VIRGINIA DEPARTMENT OF FORENSIC SCIENCE

EVIDENCE HANDLING & LABORATORY CAPABILITIES GUIDE

FIREARMS &TOOLMARKS

Contact Information

If you have any questions concerning the Firearms & Toolmarks examination capabilities or evidence handling procedures, please call the Training Section or the Firearms & Toolmarks Section at the Forensic Laboratory that services your area.

Laboratory	Section Contact	Phone Number
Central	**Stephen Atkinson**	**(804) 588-4141**
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OVERVIEW

Examiners in the Firearms and Toolmarks Section examine firearms and ammunition components in an attempt to associate a particular firearm as having fired particular ammunition components, through microscopic comparison. The section also examines tools and toolmarks to determine if the submitted tool can be associated with a submitted toolmark.

CAPABILITIES AND SERVICES

Mechanical Condition of Firearms

Each firearm submitted is examined to determine whether it is in mechanical operating condition and is test fired, when possible. This examination includes the determination of manufacturer, model, caliber and serial number. It may also include operability of the safety features and capabilities of full automatic fire.

National Integrated Ballistics Information Network (NIBIN)

Administrative Sampling Plan for NIBIN Searches

NIBIN is utilized to potentially associate criminal events through the search of digital images of cartridge cases and shotshell cases recovered from crime scenes and test fired firearms. The Bureau of Alcohol, Tobacco, Firearms and Explosives (ATF) provides guidance to NIBIN users on best practices that will result in timely investigative information. These best practices include the utilization of a triage procedure to group similar cartridge cases and enter the image of a representative cartridge case per group. In order to reduce the time it takes to provide investigative leads, the Firearms & Toolmarks Section has implemented the following Administrative NIBIN Sampling Plan:

- For cases in which two (2) or more cartridge cases and/or shotshell cases are submitted:
  - Submitted evidence will be screened and grouped based on similar characteristics.
  - At least one (1) cartridge case and/or shotshell case representing each determined group shall be imaged.
  - Appropriate NIBIN system searches shall be conducted.
- Comparative examinations will not be performed routinely.
- Projectile evidence will not be examined routinely when submitted with cartridge case and/or shotshell case evidence in the absence of a firearm.

Test fires from submitted semiautomatic pistols, semiautomatic rifles, long guns chambered to fire handgun ammunition and self-extracting / ejecting and slide action shotguns are searched against the database.

The Firearms / Toolmarks Procedures Manual (sub-section 6.1) on the DFS website contains a list of databases included in the automatic search.

If a potential association is made, a Certificate of Analysis or NIBIN Cartridge Case Image Comparison Exhibit Information printout will be issued to the agencies that originally submitted the associated evidence to the Virginia Department of Forensic Science. These notifications will

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indicate that the officer should consult with laboratory personnel to discuss resubmission of evidence if a confirmation of the association is needed to support any agency's investigation.

Firearm Parts

Firearm parts found at a crime scene may be identified as to the type of firearm from which they originated.

Ammunition Components

Bullets, wad components, cartridge cases and shotshell cases recovered at a scene or from a body may be identified by brand.

Class characteristics (caliber, number of lands and grooves, direction of twist and their dimensions, breechface and/or firing pin shapes, other various markings) exhibited on fired ammunition components can provide information concerning the brand and type of firearm in which the component was fired. This may be particularly useful when no firearm has been recovered.

Bullet

A bullet/bullet fragment can be identified as having been fired from a particular firearm if sufficient marks are present.

Cartridges

If the cartridge has been cycled (loaded, extracted and ejected) through the action of a bolt-action, lever-action, slide-action or autoloading firearm, the markings left by this process may be associated with a particular firearm. In some cases, markings left on cartridges may be associated to a particular magazine. If these types of marks are present on cartridges, it may also be possible to associate them to cartridge cases if no firearm has been recovered.

Cartridge Cases

A cartridge case may be identified as having been fired from a particular firearm if sufficient marks are present.

Shotshells

Shotshells may be associated to a firearm in the same manner as cartridges.

Shotshell Cases

A shotshell case may be identified in the same manner as a fired cartridge case. In addition, the components that may have been commercially loaded into the shotshell may be identified.

Firearm Not Recovered

Upon request, bullets and cartridge/shotshell cases recovered from the same or different incidents can be compared to determine if they were fired from/in the same firearm.

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Shotshell Components

Recovered wad material and/or projectiles may be identified as to gauge, type and/or brand of commercial manufacture.

Saboted Ammunition

A sabot is a plastic enclosure around a bullet/projectile that allows a smaller diameter and lighter weight projectile to be fired. When saboted ammunition is used, the microscopic markings from the barrel may be imparted onto the sabot rather than the bullet/projectile. A sabot may be identified as having been fired from a particular firearm if sufficient marks are present.

