

**Firearms Section**

**Firearms Section SOP**

Comparative & Analytical Division



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## **1. Introduction**

The standard operating procedures outline the general protocols used in the examination of firearms related evidence. The procedures addressed serve as guidelines and allow for flexibility in the examination of evidence as dictated by the request from the stakeholder and the condition of the evidence. Handwritten notes, examinations recorded in LIMS (as well as formatted worksheets containing information recorded in LIMS), digital photos, and printouts/digital copies of computer-based search information are utilized to document examinations.

### **1.1. Mission of the Firearms Section:**

- 1.1.1. To assist the Houston Forensic Science Center in achieving its goals and to support the Center's mission.
- 1.1.2. To provide timely forensic science services to the criminal justice system with the highest degree of quality and ethical standards.
- 1.1.3. To process and analyze evidence in a cost-efficient manner.
- 1.1.4. To maintain a working environment that is safe and fosters development of the employee.
- 1.1.5. To implement and encourage the development of new technology to improve the quality of criminal justice.

### **1.2. Goals of the Firearms Section:**

- 1.2.1. To complete the analysis of cases within 30 days from the date of the request.
- 1.2.2. To evaluate and image all appropriate items into the NIBIN database within the timeline outlined in the Minimum Required Operating Standards (MROS) issued by the ATF.



## 2. Functions And Responsibilities

The Firearms Section provides technical expertise in the analysis and interpretation of firearms related evidence.

### 2.1. Principle Duties of the Section:

The Firearms Section offers two main services to stakeholders. NIBIN processing and firearms examination.

2.1.1. NIBIN Only processing is conducted “automatically” for the Houston Police Department (HPD), meaning HFSC retrieves firearms and fired cartridge cases\* submitted to the HPD property room and automatically creates requests for NIBIN processing.

2.1.1.1. NIBIN eligible firearms are test fired and the test fired cartridge case exhibits are entered into the NIBIN database.

2.1.1.2. \*HPD operates a NIBIN Unit and processes most of the fired cartridge cases submitted to the HPD property room. However, HFSC will process and enter any NIBIN eligible cartridge cases submitted through our evidence transfer process.

2.1.2. Firearm examination requests are conducted on a request basis from stakeholders.

2.1.2.1. Firearm Examination requests may include:

- Function testing and test firing firearms.
  - **Trigger pull weight determination**
  - **Barrel and overall length (long guns only)**
- Microscopic examination of firearms related evidence.
  - Markings used in the comparison of bullets, cartridge cases, and unfired cartridges are limited to those produced by a firearm.
  - This excludes markings produced by magazines or tools used to produce ammunition.
- General rifling characteristic analysis.
- Serial number restoration on firearms.
- Rendering safe various submitted firearms and air guns (excluding airsoft guns).

2.1.2.2. Firearms examination requests are completed by Firearms Examiners, depending on their authorizations.

2.1.2.3. **Firearms examination requests are received and reviewed by Section Management or designee. Relevant case/item acceptance policies are communicated to the requestor as needed and may result in adjustments to the request. These communications are documented in the case record.**

### 2.2. Staff in the Firearms Section:

2.2.1. The Firearms Section is staffed with Analysts licensed by the Texas Forensic Science Commission (TFSC) as either Firearm/Toolmark Technicians or Firearm/Toolmark Analysts. Technicians are authorized to perform NIBIN-related tasks and are not expected to testify



in court regarding results. Analysts are authorized to perform firearms examination and NIBIN-related tasks. Not all staff are authorized to perform all duties.

2.2.2. The Firearms Section Manager and the Firearms Section Supervisor(s) are collectively referred to as Section Management.

2.2.3. In this SOP, the term “Analyst” may refer to any staff member authorized to do technical work in the section. When the term “examiner” is used, the SOP is referring to tasks only performed by Analysts licensed as Firearm/Toolmark Analysts and authorized to perform firearm examination-related tasks. The terms “NIBIN Technician” and “Firearms Examiner” are used in notifications and reports to stakeholders.



### **3. Facilities and Environmental Conditions**

The Firearms Section has traditional office space that houses Analyst cubicles, microscope workstations, an evidence vault and the NIBIN room. The Firearms Section also has workspace in the basement that includes workstations, a sink and counter space, fume hood, safety shower and eyewash stations, an evidence vault, and a “shooting room” that houses an ammunition storage room, a shooting range, and water shooting tank. The Firearms Section also has a “loaded gun room” where stakeholders can submit firearms that cannot be confirmed to be unloaded.

HFSC facilities are not exposed to extreme temperatures or humidity, allowing for the safe storage of unfired ammunition, firearms, and other firearms-related evidence.

Walls within and surrounding the firearms basement are either concrete or have been protected with Armortex®. The loaded gun room is protected by steel and concrete walls.

#### **3.1. Vaults and Storage**

- 3.1.1. Except for extreme circumstances (e.g., impending inclement weather), the Firearms Section does not store firearms or ammunition outside of the basement vault or loaded gun room.
- 3.1.2. Evidence unfired ammunition is typically packaged separately from other items in the case (may be received loaded in a magazine) but may be stored in the same container with other evidence.
- 3.1.3. Stock unfired ammunition is stored in bulk in the ammunition storage room. Analysts may store smaller amounts of ammunition at basement workstations for ease-of-access.
- 3.1.4. HFSC Firearms Section is not a long-term storage facility. Evidence is stored before, during and after analysis until it is returned to the submitting and/or requesting agency. Evidence returned includes test fires and other created items (i.e., firearm part casts).
- 3.1.5. Within the vaults, evidence is stored on shelves, in cabinets, or other designated areas.
  - 3.1.5.1. Whenever possible, all items of evidence associated with a case are stored in the same “convenience container” (e.g., pouch or box). Items from multiple cases may be stored in the same container when there is a request to compare items in those cases. The container is marked with the case number(s) for items within.
  - 3.1.5.2. Analysts may organize items for requests assigned to them in an “in progress box” stored in one of the firearms vaults.
  - 3.1.5.3. Storage of Long Guns and Oversized Items
    - 3.1.5.3.1. Long guns can be properly marked/labeled, stored, and protected from loss, contamination, or deleterious change without packaging. In this case, the firearm is marked or tagged with the unique case number(s) and item number.
    - 3.1.5.3.2. Oversized items are packaged and sealed, if possible. The items are marked or tagged with the unique case number(s) and item number.



### **3.2. Access control**

The Firearms Section vaults, ammunition storage, loaded gun room, and NIBIN room all have additional levels of access control and are only accessible to authorized staff. See the HFSC Security Manual for details on access.





#### 4. Utilization of a Second Examiner

##### 4.1. Responsibilities of a Second Examiner:

- 4.1.1. A second qualified examiner may analyze the physical evidence in a case to provide a second opinion.
- 4.1.2. A second examination is required for all reported conclusions on microscopic comparisons, as well as conclusions of insufficient and unsuitable. If a conclusion is not reported, it does not require a second examination.
- 4.1.3. A second qualified examiner shall examine restored serial number characters.
- 4.1.4. A second qualified examiner may be utilized for other conclusions, (e.g., shot pellet size determination, general rifling characteristics) but this second examination is not required.
- 4.1.5. When a second examiner reaches a conclusion or renders an opinion, it is documented in the case record and may be included in the report. The second examiner is not the author of the report.
- 4.1.6. When a second examiner is utilized, the second examiner may conduct the first round of review of the case record and a third examiner conducts an additional review. If the second examiner does not conduct the first round of review, two rounds of review must be completed by two different qualified examiners.

##### 4.2. When a Primary and Second Examiner Reach Differing Conclusions:

- 4.2.1. If inconsistencies and/or new conclusions on microscopic comparisons (including determinations of insufficient or unsuitable) are discovered between the primary and second examiners, they shall discuss the differences (consultation).
- 4.2.2. Reasons for rejecting/changing conclusion(s) of the primary or second examiner are documented in the appropriate examination record. The documentation shall include details clearly indicating the reason for the rejection or change.
- 4.2.3. If consultation between examiners does not result in a resolution (conflict), the Section Manager assigns a “third party” to assist in the resolution. This “third party” will be another authorized examiner in the Section that has not been involved in the analysis thus far.
- 4.2.4. The Section Manager tracks details of consultations and conflicts, looking for any indication of a significant technical problem. Any significant issues noted by section Analysts are brought to the attention of the Section Manager. This includes issues not specifically related to differing conclusions by examiners.
- 4.2.5. See the Consultation and Conflict Resolution Policy for further details.



## 5. Blind Verification and Blind Quality Control

### 5.1. Blind Verification

Typically, the second examiner assigned to a request has access to the primary examiner's conclusions. Blind verification is a process where conclusions made by the primary examiner are temporarily masked from the second examiner.

- 5.1.1. A percentage (typically 1%) of examination requests completed by the Firearms Section are selected for blind verification. Section Management selects the request based on the following criteria:
  - 5.1.1.1. Balance of the need for stakeholders to receive timely results with the need to meet blind verification goals.
  - 5.1.1.2. The request should represent "typical" casework in number of items, apparent complexity, and the nature of the request.
  - 5.1.1.3. The request should not have known pre-existing biases or have easy-to-access extraneous information. Examples include NIBIN Lead verification requests, requests where the items have been previously analyzed, or high-profile cases.
- 5.1.2. The request is assigned to a primary examiner. The primary examiner completes all necessary examinations to address the request. The primary examiner provides all casework documentation to the Section Manager or designee.
  - 5.1.2.1. The primary examiner ensures no visible index markings are left on the items of evidence for microscopic examination.
  - 5.1.2.2. Section Management ensures no information regarding the primary's results are accessible (including access to electronic case records). Documentation that does not indicate a microscopic comparison conclusion (i.e., test firing information) does not need to be "blinded" to the second examiner.
- 5.1.3. The request is assigned to a second examiner. The second examiner does not have access to the primary examiner's conclusions, but knows they are acting in the capacity of a second examiner.
  - 5.1.3.1. The second examiner completes necessary microscopic examinations to address the request. The second examiner does not need to repeat examinations that do not require a second examiner.
  - 5.1.3.2. The second examiner provides all casework documentation to the Section Management.
- 5.1.4. The Section Manager or designee reviews the results made by the primary and second examiners and determines if consultations are needed.
- 5.1.5. The Section Manager or designee "unblinds" the request to the second examiner, and the primary and second examiners proceed to finalize conclusions as they do in routine requests.



5.1.6. The Section Manager and Quality Division track requests completed as blind verifications as well as the results of the primary and the second examiner.

**5.2. Blind Quality Control (BQC)**

The BQC program consists of the testing or examination of items that have a “known ground truth” but are blind to the personnel involved in the examination and review process. This type of testing evaluates the entire quality system as it monitors laboratory performance from evidence submission to the final report.

5.2.1. Section Management assists the Quality Division in obtaining/creating items for testing

5.2.2. The Section Manager tracks completed BQC requests and determines if the results are “satisfactory”. A satisfactory result may include one or more of the following:

5.2.2.1. A result that conforms to the “known ground truth”.

5.2.2.2. A result that does not necessarily conform to the “known ground truth” but is technically sound (i.e., a known elimination/identification that is reported as inconclusive based on the applicable standards in the field).



## **6. Instruments, Calibration, And Reagents**

### **6.1. General Requirements for Analytical Instrumentation:**

- 6.1.1. All instruments are periodically performance checked, serviced when required, and properly calibrated (if appropriate) in accordance with the **HFSC Quality Manual and** manufacturer's recommendations and specifications.
- 6.1.2. Measuring equipment (i.e., calipers/micrometers, balances, steel rules, and digital force gauges) is handled in a safe manner, transported, stored, and used in such a way as to ensure proper functioning and to prevent contamination and deterioration. Steps to achieve this include, but are not limited to, following the manufacturer's recommended handling procedures, avoiding the use and storage of these items under adverse environmental conditions (e.g., extreme heat, cold, humidity), transporting the items only as necessary to conduct testing, and following the maintenance and performance check, and calibration regimens discussed below.

### **6.2. Out of Service Instruments or Balances:**

- 6.2.1. If a performance check fails or a performance problem is detected, the instrument or balance is immediately removed from service, Section Management is notified, and the problem is recorded in the appropriate log. Additionally, the item is clearly marked as being out of service.
- 6.2.2. Following repair, routine quality control procedures (i.e., performance check) are performed to ensure the instrument or balance is working properly before being returned to service. This information is recorded in the appropriate log.
- 6.2.3. If an instrument or balance is not currently in use, even if it is in good working order, it will be marked as being not in use. The instrument or balance will be performance checked before it is placed in use.

