page 44

O

Oil/fuel (cases of sabotage)	page 46
Collection Chart	pages 110-111

P

Packing	
(and shipping evidence)	page 91
Paints, Plastics, Polymers	page 67

Paper

(Burned/Charred)	page 27
(Watermark/Safety/Checkwriter)	page 26

Personal Protective Equipment	page 11
--	---------

Pharmaceutical	page 45
-----------------------------	---------

Photocopier Examinations	page 26
---------------------------------------	---------

Photography

(Casting Impressions)	page 31
(Forensic and Processes)	page 77
(Latent Prints)	page 36

Plaster (see: Dental/Die Stone)	page 30
Collection Chart	pages 115-116

Plastic

(Insulation on wire, plastic/rubber tapes, and miscellaneous plastic materials from crime scenes)	page 68
(Replica Casts)	page 61

Poisons	page 44
----------------------	---------

Polymers	page 67
-----------------------	---------

Protective Equipment	page 12
-----------------------------------	---------

Psycholinguistic Analysis	page 23
--	---------

Publications

(Bomb Data Center)	page 84
(Forensic Science Training catalog)	page 42

Publication Rights	page 122
---------------------------------	----------

Q

Questioned Documents	page 23
-----------------------------------	---------

R

Racketeering Records Analysis	page 33
--	---------

Rape (Evidence Considerations) page 50

Removal of Hazardous Material page 6

Residues

(Examinations of Gunshot Residues) page 58

(Information) page 74

Rope, Twine, and Cordage page 66

Collection Chart pages 110-111

S

Sabotage

(Chemicals used...) page 46

Safety

(Guidelines) page 3

(Universal Precautions) page 7

Saliva Samples page 48

Collection Chart pages 112-113

Sample Latent Fingerprint Report page 39

Schools

(Advanced Latent Fingerprint) page 38

(Hazardous Devices (Huntsville, AL) page 84

Scientific Analysis Services page 43

Search Patterns

(Strip/Grid/Spiral/Quadrant or Zone).. page 18

Semen page 50

Seminars

(Bomb Data Center) page 84

(National Center for the Analysis
of Violent Crime) page 83

Serology page 48

Shipping

(Charts) page 98

(Document Section) page 24

(Documents for Racketeering Unit) page 34

(Explosives) page 53

(Hazardous materials) page 5

(Latent evidence) page 37

(Live ammunition) page 58

(Packing evidence) page 91

Shoe Print/Tire Tread Examinations .. page 29

Collection Chart pages 112-113

Silencer

(Examinations, Determination of Accidental
Firing, etc.) page 58

Soil

Collecting samples page 69

Collection Chart pages 112-113

Standard Forms for Submitting Identification

Data page 86

Stress

The International Critical Incident Stress Foun-
dation. Emergency assistance hotline.

..... page 6

Swabs

(for DNA testing) page 50

Collection Chart pages 114-115

T

Tampering (with consumer products) ... page 47

Tape

(Paints, Plastics, Polymers, and Cosmetics
Examinations) page 67

See Collection Charts pages 98-115

Technical Services

(Audio/Video Tape and Electronic Devices
Analysis) page 79

Terminology

- (Forensic General Information) page viii
(Firearms-Toolmarks) page 59

Testimony

- (Results of Latent Fingerprint Evidence)
..... page 38

Tire Tread and Footwear Impressions

- (Two- and Three-Dimensional Impressions)
..... pages 29-30
Collection Chart pages 102-103

Titles

- 29 U.S. Labor Department, OSHA page 96
42 U.S. Department of Health page 96
49 U.S. Dept. of Transportation page 97

Toolmarks

- (and Firearms Services) page 57
(Identification) page 60
Collection Chart pages 112-113

Training

- (Advanced Latent Fingerprint) page 38
(Forensic Science Research and
Training Center) page 41
(Hazardous Devices (Huntsville, AL) .. page 84

- True Age of a Document page 27

- Typewriter Examinations page 25

U

Unknown

- (General Solids and Liquids Non-hazardous)
Collection Chart pages 107-108

- Urine Collection Chart pages 114-115

V

- Vacutainer Tubes for DNA Samples . page 51

Vaginal Samples

- (Special evidence considerations) page 50
Collection Chart pages 114-115

- Video Services page 78

- Violent Crimes (NCAVC) page 82

W

Water

- (Analysis) page 44
Collection Chart pages 114-115

Watermark

- Safety Paper, Checkwriter, National Fraudu-
lent Check, Anonymous Letter, Bank Robbery
Note Files pages 26-28

Weapons

- Examinations, Identification, Terminology,
and Disposition (the Court Order)
..... pages 57-64
Disposition of Weapons for FBI and Non-FBI
Cases page 60

Wire

- (With plastic insulation) page 68
Collection Chart pages 114-115

- Wood page 61
Collection Chart pages 114-115

Writing

- (Obliterated/Eradicated,/Indented) page 23
Collection Chart pages 98-99

X

X-ray Diffractometry

- Infrared Spectroscopy, Capillary Electro-
phoresis, and Chromatography used to iden-
tify or compare chemicals page 67

The Federal Bureau of Investigation is mandated by Title 28, Code of Federal Regulations, Section 0.85 to conduct scientific examinations of evidence, free of charge, for any duly constituted law enforcement agency within the United States. Such services may also be made available to foreign law enforcement agencies under special agreement between the Attorney General and Secretary of State.

The Attorney General has determined that the publication of the Handbook of Forensic Science is necessary to disseminate vital information related to those examinations which shall be provided at no cost and are also required by law.

Use of available funds for printing this handbook has been approved by the Director of the Office of Management and Budget, pursuant to the authority granted under Title 44, United States Code, Section 1108, and delegated by Executive Order No. 11609.

The Handbook of Forensic Science is revised every five years by the Federal Bureau of Investigation, 10th Street and Pennsylvania Avenue, Northwest, Washington, D.C. 20535.

It should be noted that the names of products and/or companies appearing in this handbook are not included for endorsement but for identification of the particular product being used.

Credits have been earned by FBI personnel who are the contributors of the writings offered in this handbook.

The Laboratory owes special appreciation to John W. Hicks (Assistant Director from 1989 to 1994) whose vision of the value of forensic evidence is reflected in this handbook.

Write to the Federal Bureau of Investigation, Attention: Assistant Director in Charge, Laboratory Division, Washington, D.C. 20535, if you have any comments.

Cover Photograph, Courtesy of Jeffrey Miller, Fairfax County Police Department.

Published in June, 1994, and sold by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402-9328, for a nominal fee.