Distance (Proximity) Determination

Contact the appropriate Firearm Section Supervisor for consultation and approval before submitting evidence for a distance determination examination.

The approximate distance the muzzle of a firearm was from an object at the time of firing may be determined by examining clothing or other materials for the presence of gunshot residues. This should not to be confused with primer residue as discussed under Trace Evidence – Primer Residue. When packaging objects thought to contain gunshot residues, use packaging techniques that protect the surface and minimize possible cross contamination (for clothing see "Clothing in Paper Baffles").

With the exception of contact shots, near contact shots or maximum distance determination, the elements needed to perform valid muzzle-to-target distance determinations include:

- Firearm
- Cartridge/shotshell case(s) or projectile that can be identified to the firearm
- Appropriate ammunition (at least one evidence cartridge of same brand, load and caliber as the item identified to the firearm)
- Clothing/other material

Pellet patterns can also be examined for distance determination.

Donations of Firearms and/or Ammunition

DFS may accept firearm and/or ammunition donations from police departments and sheriff's offices for scientific purposes as part of the firearm and/or ammunition reference collection once the criminal case is complete and the owner of the firearm is legally unable to retain the firearm or no longer wishes to keep it.

Contact the appropriate Firearm Section Supervisor prior to submitting a donation.

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COLLECTION GUIDELINES

PLEASE REFER TO THE RECOMMENDED SAFETY PROCEDURES FOR FIREARM SUBMISSION BEGINNING ON PAGE 10 UNDER GENERAL SUBMISSION OF EVIDENCE

ITEM – Firearms, handgun or long gun

METHOD - All firearms to be submitted to the laboratory should be made safe. Unload firearms after properly documenting the cylinder in revolvers or the chamber and magazine in pistols, rifles and shotguns. All magazines must be removed from firearms. The magazine should be unloaded if DNA or Latent Fingerprint examinations are NOT being requested.

Package firearms in a rigid container, seal, mark container and indicate condition of firearm on container as **LOADED** or **UNLOADED**. Firearms submitted for DNA or trace evidence must be sealed with tape over all edges and any openings (such as holes in the box) prior to submission (see example under General Submission of Evidence, page 9).

In order to submit cartridges or shotshells for a comparison examination, do not submit them in the same package as the firearm. Package them in a separate rigid or padded container (see Policy Notice – New Packaging Requirements for Firearms and Ammunition Submissions). It is not necessary to submit cartridges or shotshells when only NIBIN and/or Function exams are being requested. It is acceptable to leave cartridges in a magazine, packaged in a separate rigid or padded container from the firearm, especially if DNA or Latent Print examinations are being requested on the cartridges or the magazine itself.

If cartridges and magazine, or shotshells, are being submitted for DNA or Latent Print exams, package them in a manner which best preserves that type of evidence.

DISCUSSION - Safety is the first consideration, therefore, firearms should be unloaded prior to delivery to the laboratory. If this is not possible, call the Firearms Section prior to submission and make sure the packaging material is marked **LOADED FIREARM.** Packaging material may rub latent prints and destroy evidence, therefore, it is important to package in a manner so the firearm contacts the packaging material as little as possible.

Documenting the cylinder in a revolver may help determine the sequence of events and aid in scene reconstruction.

ITEM – Firearms found in water

METHOD – Place the firearm in a container of the same water and immediately submit the item to the laboratory.

DISCUSSION - When a firearm is found in water, leaving the firearm in the same water will slow the rusting process. If a firearm cannot be stored in water upon recovery, it is recommended to lubricate the firearm with an appropriate lubricant (e.g. Kroil, Hoppe's) and submit it to the laboratory as soon as possible.

ITEM – Bullets, shot pellets, slugs and shotshell wads

METHOD - Recover using rubber tipped forceps or gloves, so as not to contaminate or add

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trace or other biological evidence. Place in a plastic evidence bag. Package projectiles separately, clearly label and seal properly. Do not mark directly on evidence with item numbers, initials, date or other information. Place the necessary information on the packaging. Bullets collected in the emergency room or at autopsy should be washed off with water (not disinfectants) and air dried before packaging. Body fluids may destroy some microscopic markings.

In incidents where the use of saboted ammunition is suspected, the investigator should be aware that the sabot may have separated from the projectile (bullet or slug).

DISCUSSION - Handling these items with your fingers may add additional trace or biological evidence. Bullets, etc. should be handled as if biohazards are present and in a manner to protect any trace evidence, such as fibers, paint or DNA that may be present. The chain of custody can be maintained by marking the packaging material.

ITEM - Cartridge case, shotshell case

METHOD - Recover using rubber tip forceps or gloves so as not to obliterate fingerprints or damage trace evidence. If latent prints are not a concern, cartridge cases and shotshell cases may be placed in a plastic evidence bag. If latent prints are a concern, package in a small rigid container in a manner that minimizes friction between surfaces. Properly label and seal the container. Never mark the headstamp area or other portions of the cartridge case or shotshell case.