### **6.3. Comparison Microscopes:**

- 6.3.1. Performance Check
  - 6.3.1.1. Conduct a performance check on the consistency of magnification of the left and right optical systems at least once each quarter of the calendar year. This should be performed on all objective lenses as well as the digital zoom available on some microscopes. Maintain a log of the results of calibration and maintenance.
  - 6.3.1.2. Place a gauge block of known thickness on one stage and measure the thickness on the other stage using a previously performance checked set of calipers/micrometers.
  - 6.3.1.3. The thickness measured should be the same as the thickness of the gauge block. Measured value should be within 2% of the thickness of the gauge block.



Upper and lower limits of caliper measurements with commonly used gauge blocks:

<b>Gauge block thickness</b>	<b>Lower Limit</b>	<b>Upper Limit</b>
0.010 inches	0.010 inches	0.010 inches
0.050 inches	0.049 inches	0.051 inches
0.100 inches	0.098 inches	0.102 inches

6.3.1.4. If an acceptable value is obtained, then enter “Pass” in the Qualtrax Microscope Performance Check workflow.

6.3.1.5. If an unacceptable measurement is obtained, it is recorded in the appropriate log and the microscope is immediately removed from service. Section Management is immediately notified.

**6.3.2. Service**

6.3.2.1. Comparison microscopes are serviced annually by an external vendor. A record of current annual service is maintained, usually in the form of a sticker affixed to the microscopes.

6.3.2.2. Additional servicing is performed on an as-needed basis. A record of any additional service is maintained.

**6.4. Calipers/Micrometers:**

**6.4.1. Performance Check**

6.4.1.1. Conduct a performance check of calipers/micrometers at least once each quarter of the calendar year.

6.4.1.2. Ensure that the measuring surfaces of the caliper/micrometer are clean and free of any dirt or residue.

6.4.1.3. Measure at least two gauge blocks of different thicknesses and record the measurements in the Qualtrax Caliper Performance Check workflow. If an acceptable value is obtained, enter “Yes” to the within specification question in the workflow.

6.4.1.4. If the observed measurement is not within 2% of the thickness of the gauge block, enter “No” to the within specification question in the workflow and immediately remove the caliper/micrometer from service. Section Management is immediately notified. The caliper/micrometer will be repaired or replaced as needed.

Upper and lower limits of commonly used gauge blocks:

<b>Gauge block thickness</b>	<b>Lower Limit</b>	<b>Upper Limit</b>
0.010 inches	0.010 inches	0.010 inches
0.050 inches	0.049 inches	0.051 inches
0.100 inches	0.098 inches	0.102 inches

**6.4.2. Service**

Calipers/Micrometers are serviced as needed. A record of any service is maintained.

**6.5. Balances:**



6.5.1. Performance Check

- 6.5.1.1. Perform a monthly performance check of the calibration of each balance with at least two non-standard weights. Perform performance checks whenever the instrument has been moved from one location to another.
- 6.5.1.2. Weigh at least two different objects of known weight and record the measurements in the Qualtrax Balance Weights Performance Check workflow. If an acceptable value is obtained, enter "Yes" to the within specification question in the workflow.
- 6.5.1.3. If the observed measurement is not within 2% of the weight used, enter "No" to the within specification question in the workflow and immediately remove the balance from service. Section Management is immediately notified. The balance will be repaired or replaced as needed.

Upper and lower limits of commonly used non-standard weights for balance performance check:

Stated weight value (grams)	Weight value (grains)	Lower Limit (grams)	Upper Limit (grams)	Lower Limit (grains)	Upper Limit (grains)
0.50 g	7.7 gr	0.49 g	0.51 g	7.5 gr	7.9 gr
1.00 g	15.4 gr	0.98 g	1.02 g	15.1 gr	15.7 gr
10.00 g	154.3 gr	9.80 g	10.2 g	151.2 gr	157.4 gr
20.00 g	308.6 gr	19.60 g	20.40 g	302.4 gr	314.8 gr

6.5.2. Service

- 6.5.2.1. Balances are calibrated and serviced annually by an external vendor. A record of results of the service and calibration is maintained. A record of current service, usually in the form of a sticker, is affixed to the balance.
- 6.5.2.2. Balances may be serviced as needed by an approved vendor. A record of any additional service is maintained.

**6.6. Steel Rules:**

- 6.6.1. Steel rules are calibrated once an accreditation cycle by an external service provider and a copy of the calibration certificate is maintained.

**6.7. Digital Force Gauges:**

6.7.1. Performance Checks

Conduct a performance check of the digital force gauge currently in use at least once each month using the reference trigger pull weights. Maintain a record of the results of performance checks.

- 6.7.1.1. Weigh at least two reference trigger pull weights (or combination of weights) and record the measurements in the Qualtrax Trigger Pull Gauge Performance Check workflow. If an acceptable value is obtained, enter "Yes" to the within specification question in the workflow.



6.7.1.2. If the observed measurements are not within 2% of the weight used, enter "No" to the within specification question in the workflow and immediately remove the digital force gauge from service. Section Management is immediately notified. The gauge will be repaired or replaced as needed.

Upper and lower limits of commonly used reference weights (or combination of weights) for digital force gauge performance check:

Stated weight value	Lower Limit	Upper Limit
1.0 pound	0.98 pounds	1.02 pounds
5.0 pounds	4.90 pounds	5.10 pounds
10.0 pounds	9.80 pounds	10.20 pounds
15.0 pounds	14.70 pounds	15.30 pounds

6.7.2. Service

6.7.2.1. Digital force gauges are calibrated annually by the manufacturer (or other approved vendor) and a copy of the calibration certificate is maintained in Qualtrax.

6.7.2.2. Digital force gauges may be serviced as needed by an approved vendor. A record of any service is maintained.

**6.8. Non-Standard Weights:**

6.8.1. Balance Non-Standard Weights

6.8.1.1. Weights used in balance performance checks are checked annually on a calibrated balance.

6.8.1.2. This check is recorded in the Qualtrax Balance Weight Performance Check workflow. If an acceptable value is obtained, enter "Yes" to the within tolerance question in the workflow.

6.8.1.3. If the observed measurement is greater than 2% difference from the stated weight of the standard, enter "No" to the within tolerance question in the workflow and immediately remove the weight from service. Section Management is immediately notified. The weight will be repaired or replaced as needed.

Upper and lower limits of commonly used balance non-standard weights:

Stated weight value	Lower Limit	Upper Limit
0.50 g	0.49 g	0.51 g
1.00 g	0.98 g	1.02 g
10.00 g	9.80 g	10.02 g
20.00 g	19.60 g	20.40 g

6.8.2. Trigger Pull Non-Standard Weights

6.8.2.1. Non-standard trigger pull weights are checked annually on a calibrated balance.

6.8.2.2. These checks are recorded in the Qualtrax Trigger Pull Weights Performance Check workflow. If an acceptable value is obtained, enter "Yes" to the within tolerance question in the workflow.



6.8.2.3. If the observed measurement is greater than 5% difference from the stated weight, enter "No" to the within tolerance question in the workflow and immediately remove the weight from service. Section Management is immediately notified. The weight will be repaired or replaced as needed.

Upper and lower limits of commonly used trigger pull non-standard weights:

Stated weight value	Lower Limit	Upper Limit
500 grams (1.1 pounds) (base)	475 grams	525 grams
2 pounds (base)	1.900 pounds	2.100 pounds
¼ pound	0.238 pounds	0.262 pounds
½ pound	0.475 pounds	0.525 pounds
1 pound	0.950 pounds	1.050 pounds
3 pounds	2.850 pounds	3.150 pounds
5 pounds	4.750 pounds	5.250 pounds

### 6.9. Reference Standards:

#### 6.9.1. Gauge Blocks

The gauge blocks used for caliper/micrometer and microscope performance checks are sent to the manufacturer (or other approved vendor) once an accreditation cycle for calibration. A copy of the calibration certificate is maintained in Qualtrax.

#### 6.9.2. Trigger Pull Standard Reference Weights

The trigger pull standard reference weights are calibrated by an approved vendor once an accreditation cycle. A copy of the calibration certificate is maintained in Qualtrax.

### 6.10. IBIS Equipment:

6.10.1. HFSC IBIS equipment consists of Brasstrax units with associated PCs, Matchpoint units with associated PCs, as well as other peripherals (i.e., monitors, keyboards, mice, and printers).

#### 6.10.2. Brasstrax Calibration Check

After every 50 acquisitions, each Brasstrax Unit prompts the user to conduct a tune up. Follow the directions on the computer screen. The system maintains a record of these checks. A manual tune-up is performed when prompted by the system or instructed to do so by Ultra Electronics Forensic Technology, Inc. (FTI) personnel.

6.10.2.1. The record of these tune ups is stored locally in the PC associated with the Unit and not backed up by the Vendor. Loss or damage to the PC could result in loss of the record.

6.10.2.2. Monthly, Section Management or a designee runs a report of each Brasstrax Unit's Test and Adjustment activities. The report should be printed, scanned, and uploaded into the Section's digital storage location. If a month is missed, the report should be generated immediately upon discovery.





- 6.10.3. No calibration or tune up is performed on Matchpoint Units.
- 6.10.4. NIBIN users are notified via email of system upgrades, software updates, and planned outages. Section Management preserves these notifications digitally and saves them to the Section's digital storage location.
- 6.10.5. Contact FTI for any malfunctions of NIBIN or IBIS equipment and make a record of the contact (and any resolution, if applicable) in the NIBIN log.

**6.11. Reagents:**

- 6.11.1. All critical reagents are labeled with the identity of the reagent and the date of preparation (or lot number).
- 6.11.2. A log of critical reagents is maintained with the following information:
  - Reagent preparation date
  - Preparer's initials
  - Date reagent is discarded/destroyed/consumed
  - Reagent name
- 6.11.3. The critical reagents used by the Firearms Section are utilized in serial number restoration and are listed in Section 39.2.
- 6.11.4. Quality testing on critical reagents used for serial number restoration are documented in the case record as described in Section 39.3.
- 6.11.5. No reagent or other chemical preparation is used in casework if it is not working properly or if it is contaminated. If an examiner has reason to suspect that a reagent or other chemical preparation is not working properly or is contaminated, the examiner must:
  - 6.11.5.1. Check the reagent with proper sample controls.
  - 6.11.5.2. Discard the reagent if it fails the quality check, prepare a new reagent, and quality check the new reagent.
  - 6.11.5.3. Cease performing work with the reagent until the problem has been corrected.
  - 6.11.5.4. Identify casework that may have been affected by the reagents/chemicals that failed the quality check and re-test with quality checked reagents if possible.
  - 6.11.5.5. Inform Section Management and Quality Division if the problem persists.
- 6.11.6. Reagents such as water, bleach, acetone, ethanol, isopropyl alcohol, and acetic acid are used for cleaning and rinsing only and are not critical.
  - 6.11.6.1. Non-critical reagents do not require quality testing
  - 6.11.6.2. Non-critical reagents are labeled with:
    - Reagent name
    - Date of preparation (if applicable)
    - Preparer's initials (if applicable)
  - 6.11.6.3. 10% bleach solutions for cleaning are typically prepared, used, and discarded by the preparer in the same workday and therefore only require a label identifying the



reagent. A "B" or "10% bleach" on the container can be used to indicate a 10% bleach solution.

Note: If a 10% bleach solution is mixed and then used in its entirety at once (i.e., when a 10% bleach solution is mixed and then used to soak biohazard firearm for decontamination), no label is needed.



## 7. Reporting Guidelines

The Firearms Section issues reports and notifications. Reports contain results of analyses. Notifications may provide information that testing was conducted (in the case of NIBIN Notifications) or NIBIN Lead information.

This section will serve as a GUIDELINE for possible wording in reports and notifications. As much as possible, the suggested wording and punctuation should be utilized to provide consistency in reporting. Deviations from this wording may be needed. Significant deviations are approved by the Section Manager or designee. A significant deviation is one in which the deviation changes the technical meaning of the wording provided in the guidelines or when there are no guidelines provided for the testing or conclusion being reported.

The primary examiner is the author of the report. The second examiner is not a co-author.

### NOTES:

- [Item] represents the unique lab item number(s) associated with item(s) of evidence. [Item] may represent a single item or may represent a group of items being discussed together in the report. Groups of items can be listed in a report as [Item] – [Item], [Item] and [Item], or a similar fashion.
- Unique case identifier means either the Agency Case # or the Forensic Case #
- “Agency” below may refer to the investigating, submitting, or requesting organization. “Agency” is not necessarily restricted to law enforcement organizations. HFSC Management determines what organizations may request or submit evidence for analysis. Agencies may be referred to by abbreviations in reports if the requestor will understand the abbreviation.

**NOTE:** In the Reporting Guidelines section of the SOPs, bulleted points represent report wording.

### 7.1. General Report/Notification Format

As a rule, a report should follow the format provided below. Reports should have the following sections (if applicable): Related Item(s) of Evidence, Results and Interpretations, NIBIN Details, Disposition, Additional Information, Methods Used, **Range of Conclusions and Significance of the Results** and Attachments. Reports will also contain headers and footers, a report ending, and may include closing statements. Section headings in reports may be added or changed by HFSC staff with authorization to do so and may not necessarily conform to those outlined in this section.

#### 7.1.1. Header and Footer

- 7.1.1.1. The header and footer section format and information will typically be automatically generated by LIMS.



7.1.1.2. Information contained in the header may include, but is not limited to, HFSC testing location, accrediting body, requestor information, the unique case identifiers, section issuing the report, and the report number. There may also be an amended report header. See Section 7.1.12 for details.

7.1.1.3. Information contained in the footer may include, but is not limited to, report page numbers.

#### 7.1.2. Related Item(s) of Evidence

7.1.2.1. Evidence listed in the report is grouped by unique case identifier (i.e., Forensic Case Number and Agency Case Number). Evidence in this section is identified by the lab item number, the agency item number (if present), and the accurate evidence description. If an accurate description cannot be determined (i.e., if items are not examined, not inventoried, and in a sealed package), the stakeholder's description will be used. Any description provided by the stakeholder will be identified as such.

7.1.2.2. Agency item numbers are only listed in the Related Item(s) of Evidence section of the report. Agency item numbers do not need to appear in the other sections of the report.

7.1.2.3. Examples of evidence descriptions:

- [Caliber] [make] model [model name/number] [action, type of firearm], serial # [serial number]
- Test fires from [(Firearm) Item] created using [number of cartridges] [specific caliber of cartridges] from [stock/evidence [item]]
- [# if more than one] fired [caliber] cartridge case(s) (EM #[evidence marker number], if applicable)
- [# if more than one] fired [projectile description] (EM #[evidence marker number], if applicable)

Note: If the item has an associated Medico-Legal or Medical Record Number, add: "in a container bearing [source and number]." If there is no source identified with the number, add: "in a container bearing #".)

#### 7.1.3. Results and Interpretations (firearms examination requests only)

7.1.3.1. The following statements are placed in the report, where appropriate:

- The conclusions in this section are the opinions of Firearms Examiner [name of primary examiner]. When a conclusion is verified, it is also the opinion of the verifier.
- This is also the opinion of Firearms Examiner [name]. (For use when a conclusion/result is verified by a Second Examiner.)
- [Item] [was/were] not examined as part of this request. (For use when at least one item was not examined as part of the request for analysis.)

7.1.3.2. See following sections on how results should be reported.

#### 7.1.4. NIBIN Details (firearms examination requests only)



See Specific Wording for the NIBIN Details Section for more information on what to include in this section.

7.1.5. Disposition

Transfer to the submitting agency:

- [The above described evidence/[Item]] has been, or will be, released to the submitting agency.

7.1.6. Additional Information

7.1.6.1. This section of the report is utilized (as needed) to document major item description discrepancies and occurrences when the status of a seal needs to be documented.

The wording provided in this section of a report may be dependent on the nature and type of discrepancy.

7.1.6.2. This section may contain reference to an associated Quality report, if present.

7.1.6.3. This section may also be used to make other comments as needed to clarify information presented in the report.

7.1.7. Methods Used

Result Type	Method(s) Used
Firearms testing	Visual and mechanical examination
Trigger pull	Mechanical measurement (weight)
Barrel and Overall length	Mechanical measurement (length)
Conclusions of NIBIN suitability	Microscopic examination
Conclusions of identification, elimination, inconclusive, insufficient, and unsuitable for cartridge components	Microscopic examination and comparison
Caliber/gauge/shot size determinations and manufacturers lists for cartridge cases and projectiles	Visual and microscopic examination

7.1.8. Range of Conclusions (firearms examination requests only)

The range of conclusions in firearms examination reports will contain the language from the current Firearms Section Range of Conclusions document issued by the Firearms Section.

7.1.9. Attachments

Attachments will be included to a report as needed, in the form of an Appendix, typically to share General Rifling Characteristics lists with stakeholders.



7.1.10. Report Ending:

LIMS will automatically apply the signature, name, and title of the Primary Analyst on a completed report/notification.

7.1.11. Special Considerations for the Cross Comparison/Hit Report Format

To clearly distinguish between the items of evidence in two or more incidents, the items are referred to by the item number and the unique case identifier throughout the body of the report.

- [Item] of [unique case identifier]

7.1.12. Reprint reports

7.1.12.1. "Reprint reports" are issued when the Firearms Section has a notification or report that contains evidence from two or more different agency cases and HFSC has processed the evidence in both cases. Reprints are not typically distributed to stakeholders upon completion but are available in JusticeTrax upon request.

7.1.12.2. Firearms Reprint

- Firearms reprints are used when the Firearms Section has completed a firearms examination request on items from more than one agency case number.
- Typically, a stakeholder makes a firearms examination request in one case requesting comparison to items in one or more other cases.
- The Firearms Section makes a corresponding "Firearms Reprint" request in all the associated cases in JusticeTrax.
- The main report is written under the firearms examination request, and then the same report is "re-printed" in the other case numbers.

7.1.12.3. IBHT Reprint

- IBHT Reprints are used when the Firearms Section releases a NIBIN Lead on two or more cases where the Firearms Section at HFSC processed and entered the items into NIBIN.
- IBHT Reprints are not issued under case numbers where the items associated with the NIBIN Lead were not entered into NIBIN by HFSC.
- IBHT Reports are created in the same manner as the Firearms Reprint.

7.1.12.4. Reprint Report

- "Reprint Report" is a service type no longer used in JusticeTrax. It was originally developed and served to produce reprint reports for both firearms examination requests and IBHT notifications. While it is not used for current requests, it is still active and maintained in JusticeTrax in case these reports/notifications need to be amended.
- If a "reprint report" needs to be amended, there may be some information that must be manually added to the report/notification to conform to current accreditation standards. Confer with Section Management and the Quality Division if a reprint report needs to be amended.



#### 7.1.13. Amended Reports/notifications:

If a report or notification is reissued, the following will serve as a guideline for formatting and wording. A Quality Division representative will approve all amended headers prior to the report/notification being released. The Quality Division is notified of the need for an amended report/notification via the method outlined in the Quality Manual. The amended wording should appear in the header:

- This report/notification has been issued to amend Laboratory Report/notification # [original number] issued on [date]. [State why the amended report/notification is being issued and/or what was corrected from the original]. The original report/notification is available at the Houston Forensic Science Center upon request.

If the report/notification being amended addresses testing originally performed at a different location or under a different accrediting body from the current one listed in the report/notification, the amended wording must note this.

If the amended report/notification will be issued using an updated template, the differences may need to be addressed in the amended wording. Example wording:

- The report template used by the Firearms Section has changed since the original report was issued. The new template includes minor changes that do not impact the reported results.

The amended report header space on reports may be used to convey other important information to the stakeholder. Wording recorded in this DUI in Justice Trax generates at the top of the first page in red font, so it may draw attention to the information.

### **7.2. Specific Wording for Results and Interpretations Section:**

#### 7.2.1. Firearms Submitted for Casework Analysis

Firearms should be checked for functionality and determined if they function as expected during test firing. The term “function as expected” means that the firearm functions as designed by the manufacturer. If it is clear a firearm has been processed/tested by another lab or agency, that must be documented in the notes and may require documentation in the report.

7.2.1.1. The following wording should be used as a guideline to describe the method of loading a firearm for test firing. If the item used in test firing is a clip or a belt (vs. magazine), adjustments to the wording may be necessary to use accurate terminology. Handloading is implied for revolvers, single shot firearms, double barrel firearms, and other types that must be handloaded. These types of firearms do not require specification.

- “by handloading”



- “using (magazine) [Item] and”
- “using a reference magazine and”
- “using the integrated magazine and”

7.2.1.2. Functionality of a Firearm and Test Firing Details (if appropriate):

7.2.1.2.1. As received, firearm can discharge a cartridge and functioned as expected during test firing:

- [Item] is capable of discharging a cartridge in the condition submitted. [Item] was examined and test fired [method of loading] [#] [stock/evidence cartridges] from [source, if applicable] on [date]. This set of test fires is designated [Item]. [Item] functioned as expected.

7.2.1.2.2. As received, firearm can discharge a cartridge and did not function as expected during test firing:

- [Item] is capable of discharging a cartridge in the condition submitted. [Item] was examined and test fired [method of loading] [#] [stock/evidence cartridges] from [source, if applicable] on [date]. This set of test fires is designated [Item]. [Item] did not function as expected during test firing. [State the reason(s) why the firearm did not function as expected.]

7.2.1.2.3. As received, firearm cannot discharge a cartridge. Nonfunctioning firearm restored to functional condition, and functioned as expected during test firing:

- [Item] is not capable of discharging a cartridge in the condition submitted. [State the reason(s) why firearm is not capable of discharging a cartridge.] [Item] was restored to a functional condition. [State how the firearm was restored.] [Item] was examined and test fired [method of loading] [#] [stock/evidence cartridges] from [source, if applicable] on [date]. This set of test fires is designated [Item]. [Item] functioned as expected. [State if the firearm was fully, partially, or not returned to the condition as received after test firing. It may also be appropriate to state why it was partially or not returned to the condition as received.]

7.2.1.2.4. As received, firearm cannot discharge a cartridge. Nonfunctioning firearm restored to functional condition, and did not function as expected during test firing:

- [Item] is not capable of discharging a cartridge in the condition submitted. [State the reason(s) why the firearm is not capable of discharging a cartridge.] [Item] was restored to a functional condition. [State how the firearm was restored.] [Item] was examined and test fired [method of loading] [#] [stock/evidence cartridges] from [source, if applicable] on [date]. This set of test fires is designated [Item]. [Item] did not function as expected during test firing. [State the reason(s) why the firearm did not function as expected.]





[State if the firearm was fully, partially, or not returned to the condition as received after test firing. It may also be appropriate to state why it was partially or not returned to the condition as received.]

7.2.1.2.5. As received, firearm cannot discharge a cartridge. Nonfunctioning firearm NOT able to be restored to functional condition:

- [Item] was examined on [date]. [Item] is not capable of discharging a cartridge in the condition submitted. [State the reason(s) why firearm is not capable of discharging a cartridge.] Attempts to restore [Item] to an operable condition were unsuccessful. [State how the firearm was attempted to be restored, and why it is not capable of discharging a cartridge.] [Item] was not test fired. [State if the firearm was returned to the condition as received.]

7.2.1.2.6. As received, firearm cannot discharge a cartridge. No restoration attempt made:

- [Item] was examined on [date]. [Item] is not capable of discharging a cartridge in the condition submitted. [State the reason(s) why firearm is not capable of discharging a cartridge.] No restoration attempt was made on [Item]. [Item] was not test fired.

7.2.1.2.7. If additional sets of test fires are created, the following wording should be used:

- [Item] was test fired [method of loading] [#] [stock/evidence cartridges] from [source, if applicable] on [date]. This set of test fires is designated [Item]. [Use above suggested wording for statements regarding the functionality of the firearm during test firing.]

7.2.1.3. The results of trigger pull, if determined:

7.2.1.3.1. If the trigger pull determination was performed with a digital force gauge, it is reported as follows:

Firearm has more than one mode/action of firing:

- Approximate Trigger Pull(s):  
[Item] Mode/Action: [mean value] The uncertainty of this measurement (UM) is available upon request.  
[Item] Mode/Action: [mean value] The uncertainty of this measurement (UM) is available upon request.

Firearm has one mode of firing:

If a firearm only has one mode/action of firing, that does not need to be specified in the report. The mode/action must be documented the case record.

- Approximate Trigger Pull(s):



[Item]: [mean value] The uncertainty of this measurement (UM) is available upon request.

7.2.1.3.2. If the trigger pull determination was performed with the trigger pull weights, it is reported as above, with the following changes:

- Approximate Trigger Pull(s):

[Item] Mode/Action (if needed): [range] This range of values is not considered quantitative, and no significance can be attached or testified to.

7.2.1.4. Officers' Firearms:

7.2.1.4.1. When an officer's firearm is test fired, the above wording applies.

7.2.1.4.2. Additionally, safeties need to be addressed; specifically if the examined safeties functioned or did not function as expected.

- All examined safeties functioned as expected.
- All examined safeties did not function as expected. [State why the examined safety/safeties did not function as expected.]

7.2.1.5. Cartridges cycled in a Firearm:

- [# (spelled out)] [stock/evidence] cartridges were cycled in [Item] [by handloading/using (magazine) Item/using a reference magazine] on [date]. This set of cycled cartridges is designated [Item].

7.2.1.6. Barrel or Other Casts Created:

- A cast of [part of firearm] of [Item] was created on [date]. This cast is designated [Item]. (Note: If the firearm was disassembled, cleaned, etc. prior to the cast being created, this should also be noted in the report.)

7.2.1.7. Barrel and Overall Length of Long Guns

7.2.1.7.1. If the barrel and/or overall length of a firearm are/is less than the legal limit, use the following wording in the report:

- According to the National Firearms Act, the minimum length for the barrel of a rifle is 16". The minimum length for the barrel of a shotgun is 18". The minimum overall length for rifles and shotguns is 26".