DISCUSSION - Handling these evidence items may destroy fingerprint evidence. The marks in the headstamp area and other portions are used in the laboratory comparison and identification process.

ITEM - Cartridge, shotshell

METHOD - In order to submit cartridges or shotshells for a comparison examination, do not submit them in the same package as the firearm. Package them in a separate rigid or padded container (see Policy Notice – New Packaging Requirements for Firearms and Ammunition Submissions). It is not necessary to submit cartridges or shotshells when only NIBIN and/or Function exams are being requested. It is acceptable to leave cartridges in a magazine, packaged in a rigid or padded container, especially if DNA or Latent Print examinations are being requested on the cartridges or the magazine itself. Never mark the headstamp area or other portions of the cartridge or shotshell.

If cartridges and magazine, or shotshells, are being submitted for DNA or Latent Print exams, package them in a manner which best preserves that type of evidence.

DISCUSSION - Handling these evidence items may destroy fingerprint evidence. The marks in the headstamp area and other portions are used in the laboratory comparison and identification process. Ammunition found at the scene or in the suspect's house, vehicle, possession, etc., may be helpful in the comparison process.

ITEM - Clothing for distance (proximity) determination exams

METHOD - Completely air dry the clothing. Place clothing item flat onto a clean piece of butcher paper sufficiently larger than the item itself. Place additional paper inside article of

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clothing to separate the layers. Place another piece of paper that is slightly smaller than the first, but still covers the entire item, over the item and roll or fold it over onto itself so no openings are exposed (see Clothing in Paper Baffles). Properly label and seal the container.

DISCUSSION - This packaging approach ensures that the area of the clothing bearing gunshot residues will not come in contact with other areas of the garment. This is also a good procedure for bloody garments. Plastic will cause the biological material on the clothing to deteriorate, even if it is thoroughly air dried.

Toolmarks Overview

Toolmark Identification is a discipline of forensic science which has as its primary function to determine if a toolmark was produced by a particular tool. Toolmark cases may involve any type of criminal activity, ranging from burglary to homicide. Toolmarks may be encountered on many varied surfaces including wood and metal, therefore, all cases and many surfaces should be considered for potential toolmarks.

CAPABILITIES AND SERVICES

Examination of the Suspect Tool with a Toolmark

The tool will be examined for foreign deposits such as paint or metal for comparison against the marked object. This trace evidence may help to associate the tool with the marked surface.

Test marks are made with the suspect tool. The test marks are microscopically compared to the questioned toolmark to determine if the suspect tool produced the questioned toolmark.

COLLECTION GUIDELINES

ITEM - Toolmarks

METHOD - If the object bearing the toolmark is reasonably mobile, bring the entire object to the laboratory. Protect the toolmark area by covering it carefully with paper, however, always consider latent fingerprints, trace evidence, paint, etc. when packaging. If the object is particularly large or is completely immobile, the toolmark area may be cut out (depending on the situation) or cast using a suitable casting material. Package the toolmark cast in a rigid container. Include mid-range or orientation photographs, sketches and reports.

Package bone or cartilage in formalin solution. The item should be completely submerged in the liquid and stored at room temperature.

DO NOT place suspect tool into toolmark as it could destroy markings or transfer trace evidence.

DISCUSSION - The actual toolmark is preferred over a cast of the toolmark, therefore, the microscopic marks need to be protected to provide the best possible results. Submission of

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photographs, sketches and reports may help determine the action of the tool.

ITEM - Tools

METHOD - Do not submit a tool for toolmark comparison until it can be associated with a suspect (e.g., it was seized from the suspect's possession/property or it has been associated to that suspect through forensic evidence). If fingerprints are a consideration, package in a manner to immobilize the item to reduce the contact with the packaging material. Do not place any identifying marks on the tool.

Package in a manner to protect the working end of the tool (e.g., on a screwdriver place a paper fold over the tip). After the working end has been protected, place in a rigid container.

DISCUSSION - Fingerprints and/or DNA can associate a suspect with the tool. Wrapping the working end of the tool will protect the microscopic characteristics of the tool as well as trace evidence.

SPECIALIZED EXAMINATIONS

Number Restorations

Serial numbers provide a means of identifying and tracing equipment, vehicles, firearms and other products using this form of identification. The numbers or letters are **usually** stamped into a metal surface. Serial numbers can be obliterated using several different techniques, such as scraping, grinding, punching or filing. Frequently, the damage is limited to the surface with the intention to make the number unreadable. Often the stamping methods deform the metal below the surface and allow for the recovery of the serial number. It may be possible to restore an obliterated serial number.

COLLECTION GUIDELINES

ITEM - Obliterated Serial Numbers

METHOD - Protect the area needing restoration. Do not attempt to restore the number.

DISCUSSION - The first attempt to restore the number is the most productive and further attempts will likely destroy the evidence.

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