7.2.1.7.2. Barrel length less than legal limit:

- The barrel length of [Item] is X inches.

7.2.1.7.3. Overall length less than legal limit:

- The overall length of [Item] is X inches.

7.2.1.7.4. Barrel and overall lengths less than legal limit:

- The barrel length of [Item] is X inches and the overall length of [Item] is X inches.



7.2.1.7.5. If the barrel and/or overall length is within one-half of one inch under the legal limit for the firearm, measurements must be made using a NIST-traceable measuring device and include uncertainty of measurement. When this occurs, the following statement is added to the length statement(s).

- $\pm$  [Barrel length and/or overall length uncertainty] inches at a coverage probability of approximately 95% ( $k=2$ ).

## 7.2.2. Comparison of Fired Bullets, Cartridge Cases and Shotshells

### 7.2.2.1. Identification

- [Item] [was/were] fired in [Item] (identification).
- [Item] [was/were] fired in the same firearm as [Item] (identification).
- [Item] were fired in the same firearm (identification).

### 7.2.2.2. Elimination

- [Item] [was/were] not fired in [Item] (elimination).
- [Item] [was/were] not fired in the same firearm as [Item] (elimination).
- [Item] were not fired in the same firearm (elimination).

### 7.2.2.3. Inconclusive

- [Item] could not be identified or eliminated as having been fired in [Item] (inconclusive).
- [Item] could not be identified or eliminated as having been fired in the same firearm as [Item] (inconclusive).
- [Item] could not be identified or eliminated as having been fired in the same firearm (inconclusive).

### 7.2.2.4. Unsuitable

- [Item] [is/are] unsuitable for microscopic identification. (Follow this by caliber determination and manufacturers list statements found in the General Rifling Characteristics Database Information Section 7.2.3.2.2, if applicable).

### 7.2.2.5. Insufficient

7.2.2.5.1. There may be times when an item has discernible class characteristics but no **(or very few)** individual characteristics, **but the item is useful for elimination. Any applicable elimination statements are included in the report, along with this statement about the item(s):**

- [Item] has a lack of discernible characteristics (insufficient). As a result, no further examination of [Item] will occur. This is also the opinion of Firearms Examiner [name].

7.2.2.5.2. There may be times when an examiner cannot determine if markings are individual or subclass. In these instances, the following statement may be used:

- [Item] has markings that may not be unique to [a firearm] (insufficient). As a result, no further examination of [Item] will occur. Submission of a firearm for



comparison or developments in the field may allow for a definite determination in the future. This is also the opinion of Firearms Examiner [name]. New requests must be made for additional analysis.

### 7.2.3. General Rifling Characteristics Database Information

Manufacturers' lists appear as attachments at the end of LIMS reports. Each list generated is referred to by an appendix number. The appendix number is referenced in the body of the report.

#### 7.2.3.1. Bullet items where a GRC list can be generated:

7.2.3.1.1. If the evidence is not compared to a firearm, then use the following wording:

- [Item] [is/are] consistent with the [X] caliber family, which includes [specific caliber(s)].
- [Item] could have been fired in a [specific caliber] firearm produced or marketed by manufacturers listed in Appendix [appendix number].

Note: The above sentence is repeated for each applicable specific caliber.

7.2.3.1.2. If the evidence is compared to a firearm and the result is inconclusive (but consistent in class), then use the following wording:

- [Item] [is/are] consistent with the [X] caliber family, which includes [specific caliber(s)].
- In addition to [Item (the compared firearm)], [Item] could have been fired in a [specific caliber] firearm produced or marketed by manufacturers listed in Appendix [appendix number].

Note: The sentence "[Item] could have been fired in a [specific caliber] firearm produced or marketed by manufacturers listed in Appendix [appendix number]" is repeated for each applicable specific caliber.

7.2.3.1.3. There may be situations where the caliber family (and potentially other class characteristics) of a bullet can be determined, but the condition of the evidence does not reasonably allow for narrowing to one or a few specific calibers. In that instance, the following wording may be utilized (see the General Rifling Characteristics Utilization Section for further details):

- [Item] [is/are] consistent with the [X] caliber family (if appropriate, list specific calibers).
- [Item] could have been fired in a [caliber family] firearm produced or marketed by manufacturers listed in Appendix [appendix number].

#### 7.2.3.2. Bullet items when no GRC list can be generated:

7.2.3.2.1. Able to determine caliber, but not enough class characteristics remaining to generate a GRC list:



- [Item] [is/are] consistent with the [X] caliber [family/families] (if appropriate, list specific caliber(s)). Due to the condition of [Item], a list of firearms manufacturers was not generated.

7.2.3.2.2. Not able to determine caliber:

- Attempts to determine the caliber [family/families] of [Item] were unsuccessful.

7.2.3.2.3. Exact caliber family cannot be determined, but one may be able to say that an item is bigger than/smaller than or in between certain caliber families.

- Attempts to determine the caliber [family/families] of [Item] were unsuccessful; however, [Item] is/are [larger/smaller] than the [X] caliber family. Due to the condition of [Item], a list of firearm manufacturers was not generated.
- Attempts to determine the caliber [family/families] of [Item] were unsuccessful; however, [Item] [is/are] consistent with or [larger than/smaller than] the [X] caliber family. Due to the condition of [Item], a list of firearm manufacturers was not generated.

- Attempts to determine the caliber [family/families] of [Item] were unsuccessful; however, [Item] [is/are] [larger than/consistent with] the [X] caliber family and [smaller than/consistent with] the [X] caliber family. Due to the condition of [Item], a list of firearm manufacturers was not generated.

7.2.3.2.4. If a stakeholder specifically requests that a GRC list be provided, but the condition of the evidence is such that a list cannot be generated, the following language will be included in the report:

- Due to the condition of [Item], a list of firearm manufacturers was not generated.

7.2.3.3. Cartridge Cases where a GRC list can be generated:

7.2.3.3.1. If the evidence is not compared to a firearm, then use the following wording:

- [Item] could have been fired in a [specific caliber] firearm produced or marketed by manufacturers listed in Appendix [appendix number].  
Note: The above sentence is repeated for each applicable specific caliber.

7.2.3.3.2. If the evidence is compared to a firearm and the result is inconclusive (but consistent in class), then use the following wording:

- In addition to [Item (the compared firearm)], [Item] could have been fired in a [specific caliber] firearm produced or marketed by manufacturers listed in Appendix [appendix number].  
Note: The sentence “[Item] could have been fired in a [specific caliber] firearm produced or marketed by manufacturers listed in Appendix [appendix number]” is repeated for each applicable specific caliber.

7.2.3.4. Cartridge Cases where no GRC list can be generated:



If the condition of a cartridge case precludes a GRC list being generated, refer to section 7.2.3.2 for appropriate verbiage.

7.2.3.5. Combination of bullet(s) and cartridge case(s):

7.2.3.5.1. If the evidence is not compared to a firearm, then use the following wording:

- If [Item] were fired in the same firearm, they could have been fired in a [specific caliber] firearm produced or marketed by manufacturers listed in Appendix [appendix number] (this sentence is repeated for each applicable specific caliber).

7.2.3.5.2. If the evidence is compared to a firearm and the result is inconclusive (but consistent in class), then use the following wording:

- If [Item] were fired in the same firearm, then in addition to [Item (the compared firearm)], they could have been fired in a [specific caliber] firearm produced or marketed by manufacturers listed in Appendix [appendix number].

Note: The sentence “[Item] could have been fired in a [specific caliber] firearm produced or marketed by manufacturers listed in Appendix [appendix number]” is repeated for each applicable specific caliber.

7.2.3.6. In some instances, an examiner may report a GRC list for a group of items that may have been fired in more than one firearm (in the case of items that are consistent in class but were determined to be inconclusive or eliminated from each other based on individual characteristics). In this case, the examiner may modify the statements outlined in Section 7.2.3 to reflect this. Examples may include, but are not limited to:

- In addition to [Item (the compared firearm)], [Item] could have been fired in one or more [caliber/calibers] firearms...
- [Item] could have been fired in two different [caliber/calibers] firearms...

7.2.3.7. If it is the examiner’s opinion that the generated list of firearm manufacturers is too lengthy for the report, then the following statement is provided in lieu of the appendix reference:

- The list of potential manufacturers is too long to present here. Please contact the Firearms Section of the Houston Forensic Science Center if this information is needed.

7.2.3.8. If the GRC program does not return any matching entries, the following statement is provided in the report in lieu of the appendix reference:

- There are currently no matching entries in this laboratory’s database.

7.2.3.9. A GRC disclaimer statement shall appear on any list presented in the report/appendix.

- Manufacturers lists are investigative tools and are not intended to be all-inclusive. Any suspect firearms should be submitted for comparison.



#### 7.2.4. Fired Shotshell Component Determinations

Fired shotshell components are not suitable for GRC determinations; however, the following wording is used when appropriate:

##### 7.2.4.1. Pellets

- [Item] [is/are] consistent with [size/sizes] shot.

##### 7.2.4.2. Wadding/Carriers

- [Item] [is/are] consistent with having been loaded in a [X] gauge shotshell.

##### 7.2.4.3. Shotshells

- [Item] [was/were] fired in a [X] gauge firearm.

#### 7.2.5. Examination and Comparison of Unfired Ammunition Components

Occasionally, Firearms Examiners are asked to examine unfired ammunition components. Some suggested wording to use in these instances is listed below, but wording may need to be developed on a case-by-case basis.

##### 7.2.5.1. Determination if a component is from a specific marketer of ammunition.

- [Item] [is/are] consistent with [bullets/cartridge cases/shotshells/etc.] marketed by [brand].

##### 7.2.5.2. Comparison to determine if unfired ammunition components are similar in style, same manufacturer/marketer, etc.

- [Item] [is/are] similar in size, weight, and style to [Item]. This style [is/is not] unique to [brand/a specific brand].
- [Item] [is not/are not] similar to [Item].

##### 7.2.5.3. Comparison to determine if unfired ammunition components were cycled in the same/a specific firearm.

- [Item] [was/were] evaluated for markings consistent with a cartridge being loaded and/or unloaded in a firearm (cycling). The same firearm cycled [Item].
- [Item] [was/were] evaluated for markings consistent with a cartridge being loaded and/or unloaded in a firearm (cycling). [Item] cycled [Item].
- [Item] [was/were] evaluated for markings consistent with a cartridge being loaded and/or unloaded in a firearm (cycling). It could not be determined if the same firearm cycled [Item].
- [Item] [was/were] evaluated for markings consistent with a cartridge being loaded and/or unloaded in a firearm (cycling). It could not be determined if [Item] cycled [Item].
- [Item] [was/were] evaluated for markings consistent with a cartridge being loaded and/or unloaded in a firearm (cycling). No markings consistent with cycling were observed.

#### 7.2.6. Serial Number Restoration



There may be times when more than one type of processing is used and should be noted in the report.

7.2.6.1. Complete serial number restored

- The serial number of [Item] was [type(s) of processing – i.e., mechanically, chemically, magnetically] processed and restored to read “[restored serial number]”. This is also the opinion of Firearms Examiner [name].

7.2.6.2. Serial number partially restored

7.2.6.2.1. General format for a partially restored serial number:

- The serial number of [Item] was [type(s) of processing – i.e., mechanically, chemically, magnetically] processed and partially restored to read “[partially restored serial number]”. This is also the opinion of Firearms Examiner [name].

7.2.6.2.2. A “?” is used to represent a character or number of characters that could not be restored. If a question mark is used as a place holder in the serial number, the following wording is used after the above listed statement.

- [The/Each] question mark represents [a/one or more] serial number character(s) that could not be restored. (This statement can be adjusted depending on the number and location of characters that could not be restored.)

7.2.6.2.3. An “\*” is used to represent characters that could be partially restored and where a limited set of possibilities of what that character could be exists. If more than one “\*” is needed, then they can be designated as the first, second, etc. in the explanation (i.e., “the first asterisk represents...”). If an “\*” is used as a place holder in the serial number, the following wording is used after the above statement:

- The [first, second, etc., if necessary] asterisk represents [a/an] “[character]”, [a/an] “[character]”, or [a/an] “[character]” (listing as many as necessary).

7.2.6.3. No characters restored

- An area of obliteration on [Item] was [type(s) of processing – i.e., mechanically, chemically, magnetically] processed, but attempts to restore the serial number were unsuccessful.

7.2.6.4. Secondary sources and/or numbers

The following statement is used when using secondary sources and/or numbers to determine the serial number:

- Based on current research and manufacturer information, the serial number of [Item] was determined to be “[serial number]”. [See language presented in above for appropriately reporting out the serial number.]

7.2.6.5. No area of obliteration observed

- [Item] was examined, but no area of obliteration was observed. No restoration attempt was made.





### **7.3. Specific Wording for the NIBIN Details Section:**

NIBIN processing addressed in the NIBIN Details Section of a report may be part of a firearms examination request or part of the NIBIN program.

#### **7.3.1. NIBIN Entry as Part of A Firearms Examination Request.**

This language should be used if the information was not provided in a prior report and the evidence was not previously processed through the NIBIN program.

##### **7.3.1.1. Unsuitable for NIBIN Entry/Not Entered into NIBIN:**

- [Item] [was/were] evaluated for NIBIN entry on [date]. [Item] [was/were] not entered into NIBIN. The evidence was not entered into NIBIN for one or more of the following reasons:

- No or few markings to image;
- Ineligible offense, caliber, or firearm type;
- Too damaged;
- A representative item is already imaged.

Note: If an item was not evaluated for NIBIN entry, the above statements are not included in the report.

##### **7.3.1.2. If the item is entered into NIBIN:**

- [Item] [was/were] entered into NIBIN on [date]. The appropriate investigative agency(ies) and/or division(s) will be notified of any possible NIBIN associations with this evidence.

#### **7.3.2. NIBIN Entry as Part of the NIBIN Program Addressed in Casework Analysis**

7.3.2.1. This language should be used if the evidence was processed through the NIBIN program and a NIBIN notification without item number(s) and description(s), or no NIBIN Notification, was generated.

- The information provided below details work done on evidence that was received from the submitting agency prior to casework analysis and processed through the NIBIN program. This evidence is typically returned to the submitting agency within five business days of processing.

Note: If a NIBIN Notification that includes the item numbers and descriptions of the items processed was generated, the information does not need to be repeated in a firearms examination report.

##### **7.3.2.2. Firearm**

###### **7.3.2.2.1. Entered into NIBIN:**

- [Item] was test fired [method of loading] [#] [stock/evidence] cartridges [from source, if applicable] on [date]. This set of test fires is designated [Item] (test fires). [Item] (test fires) was entered into NIBIN on [date]. The appropriate investigative agency(ies) and/or division(s) will be notified of any possible NIBIN associations with this evidence.



7.3.2.2.2. Unsuitable for NIBIN Entry/Not entered into NIBIN:

- [Item] was test fired [method of loading] [#] [stock/evidence] cartridges [from source, if applicable] on [date]. This set of test fires is designated [Item] (test fires). [Item] [was/were] evaluated for NIBIN entry on [date]. [Item] [was/were] not entered into NIBIN. The evidence was not entered into NIBIN for one or more of the following reasons:

- No or few markings to image;
- Ineligible offense, caliber, or firearm type;
- Too damaged;
- A representative item is already imaged.

Note: If an item was not evaluated for NIBIN entry, the above statements are not included in the report.

7.3.2.2.3. Non-Functional Firearm Restored to a Functioning Condition:

- [Item] was received on [date] in a nonfunctioning condition. [Item] was restored to a functional condition and test fired [method of loading] [#] [stock/evidence] cartridges [from source, if applicable] on [date]. This set of test fires is designated [Item] (test fires). [State if the firearm was returned to the condition as received after test firing.] (Follow wording above if test fires were suitable or unsuitable for NIBIN entry).

7.3.2.2.4. Non-Functional Firearm Not Restored to a Functioning Condition:

- [Item] was received on [date] in a nonfunctioning condition. Attempts to restore [Item] to an operable condition were unsuccessful. [Item] was not test fired. [State if the firearm was returned to the condition as received.]

7.3.2.2.5. See Section 7.2.1.1 for guidelines on wording for methods of loading.

7.3.2.2.6. Non-Functional Firearm, No Restoration Attempt:

- [Item] was received on [date] in a nonfunctioning condition. [Item] was not restored to a functional condition. [Item] was not test fired.

7.3.2.2.7. Not Test Fired:

- [Item] was received on [date] and not test fired.

7.3.2.3. Fired Evidence:

7.3.2.3.1. Suitable for NIBIN Entry

- [Item] [was/were] entered into NIBIN on [date]. The appropriate investigative agency(ies) and/or division(s) will be notified of any possible NIBIN associations with this evidence.

7.3.2.3.2. Unsuitable for NIBIN Entry/Not Entered into NIBIN

- [Item] [was/were] evaluated for NIBIN entry on [date]. [Item] [was/were] not entered into NIBIN.

**7.4. Reporting Format and Guidelines for Firearms Submitted for Unloading Only:**



The information included in this type of report will generally follow those outlined above with the following exceptions:

7.4.1. Results and Interpretations

7.4.1.1. Begin with a statement about why the report is being generated:

- This report is to detail how [Item] [was/were] rendered safe.

7.4.1.2. Include a brief description of the condition of the item as received. This may include, but is not limited to, statements such as:

- [Item] was corroded.
- [Item] was submitted submerged in water.
- The slide of [Item] was stuck in the forward position.
- The cylinder of [Item] could not be opened.

7.4.1.3. State how the firearm was unloaded and/or how it was rendered safe. This may include, but is not limited to, statements such as

- The slide/cylinder of [Item] was hammered open.
- A cartridge/[number] cartridges was/were removed from the chamber(s) of [Item].
- [Number] cartridges were removed from the magazine Item [Item].
- [Item] was disassembled to unload it.
- The top strap of [Item] was sawed through to release the cylinder.

7.4.1.4. Unless the firearm was also function tested, include the following wording:

- [Item] was not further examined as part of this request.

**7.5. Reporting Guidelines for Evidence Processed for NIBIN Only Entry (NIBIN Notification):**

When items are processed through the NIBIN program only for NIBIN entry and not as a result of casework analysis, a NIBIN Notification is generated. The overall format of a NIBIN notification follows the format outlined in Section 7.1.

7.5.1. If evidence is processed by the Firearms Section for the NIBIN program, the following language will be used to notify the stakeholder of work completed:

• **Notification Details:**

**This notification serves to inform the customer that NIBIN processing has been completed on the above listed evidence.**

**No testimony will be provided regarding this notification. If testimony is needed, a firearms examination request must be made.**

If test fires are among the items listed above, they were entered into NIBIN unless noted in the Additional Information section below. If fired cartridge cases are among the items



listed above, the representative items entered are listed in the Additional Information section below. If no representative items were entered, that is noted in the Additional Information section below.

If a NIBIN lead is identified, a separate notification is generated.

**Disposition:**

The above described evidence has been or will be returned to the submitting agency.

**Additional Information:**

[If test fires or representative items of fired evidence were not entered, list here as “[Item] was/were not entered into NIBIN.”

If representative items of fired evidence were imaged, list here as “[Item] was/were entered into NIBIN on [date].

If the evidence was received with issues that need to be reported but did not result in a rejection of the evidence, those issues must be included in the report. See the Quality Manual as well as Sections 7.1.6.1 – 7.1.6.3 for further information.]

If the evidence was not entered into NIBIN, it is for one or more of the following reasons:

- No or few markings to image;
- Ineligible offense, caliber, or firearm type;
- Too damaged;
- A representative item is already imaged.

**Methods used:**

Result Type	Method(s) Used
Firearms testing	Visual and mechanical examination
Conclusions of NIBIN suitability	Microscopic examination

7.5.2. If evidence in the Firearms Section for NIBIN processing is rejected due to major discrepancies (i.e., those in Section 11.2), the following language will be used to notify the stakeholder:

• **Notification Details:**



**This notification serves to inform the customer that NIBIN processing was not completed on evidence associated with this case.**

[Item] was/were rejected for NIBIN processing. [Include a summary of the reason(s) for the item being rejected.]

[If the evidence was received with issues that need to be reported, those issues must be included in the report. See the Quality Manual as well as Sections 7.1.6.1 – 7.1.6.3 for further information.]

**7.6. High Confidence Correlation Notification (NIBIN Lead):**

7.6.1. When a High Confidence NIBIN Lead is identified, a notification is issued in LIMS using the language provided below. If a High Confidence NIBIN Lead (or confirmed NIBIN Hit) has previously been reported linking additional case(s) to either of the cases listed in the current notification, it is permissible to include those cases and items in the notification as well.

7.6.2. High Confidence NIBIN Lead Notification Language:

- The following information is being provided for investigative purposes only.

A possible NIBIN association (case to case link) has been identified between firearms evidence in the following cases:

[Agency] [I], [Item]

[Agency] [I], [Item]

This evidence in these cases has not been compared by a Firearms Examiner.

If you desire that the items of evidence in these cases be microscopically examined by a Firearms Examiner, please submit a request for testing. Contact HFSC for assistance in submitting a request via email at [triage@hfscctx.gov](mailto:triage@hfscctx.gov).

Results of analysis of these items will result in one of the following conclusions:

- Identification
- Inconclusive
- Elimination

For additional clarification regarding conclusion statements, please visit the Houston Forensic Science Center Record Search at <https://records.hfscdiscovery.org> for the applicable version of the Firearms Section Range of Conclusions Document. For questions or concerns, please



contact the Client Services & Case Management Division at (713) 929-6760 or by emailing [triage@hfsctx.gov](mailto:triage@hfsctx.gov).

### 7.7. Low Confidence Correlation Result Notification

7.7.1. When a Low Confidence Correlation Result is found, a notification is issued in LIMS using the language provided below.

7.7.2. Low Confidence Correlation Result Notification Language:

- The following information should **NOT** be used for investigative purposes.

When reviewing the images of the items listed below in NIBIN, a Firearms Analyst saw some similarity, but not enough for the person reviewing them to be confident that if the items are examined under a microscope by a Firearms Examiner, the result would be an identification (**low confidence result**). However, it could be beneficial to microscopically compare the items listed below.

[Agency] [I], [Item]

[Agency] [I], [Item]

This evidence in these cases has not been compared by a Firearms Examiner.

If you desire that the items of evidence in these cases be microscopically examined by a Firearms Examiner, please submit a request for testing. Contact HFSC for assistance in submitting a request via email at [triage@hfsctx.gov](mailto:triage@hfsctx.gov).

Results of analysis of these items will result in one of the following conclusions:

- Identification
- Inconclusive
- Elimination

For additional clarification regarding conclusion statements, please visit the Houston Forensic Science Center Record Search at <https://records.hfscdiscovery.org> for the applicable version of the Firearms Section Range of Conclusions Document. For questions or concerns, please contact the Client Services & Case Management Division at (713) 929-6760 or by emailing [triage@hfsctx.gov](mailto:triage@hfsctx.gov).

### 7.8. Release of Results Prior to Issuance of Final Report

Occasionally, a stakeholder may request the Firearms Section to complete analysis on a priority basis, typically for investigative purposes. Very rarely, a stakeholder may request results be released to them before a report is finalized.



7.8.1. An Analyst may release results to a requestor prior to the release of the report under the following conditions:

7.8.1.1. Written permission is obtained from Section Management prior to the release of results. If the Supervisor or Manager was involved in the examination or technical review of the analysis in the request, then they cannot authorize the release of results. In the event the Manager and Supervisor are the only examiners available to be the primary and second/tech reviewer, the CEO or COO may authorize the release of results.

7.8.1.2. All results (that will be released early) requiring a second examiner (see Sections 4.1.2-4.1.3) have been documented and verified by the second examiner, and the second examiner has conducted their technical review. Other results (that will be released early) that do not require a second examiner are supported by examination documentation and have been technically reviewed.

7.8.1.3. The Analyst releasing the results must have reached the opinions being released. A result that was verified can be released by the primary or second examiner. A result that did not require verification can only be released by the primary examiner.

7.8.1.4. All results released to a stakeholder prior to the issuance of a report are included in the report.

7.8.1.5. Special Considerations for Law Enforcement Owned Weapons:

When responding to Officer-Involved Shooting call outs, Firearms Examiners are typically asked to release law enforcement owned firearms back to the owner of the firearm (or a representative) immediately after testing is completed.

7.8.1.5.1. If a Firearms Examiner testing a weapon identifies a concern about the weapon that could pose a safety hazard to the user or to the public, the Firearms Examiner does not need prior approval to release that information.

7.8.1.5.2. The following conditions must be met before a Firearms Examiner may release information prior to the release of the report without specific prior approval:

7.8.1.5.2.1. The firearm belongs to a Law Enforcement Officer or Agency.

(Alternatively, the Agency requesting the testing on a call-out basis may be requesting the firearm be released to the owner immediately after testing.)

7.8.1.5.2.2. HFSC is not retaining custody of the firearm (i.e., it is being released before the case record has been technically reviewed.)

7.8.1.5.2.3. The firearm poses a safety hazard to the user or the public (e.g., malfunctioning safety, firearm did not discharge one or more cartridges, cartridges did not feed properly from the magazine, damage to the firearm that may interfere with functionality or safety, firearm can discharge a cartridge in a way other than was intended, safety recalls).



7.8.1.5.2.4. Alternative to 7.8.1.5.2.3, the firearm may *not* pose a safety hazard to the user or the public, but the owner or Agency Representative requesting the testing may have reason to believe the firearm is compromised. However, the owner/requester must express specific concerns or specific reasoning for the concern.

7.8.1.5.3. The information released must be limited to the specific identified/potential/suspected hazard(s) of the firearm.

7.8.1.5.4. The Firearms Examiner who released the results notifies Section Management on the next business day, in addition to adhering to 7.8.2.

7.8.2. The Analyst who released the results documents the information released, to whom, the date of release, and the method (verbal, email, etc.) in the case record.

**7.9. Literature/Supporting Documentation:**

7.9.1. National Firearms Act (current edition)

7.9.2. ATF Policy on Issuing NIBIN Leads (current edition)





## **8. Case Record Review**

All Firearms Examination reports, Firearms Reprint reports, NIBIN Lead (IBIS Hit) Notifications, IBIS Hit Reprint reports and associated records undergo two rounds of review. These reviews are documented in LIMS as a “technical review” and an “administrative review”. However, *both* rounds of review cover technical and administrative aspects. In the event the first and second rounds of review are not completed and documented by two separate Analysts, it will be reported to Quality and tracked.

When a request requires a second examiner, the first round of review may be conducted by the second examiner. This is documented in LIMS by completing the “second Analyst review” milestone. The second round of review is documented by the second reviewer completing both the “tech review” and “admin review” milestones in LIMS.

When a request does not require a second examiner, or if the second examiner does not complete the first round of review, the first round of review is documented by one Analyst completing the “tech review” milestone and the second round of review is documented by a different Analyst completing the “admin review” milestone.

NIBIN Only Notifications do not contain extensive technical information. Therefore, only one round of review covering both technical and administrative aspects is required.

It is preferable that NIBIN Only Notifications documenting the processing of fired evidence still undergo two rounds of review. If one Analyst inadvertently completes both rounds of reviews for these types of requests, it does not need to be reported to Quality. However, a post-mortem review will be conducted by a second Analyst as soon as possible after it is discovered.

Other types of reports or notifications issued by the Firearms Section (e.g., stop work reports or administrative information only reports) may only need an administrative review.

Administrative and technical aspects of reviews are conducted using check lists as guidelines.

If an error is made in recording the review milestones in LIMS, but no changes to a report are required, the report does not need to be amended. The Analysts performing the reviews will be made clear by adding documentation to the case record.

All changes made to the case record due to a review are tracked. Changes made in LIMS and Mideo are tracked automatically. Changes made to written documentation are tracked by initialing and dating the change on the paper record.



Corrections needed that are identified by a reviewer are recorded in the designated fields in LIMS. If no changes/corrections are needed to the case record, "defect free" is noted in the designated fields in LIMS. The review performed by the second examiner is considered part of the review process. However, there are some pieces of information that are not known by the primary examiner until the second examiner has completed their analysis (e.g., name of second examiner). These do not need to be recorded unless the change is not made before the next round of review.

### **8.1. Firearms Casework Review Checklist (including report reprint types)**

#### 8.1.1. Technical Aspects:

- All reported conclusions on microscopic comparisons, conclusions of insufficient and unsuitable, and the reported restored serial numbers have been reached by the primary and second examiner.
- Laboratory and section policy was followed in examination and reporting procedures.
- All conclusions/opinions in report are supported by exam documentation in the case record.
- All (final) conclusions/opinions in case file are documented in the report.
- Methods used are properly documented in the report.
- All manual calculations and data transfers are checked (i.e., shot size determination and GRC information), if applicable.
- Any consultations or conflicts are documented in the case record and the conflict resolution policy was properly followed.

#### 8.1.2. Administrative Aspects:

- Spelling and grammar in report and case record are correct.
- Abbreviations used are easily understood or documented in SOPs.
- Cross outs, interlineations, and additions in the written case record are initialed (and dated, if appropriate).
- Written case record is free from obliterations (only single-line strikethroughs).
- All handwritten material is done in ink.
- Chain of custody is clear and complete.
- Every page (both administrative and exam) has the unique case identifier. If the page/record is electronic, the unique case identifier is visible on the screen when viewed.
- Name, initials, or secure electronic equivalent are on every page of exam documentation.
- Examination documentation is clear as to who performed the analysis and the date it was performed.
- Name, initials, or secure electronic equivalent, of the individual adding administrative documentation to the case record are on administrative documents.



- Dates that exams, etc. were conducted are recorded.
- Report issued addresses request that was made. (Multiple reports may be needed to address some requests)
- Report(s) and documentation follow lab policy (formatting, headers, correct versions of worksheets).
- **Requestor information is correct in reports. Additional requestors or stakeholders may be added to the distribution list.**
- Any deviations from standard practice, policy, etc. are documented in the case record.
- Printed and/or written laboratory generated examination records are page numbered indicating the total number of pages.
- Attachments are included in the firearm examination report and the firearm reprint report as needed.

## **8.2. NIBIN Only Review Checklist**

### 8.2.1. Technical Aspects:

- Laboratory and section policy was followed in examination and reporting procedures.
- Methods used are properly documented in the report.
- Any conflicts are documented in the case record and the conflict resolution procedure was properly followed.
- Item(s) were imaged into NIBIN according to standard protocols, including accurate information critical to proper correlation and lead reporting.

### 8.2.2. Administrative Aspects:

- Spelling and grammar in notification and case record are correct.
- Abbreviations used are easily understood or documented in SOPs.
- Cross outs, interlineations, and additions are initialed in the written case record (and dated, if appropriate).
- Chain of custody is clear and complete.
- Every page (both administrative and exam) has the unique case identifier. If the page/record is digital, the unique case identifier is visible on the screen when viewed.
- Name, initials, or secure electronic equivalent are on every page of exam documentation.
- Examination documentation is clear as to who performed the analysis and the date it was performed.
- Name, initials, or secure electronic equivalent, of the individual adding administrative documentation to the case record are on administrative documents.
- Dates that exams, etc. were conducted are recorded.
- Notification issued addresses request that was made. (Multiple reports may be needed to address some requests.)



- Notification(s) and documentation follow lab policy (formatting, headers, correct versions of worksheets).
- **Requestor information is correct. Typically NIBIN requests are “auto request”, but may have a stakeholder as a requestor on occasion.**
- Any deviations from standard practice, policy, etc. are documented in the case record.
- Case and item information not critical to correlation and lead reporting are entered correctly into NIBIN.

### **8.3. High and Low Confidence NIBIN Correlation Result Notifications Review Checklist**

#### 8.3.1. Technical Aspects:

- Items listed in hit conform to HFSC policy regarding issuing a NIBIN Lead Notification.
- Laboratory and section policy was followed in reporting procedures.
- Case numbers and Item numbers reported align with case record documentation (when available in LIMS) and with information from NIBIN.
- Any items processed for NIBIN by HFSC that are associated with the NIBIN Lead are reviewed to ensure the same item was not imaged twice and is being reported as a Lead to itself. This may be accomplished by viewing the two associated image printouts and evaluating them to confirm they are two different items.
- Any pending NIBIN Only requests associated with the NIBIN Lead request are technically and administratively reviewed and the reports are issued.

#### 8.3.2. Administrative Aspects:

- Spelling and grammar in report are correct.
- Abbreviations used are easily understood or documented in SOPs.
- Every page has the unique case identifier.
- Name, initials, or secure electronic equivalent, of the individual adding administrative documentation to the case record are on administrative documents.
- Notification issued addresses NIBIN Leads made. (Multiple notifications may be needed in some instances)
- Notification(s) and documentation follow lab policy (formatting, headers, correct versions of worksheets).
- Any deviations from standard practice, policy, etc. are documented in the case record.



## 9. Abbreviations Used in the Firearms Section

Many abbreviations are used to accurately catalog evidence items submitted into the Firearms Section.

NCIC Codes are used for firearm abbreviations.

Other abbreviations used in the Firearms Section are as follows:

### Bullet type/style abbreviations:

BC	Bullet Core	BCFR	Bullet Core Fragment
BEB	Brass Enclosed Bullet	BW	Brass Wash
CL	Coated Lead	CuW	Copper Wash
FBJ	Fired Bullet Jacket	FBJFR	Fired Bullet Jacket Fragment
FJB	Fired Jacketed Bullet	FJBFR	Fired Jacketed Bullet Fragment
FMJ	Full Metal Jacket	FNJB	Fired Non-Jacketed Bullet
FR	Fragment	FNJBFR	Fired Non-Jacketed Bullet Fragment
JHP	Jacketed Hollow Point	LHP	Lead Hollow Point
LRN	Lead Round Nose	MC	Metal Case
SJHP	Semi-Jacketed Hollow Point	SJSP	Semi-Jacketed Soft Point
SWC	Semi-Wad Cutter	TC	Truncated Cone
TMJ	Total Metal Jacket		

### Shotshell component abbreviations:

CW	Cardboard Wad	MS	Magnetic Slug
MSP	Magnetic Shot Pellet(s)	NMS	Non-Magnetic Slug
NSP	Non-Magnetic Shot Pellet(s)	PSC	Plastic Shot Carrier
PSW	Plastic Shot Wad	PSWR	Plastic Shot Wrap
PW	Paper Wad		

### Element/compound abbreviations:

Al	Aluminum	BR	Brass
Cu	Copper	Ni	Nickel
SS	Stainless steel	Pb	Lead

### Patented cartridge/bullet abbreviations:

GD	Gold Dot	GS	Golden Saber
HS	Hydra-Shok	ST	Silver Tip

### Caliber abbreviations:

ACP	Automatic Colt Pistol	GAP	Glock Automatic Pistol
Lug	Luger	Mag	Magnum
Mak	Makarov	Para	Parabellum
Spl	Special	S&W	Smith & Wesson



Brand name abbreviations:

FED or FC	Federal	REM or R-P	Remington Peters
Sig	Sig Sauer	S&W	Smith & Wesson
WIN or W-W	Winchester		

Class/individual/conclusion abbreviations:

A	Arched	AOI	Area of Interest
BF	Breechface	C	Circular
CH	Chamber	Char	Characteristics
CIC	Consistent in Class	CIRC	Consistent in Remaining Class
DOT	Direction of Twist	E	Elliptical
<b>EJ</b>	<b>Ejector</b>	<b>EX</b>	<b>Extractor</b>
ELIM	Elimination	FP	Firing Pin
FPA	Firing Pin Aperture ( <b>Shear</b> )	FPD	Firing Pin Drag
FPI	Firing Pin Impression	G	Granular
GI/GIMP	Groove Impression	H	Hemispherical
ID	Identification	Imp	Impressed/Impression
INC	Inconclusive	Indv/Ind	Individual
INSUF	Insufficient	IRR	Irregular
L	Left (twist)	L/G (L&G)	Lands and Grooves
LI/LIMP	Land Impression	P	Parallel
Part	Partial	Poly	Polygonal
R	Right (twist)	REC	Rectangular
UN	Unsuitable	VE	Vertical Elliptical
Vis	Visible	XH	Crosshatch

General firearms abbreviations:

AFTE	Association of Firearm and Tool Mark Examiners	Cart(s)	Cartridge(s)
CC	Cartridge Case	Cyl	Cylinder Bore (Choke)
DA	Double Action	ETs	Evidence Test(s)
FA	Firearm	F/FC/Full	Full Choke
IB	NIBIN/IBIS	IC/Imp Cyl	Improved Cylinder (Choke)
IM/Imp Mod	Improved Modified (Choke)	M/Mod	Modified (Choke)
Oblit	Obliterated	<b>PMF</b>	<b>Privately Manufactured Firearm</b>
SA	Single Action	Sk	Skeet (Choke)
SN (S/N)	Serial Number	Stk	Stock
TF	(Set of) Test Fires		



NCIC Gun Codes (Commonly used):

B	Submachine gun/automatic pistol	MA	Machine gun
PD	Derringer	PG	Air operated pistol
PI	Semiautomatic pistol	PK	Blank pistol
PR	Revolver	PS	Single shot pistol
PU	Percussion pistol	RA	Automatic rifle
RB	Bolt action rifle	RC	Carbine
RG	Air operated rifle	RI	Semiautomatic rifle
RL	Lever action rifle	RS	Single shot rifle
RU	Percussion rifle	SB	Bolt action shotgun
SE	Double barrel shotgun (side by side)	SO	Over and under shotgun
SP	Pump action shotgun	SS	Single shot shotgun

Miscellaneous abbreviations:

#	Number	I	Agency Case Number
FCN	Forensic Case Number	CoC	Chain of Custody
ME	Medical Examiner	IPB	In Progress Box
MRN or MR #	Medical Record Number	ML #	Medico Legal Number
MU	Measurement Uncertainty	UofM	Uncertainty of Measurement



## 10. Methods Used in the Firearms Section

For the commonly used methods listed below, the results can only be obtained using the methods listed. Therefore, the method does not need to be specified in the case record. If more than one method may be used (i.e., serial number restoration), the method(s) are documented in the case record. Methods used are documented in the report.

Infrequently used methods and infrequently performed analysis types are listed in Section 10.2.

### 10.1. Commonly used methods:

10.1.1. Firearms are visually and mechanically examined. Visual and mechanical examination includes:

- Verifying the firearm is unloaded by checking the chamber
- Noting identifying information like manufacturer, importer, caliber, and serial number
- Documenting physical characteristics, including extractor and ejector positions, bore condition, and rifling characteristics
- “Bench testing” the firearm to determine operability, safeties present, and overall mechanical condition
- Checking magazine capacity
- Test firing

10.1.2. Trigger Pull is determined by mechanical measurement (weight). Mechanical measurement (weight) includes:

- Operating a digital force gauge to determine the amount of weight required to pull the trigger of a firearm
- Using trigger pull non-standard weights to determine the amount of weight required to pull the trigger of a firearm

10.1.3. Barrel and overall length of a firearm is determined by mechanical measurement (length). Mechanical measurement (length) includes:

- Using a ruler to measure the barrel and/or overall length of a firearm
- Placing a non-marring item down the barrel to assist in measuring the barrel length

10.1.4. NIBIN suitability of fired cartridge cases is determined by microscopic examination.

Microscopic examination for NIBIN suitability may occur using either a stereoscope or a comparison microscope.

10.1.5. The “range of conclusions” for cartridge components is determined using microscopic examination and comparison. The “range of conclusions” determined using this method are:

- Identification
- Elimination
- Inconclusive





- Insufficient
- Unsuitable

10.1.6. Cartridge components are evaluated and classified using visual and microscopic examination. Evaluation and classification include:

- Caliber/gauge/shot size determination
- Number of land and groove impressions
- Width of land and groove impressions
- Twist of land and groove impressions
- Location of extractor and ejector marks
- Type of breechface marks
- Shape of firing pin impression
- Physical characteristics (e.g., corrosion, style, apparent composition)

**10.2. Infrequently Used Methods and Infrequently Performed Analyses:**

Test methods used in the Firearms Section fewer than 10 times/year in the section are considered “infrequent.” Test methods used infrequently are those related to serial number restoration.

Specific applications of regularly used test methods that Analysts may perform infrequently may include: measuring barrel and/or overall length of firearms where uncertainty is reported, determining gauge of shotshell components or shot pellet size, conducting microscopic comparisons on unfired cartridges, rendering firearms safe, using reduced powder loads or primed cartridge cases/shotshells, and casting. If an examiner is performing one of these functions, he/she should consult all applicable SOPs prior to proceeding with testing.



## **11. Handling of Evidence**

Evidence is handled while in the care, custody, and control of HFSC in a way that protects the integrity of the evidence and prevents loss, contamination, or deleterious change. The HFSC Quality Manual contains general details on evidence handling, including packaging and sealing.

Section personnel do not inventory or examine evidence for which there is a pending request for another service on the same evidence. Examples include a pending request for latent print processing and/or DNA screening on an item of evidence.

Section personnel handle evidence while wearing gloves and other necessary PPE until the Analyst determines that there is not an evident hazard posed by obvious blood, bodily fluids, or other hazardous substances. This is done to keep section personnel from a hazardous exposure.

### **11.1. Receipt of Evidence**

11.1.1. In general, the HFSC staff member receiving evidence ensures that the item is appropriately labeled, packaged, and/or sealed. How an item is packaged (outer packaging) upon receipt into the Firearms Section is noted in the case record by Firearms Section staff.

11.1.1.1. In the Firearms Section, there are some notable exceptions to the general requirement that items of evidence be received packaged and sealed.

11.1.1.1.1. Items of evidence, especially firearms and their accessories, submitted for immediate analysis do not need to be received packaged or sealed.

11.1.1.1.2. Firearms that cannot be unloaded, or firearms that cannot be determined to be unloaded, may be submitted to the Firearms Section. Packaging and sealing such items may present a serious safety concern; therefore, the Firearms Section does not require that firearms submitted in this condition be packaged or sealed.

11.1.1.1.3. Long guns can be properly marked/labeled, stored, and protected from loss, contamination, or deleterious change without packaging. The Firearms Section does not require that long guns be packaged or sealed upon submission to the Firearms Section or release to the submitting agency. Long guns are marked with the unique case identifier(s) and item identifier.

11.1.1.1.4. Other bulky or oversized items may be submitted and should be received and stored at the direction of Section Management.

11.1.1.2. If items are received unpackaged and/or not properly sealed and do not meet the conditions outlined in 11.1.1.1.1-11.1.1.4, they are handled as follows:

11.1.1.2.1. Items that are received for analysis in an unpackaged/unsealed condition, but where the identity of the item can be verified in another way (e.g., the



description of a firearm includes a serial number consistent with the serial number on the firearm received):

- The condition of the evidence/evidence packaging is documented in the case record prior to processing the item. If there is damage to the packaging or evidence **that appears to be caused by mishandling of the evidence/package**, it is recommended that be documented with photographs retained in the case record.
- If analysis is to proceed on the same day the issue with packaging is noted, a remedial seal does not need to be established at this time. If analysis will proceed on a different day, a remedial seal is established.
- Analysis of items proceeds.
- The condition of the item upon receipt and the steps taken to remediate the seal/package are documented in the case record and report/notification as required by the quality manual.
- A proper seal is established by an HFSC staff member before the evidence is returned to the submitting agency.

11.1.1.2.2. Items that are received for analysis in an unpackaged/unsealed condition or if it appears the package/seal was tampered with, and where the identity of the item cannot be verified in another way:

- The condition of the evidence/evidence packaging is photographed and documented in the case record.
- Items are rejected for analysis (see Section 11.2 for further information).
- Items are returned to the submitting agency without a seal being established by an HFSC staff member.

Note: If a firearm accessory (e.g., magazine) or unfired cartridges are received unsealed, typically they need not be rejected. However, they will not be used during testing. The condition of the evidence is noted in the report/notification.

Note: If a stakeholder specifies they want testing on a firearm accessory or unfired cartridges and the items are received unsealed, those items are rejected.

11.1.2. Major discrepancies between the way an item of evidence is described by the stakeholder and the actual description of the evidence are noted in the case record and listed in the report/notification. These discrepancies are typically addressed in the additional information section.

11.1.2.1. The Firearms Section frequently receives items of evidence that are incorrectly described. The incorrect descriptions are made by non-experts and are not normally a concern to an Analyst when conducting firearms-related analysis. Examples of



common discrepancies that are not considered major and do not need to be explicitly addressed are:

- **Some** firearms type are frequently received as both pistols and rifles (e.g., AK and AR types). The distinction of these is nuanced and not critical to the identity of the firearm.
- Firearms with a bolt are sometimes described as bolt-action even though they are semiautomatic or full automatic firearms. Similar mistakes are also frequently made by non-experts.
- Marketers or importers listed as manufacturers of firearms. Determining one from the other can be difficult to impossible without additional information. If the company the stakeholder listed as the manufacturer is found on the firearm, it is explainable and not critical to the firearm's identity.
- Nuances in model names. It may be difficult to determine or understand what the actual model of a firearm is. Other times a typical model or firearm type (e.g., "AR", "1911") may have a more specific model name but the typical model name used by the stakeholder sufficiently describes the firearm.
- Minor discrepancies in caliber. For example, 223 Remington and 5.56x45mm are technically different calibers but are frequently used interchangeably.
- Missing information. Stakeholders may leave out all or part of the caliber, manufacturer, model and/or serial number from their descriptions.

11.1.2.2. Examples of major discrepancies that need to be documented and reported are

- Incorrect serial number
- Incorrect caliber
- Other incorrect firearm types, manufacturers and/or models that are not explainable like the examples listed in Section 11.1.2.1.
- Incorrect quantities, especially for cartridge cases and unfired cartridges. Bullets and bullet fragment quantities are frequently incorrect or change as they are damaged in packaging/transport.

## **11.2. Rejecting Evidence**

11.2.1. If evidence submitted to the Firearms Section meets the below criteria, consult Section Management for details on how to proceed. Evidence meeting the below criteria may be rejected for testing.

11.2.1.1. Inconsistent case identifiers on evidence and submission form or LIMS equivalent.

11.2.1.2. Absence of unique case identifier or item identifier (if applicable).

11.2.1.3. Evidence submitted is not suitable for the type of analysis requested.

11.2.1.4. Evidence received unsealed and where the identity of the item cannot be confirmed another way, or it appears the packaging/seal were tampered with.



11.2.1.5. Inconsistent evidence descriptions so egregious that the identity of the evidence is called into question.

11.2.1.5.1. Switched evidence labels

HFSC occasionally receives evidence packages where the labels have been switched (ex: Item X is in a package labeled Item Y; Item Y is in a package labeled Item X).

- Do not proceed with testing on any items with switched labels.
- Notify CS/CM staff so the evidence can be returned and corrected.
- If the items are needed for testing, request for items to be resubmitted once the submitting agency has made corrections.
- If proper corrections have been made, testing may proceed.

11.2.1.5.2. Analysts use their discretion and seek advice from a Supervisor or the Section Manager if the identity of the evidence remains in question.

11.2.2. Evidence rejected for analysis is documented in a report that includes the reason for the rejection. Staff are encouraged to utilize photographs to document reasons for rejection, when applicable. Photographs are required when the condition of the evidence or packaging is the reason for rejection.

### **11.3. Repackaging Evidence**

It may be necessary to repackage items of evidence received for analysis. In the event this occurs, every effort must be made to retain as much of the original packaging as possible as well as the way the items were packaged.

11.3.1. Repackaging may be necessary if the original packaging is damaged, contains liquid, is too small to contain its contents, has been opened and sealed so many times that the package can no longer be reasonably sealed again, or poses a potential biohazard.

11.3.2. When repackaging evidence:

11.3.2.1. Repackaging of evidence is noted in the case record when it is the outermost evidence container. If the outermost original evidence package does not change, it is not necessary to note inner repackaging. It is not necessary to note additional layers of packaging added to the evidence in the case record unless it is the outermost sealed packaging containing the evidence.

11.3.2.2. Original packaging is marked with the item(s) of evidence originally found in the package.

11.3.2.3. New packaging is marked in a way to indicate it was provided by HFSC (typically "lab bag" is written on the package).

11.3.2.4. Original packaging is maintained with the newly packaged item(s) that were originally found in the package.

11.3.2.5. If there are multiple packages contained inside another package, the method of packaging must clearly indicate which items were found in which packages.



- 11.3.2.6. If original packaging cannot be maintained (due to damage, health and safety concerns, or reasonable size restrictions), preserve and retain original markings and seals whenever possible. This may necessitate taking photographs to document packaging as received.
- 11.3.2.7. When in doubt, ask for assistance from Section Management or an experienced Analyst.
- 11.3.3. **It may also be needed if the packaging is not sufficient to ensure protection from loss, etc. or to prevent damage to the packaging.**
  - 11.3.3.1. **It is preferable that items packaged in paper envelopes (especially small items and bullet fragments) have an additional layer of packaging. This may be added inside or outside of the original packaging. Plastic bags or paper envelopes may be used as the additional layer. Packaging in boxes should only be done when needed since storage is a concern for stakeholders.**
  - 11.3.3.2. **If adding a layer of packaging, the general guidelines above for repackaging should be followed.**

#### **11.4. Release/Return of Evidence**

- 11.4.1. If items are received improperly packaged or unpackaged, it may be necessary for them to be properly packaged and sealed by HFSC staff prior to release to the submitting agency. This is noted in the case record.
- 11.4.2. If items submitted for immediate analysis (see 11.1.1.1.1 above) are to be released to the submitting agency immediately after analysis, the items do not need to be packaged or sealed prior to release unless requested by the recipient.
- 11.4.3. Firearms will not be released to a private citizen.



## 12. Potential Biohazards, Decontamination, and Trace/Foreign Material

The presence of biohazards and other pertinent material on items submitted for examination is documented in the case record, including how the condition was initially determined (item description, label on package, visually observed). Blood and body fluids/tissues are not documented when noted on projectiles or other items associated with a Medico-Legal (ML) or MRN/hospital number. Blood and body fluids/tissues are documented when noted on projectiles or other items that are not associated with an ML/MRN number.

Possible blood and body fluids/tissues are collected by an authorized staff member. Sections 12.2-12.3 below outline how to determine if an item needs to have possible blood or body fluids collected and how to decontaminate the items. Blood and body fluids/tissues are not collected from any projectiles unless specifically requested by the stakeholder; however, if Firearms Analysts suspect the material may be pertinent, they can request the collection. Blood and body tissues/fluids are not collected from any items of evidence associated with an ML/MRN number.

If an item of evidence poses a biohazard and must be handled by Firearms Section personnel, it is decontaminated. Prior to decontamination, pertinent foreign/trace material should be collected. Pertinent material may include areas appearing to be blood or other bodily fluids, hairs/fibers, or other material identified by the stakeholder as being of interest. **Firearms submitted to be rendered safe do not need to be decontaminated if they can be safely handled with proper PPE. Biological/trace material only needs to be collected from these firearms if it cannot be preserved during the render safe process.**

The presence, collection (when done by a Firearms Section Analyst), and decontamination of items is documented in the case record (usually a comments box in the applicable Justice Trax DUI). The Firearms Section may implement other ways/places to document.

**Possible blood, body fluids/tissues and trace materials are not collected from items submitted but not opened/inventoried/examined by firearms staff. Those items remain packaged/sealed and preserved for future testing.**

### 12.1. Trace and Foreign Materials

12.1.1. Apparent hairs/fibers are typically collected by staff authorized to collect possible blood. However, any staff member may collect hair/fiber as needed. Apparent hairs/fibers should be documented and collected from firearms related evidence. They should be picked up with forceps/tweezers and placed in an envelope. Glassine envelopes are the preferred container for hairs/fibers.



- 12.1.2. If suspected drug evidence is observed on or packaged with firearms related evidence, notify Firearms Section Management. Plant substances are typically safe to collect and should be collected/submitted with guidance from CS/CM. Other suspected drug evidence should be treated carefully and while wearing PPE. Consult with the Seized Drug section for guidance on how to proceed if an item is suspected of being contaminated with drug evidence.
- 12.1.3. Analysts should use their best judgement in determining the need to document other types of trace materials noted on/with firearms, cartridge cases, unfired cartridges, etc. Mud, grass, bugs, fluid (e.g., water or oil), etc. are frequently on/with items of evidence. If the trace material is removed, its presence and removal is documented. If the trace material remains with/on the evidence, its presence may be documented if it appears pertinent.
- 12.1.4. Projectiles frequently have other trace materials attached/imbedded. These include, but are not limited to, drywall, paint, glass, wood, plastic, concrete, fabric, and upholstery material. The presence of these substances should be noted in the case record, but typically do not need to be collected. An Analyst must use his/her judgement on when to collect these materials **instead of discarding them when they are decontaminated**. Seek guidance from Section Management when needed.
- 12.1.5. Once the presence of trace and foreign materials has been documented and collected (if appropriate), use the following as guidelines for removal from evidence (if necessary):
- Remove loose material by rinsing with acetone or water.
  - Remove plaster by rinsing in a dilute acetic acid solution (typically 10%-20%).
  - Remove paint by soaking in isopropyl alcohol or acetone.
  - Adherent material may be removed with a nylon brush, forceps, or similar item; however, care must be taken to not damage the item of evidence.

## **12.2. Determining course of action for decontamination**

- 12.2.1. When there is an indication (in LIMS item description, on packaging, visual inspection, etc.) that an item of evidence (other than projectiles and/or items associated with a Medico-Legal or MRN/hospital number) is contaminated with a biohazard (e.g., blood, bodily fluids), decontamination does not proceed unless:
- 12.2.2. If the biohazardous condition was noted by HFSC CSU, it is reasonable to expect that CSU has obtained any needed samples/swabs of the biohazard and processing may proceed.
- 12.2.3. If the biohazardous condition was noted by an HFSC staff member in another technical section, do not proceed with decontamination until it is confirmed that HFSC staff authorized to collect biological material (e.g., blood) has evaluated the item for evidentiary value and swabs were obtained, if necessary. If an authorized HFSC staff member has not evaluated the item(s), a Firearms Section Analyst arranges for the item(s) to be swabbed before proceeding.





- 12.2.4. If the biohazardous condition was noted by a stakeholder/submitting agency representative, HFSC firearms staff will use their discretion and may initially examine item(s) for potential biohazards.
  - 12.2.4.1. If no potential biohazard is noted, Firearms Section staff will document the lack of biohazard in the case record and processing may proceed. In this instance, decontamination of the item is not required and no additional HFSC staff needs to evaluate the items.
  - 12.2.4.2. If a potential biohazard is noted, or the Firearms Section Analyst has a question about the risk of a biohazard, the Analyst arranges for HFSC authorized staff to evaluate the items and obtain swabs, if necessary.
- 12.2.5. If the biohazardous condition is (initially) noted by a Firearms Section Analyst during any stage of inspection or processing of an item, all handling of the item ceases. If HFSC authorized staff has already evaluated the item, processing may proceed. Otherwise, Firearms Section staff will arrange for an authorized staff member to evaluate the item and obtain swabs, if necessary.

**12.3. Decontamination of the item(s) proceeds as needed.**

- 12.3.1. The decontamination process is typically accomplished by the application of a 10% bleach solution to the area.
  - 12.3.1.1. Areas contaminated with dried blood (or other body fluids) should have a contact time with the bleach solution of at least ten minutes.
  - 12.3.1.2. Liquid contamination should have a contact time with the bleach solution of at least fifteen minutes.
  - 12.3.1.3. When evidence is decontaminated, a note is made in the case record. Note that it was decontaminated, who performed the decontamination (if different from the primary), and date.
  - 12.3.1.4. Small, superficial, areas may be decontaminated by dampening a Wypall® or similar absorbent towel with 10% bleach and allowing the towel to contact the area for at least ten minutes.
- 12.3.2. Repackaging
  - 12.3.2.1. Decontaminated items must not be placed back in the packaging that poses a biohazard.
  - 12.3.2.2. An appropriately labeled laboratory package is used to store the decontaminated items. The new package must be marked to indicate it was provided by the section (e.g., Lab Bag). The new package should indicate the contents have been decontaminated with a note "cleaned" or similar on the package.
  - 12.3.2.3. Original packaging is retained. If the original packaging was not marked as biohazard, a biohazard sticker or similar indication should be added.



12.3.3. Additional information on decontaminating various item types can be found in the following section.

#### **12.4. Decontaminating Specific Item Types**

##### **12.4.1. Firearms**

12.4.1.1. Every effort is made to ensure that the firearm is unloaded before decontamination begins.

12.4.1.2. Analyst discretion is used to attempt to determine the functionality and bore condition of the firearm as received. Analyst safety must be the primary concern. If these **cannot** be safely ascertained before decontamination proceeds, it is noted in the case record.

12.4.1.3. Document the presence of any trace material adhering to the firearm. Trace materials should be collected as described in Section 12.1.

12.4.1.4. Determine the extent to which a biohazard exists on the firearm. Be certain to wear appropriate personal protective equipment.

12.4.1.4.1. If the biohazard is present on the external surface(s) of the firearm, disassembly (field or detail stripping) may not be necessary.

12.4.1.4.2. If the biohazard is present on internal components of the firearm, only the level of disassembly needed to effectively decontaminate the affected components is performed.

12.4.1.5. Decontaminate the affected area(s).

12.4.1.6. Rinse the treated area(s) with water.

12.4.1.7. Ensure that the affected area(s) is/are completely dry by using a paper towel (or other cloth material) or heat. Alternatively, acetone, ethanol, or isopropyl alcohol may be used. Acetone or excessive heat should not be used on polymer frames.

12.4.1.8. Once dry, apply a light coat of gun oil or other appropriate lubricant to the affected area(s) to prevent corrosion.

12.4.1.9. If a firearm was disassembled for decontamination, the level of disassembly (if any) is noted in the case record. This may include a distinction between field stripping vs. fully disassembling a firearm.

##### **12.4.2. Fired cartridge components (bullets, pellets, slugs, and casings)**

12.4.2.1. Submerge items in the decontamination solution. If solid biological material is present, attempt to remove it prior to submerging the cartridge components into the decontamination solution. Heavily soiled items may need repeated rounds of decontamination to remove all material. Use a stereoscope as needed to inspect items for remaining contaminants.

12.4.2.2. Rinse the treated area(s) with water.



- 12.4.2.3. Ensure that the affected area(s) is/are completely dry by using a paper towel or other cloth material. Cartridge cases may need to be rinsed with acetone, ethanol, or isopropyl alcohol to completely dry them and prevent corrosion.
- 12.4.3. Other evidence items may need to be decontaminated on a case-by-case basis.



## 13. Evidence Marking/Inventory

### 13.1. General Guidelines for Inventory:

- 13.1.1. All items submitted for processing and analysis are inventoried. Observations of the attributes and general condition of the evidence as received are recorded in the case record. Additional documentation of evidence attributes may occur during evidence processing.
  - 13.1.1.1. Observations made and recorded at initial inventory are typically made using direct observation with the unaided eye (or with a stereo microscope) and are not based on analysis. However, projectile weights are measured using a balance.
  - 13.1.1.2. Observations recorded at this time include characterization of the outer packaging as received, the presence and collection of foreign material as described in Section 12, and documentation of any decontamination and repackaging of items.
  - 13.1.1.3. Attributes and observations characterizing items as received are recorded. If the condition of the evidence is unremarkable (e.g., no damage, corrosion, major defects), it does not require notation.
  - 13.1.1.4. Observations made during initial inventory are not considered an examination. Additional evaluation and examination of the evidence may result in changes to item descriptions and observations. LIMS attributes and other case record documentation are used to record information. For Firearms Examination requests, The Firearms Section Inventory Worksheet is used for initial inventory, but may be replaced with an approved LIMS generated inventory sheet.
- 13.1.2. If evidence marker numbers are clearly marked on packaging, it is recommended that the numbers be recorded in the case record when the items are inventoried.
- 13.1.3. Medico-Legal number (M.L. #), Medical Record number (MRN) (or a number that may be one of these types but is not designated as such) associated with an item is documented.
- 13.1.4. If items of evidence within a package are given "child" or "sub-item" designators, these designators are recorded in LIMS at during inventory/processing if it has not already been completed.
- 13.1.5. Details on specific attributes that are initially recorded for various evidence types are found in section 13.3.
- 13.1.6. See Section 11.1.2 for details on addressing discrepancies in item descriptions.

### 13.2. General Guidelines for Evidence Marking:

- 13.2.1. Evidence must be marked in accordance with any requirements in the HFSC Quality Manual. Evidence should be marked with a unique identifier, typically the Forensic Case number (FCN) and item number. Packaging is also marked with the **primary** Analyst's initials and date the item was initially **inventoried**. All markings must be legible. **Second examiners and reviewers assigned to a request are not required to mark evidence or**



packaging. If someone other than the primary logs the evidence in, that Analyst must also mark the packaging.

13.2.2. The outer packaging for all items received is marked and documented, even if the items will not be inventoried or processed by the Firearms Section. For Firearms Section requests unfired cartridges, magazines and other firearms-related evidence is frequently received but not processed.

13.2.2.1. Evidence that is received as part of a request but not examined does not need to be marked directly. The outer packaging must be marked with the unique identifier, the Analyst's initials, and date the item was initially handled.

13.2.2.2. Evidence (and packaging) that is rejected for testing does not need to be marked. This occurs frequently with items for NIBIN processing that are not NIBIN-eligible.

13.2.3. Evidence is typically marked by engraving or with permanent marker. Packaging is marked with permanent marker or ink pen (paper surfaces only). If permanent marker is used on plastic surfaces, consider covering the markings with clear tape. **Black or blue are the preferred colors for marking packaging with permanent marker or ink.**

13.2.4. Firearms-related evidence that is examined by an Analyst is typically marked directly. Directly marking evidence may be accomplished by writing with permanent marker or engraving. Instructions and exceptions for specific evidence types may be found in Section 13.3.

13.2.5. If an item processed by an Analyst is not marked directly with permanent marker or engraving, the item must be placed in a "lab bag", marked with the case number and item number. Exceptions for specific evidence types may be found in Section 13.3.

13.2.6. Sealing of evidence is done in conformance with Quality Manual standards. See Section 11.1 regarding how evidence is handled upon receipt.

### **13.3. Special Considerations for Specific Evidence Types**

#### **13.3.1. Firearms**

13.3.1.1. **MAKE SURE THE FIREARM IS NOT LOADED!!** Only after verifying that the firearm is unloaded can you continue the inventory. If the firearm is received loaded but was not specifically submitted to render safe (Section 18), notify Section Management, place the firearm in an area designated for loaded weapons, and wait for instructions on how to proceed.

13.3.1.2. Attributes documented for firearms are:

- Caliber/gauge
- Manufacture
- Model
- Type (NCIC code for firearm type)
- Serial Number (complete number, partial number, or obliterated)\*.



13.3.1.2.1. \*Serial numbers found on the frame/receiver of a firearm are considered the “official” serial number. If any other serial number is documented, it is noted where on the firearm that serial number was found. If the other serial number is reported, where it is found is also reported.

13.3.1.2.2. Some firearms are received with attachments covering the serial number. For NIBIN Only request, these serial numbers may be recorded as “obscured”. For firearms examination requests, the items should be removed (if possible) to observe the serial number.

13.3.1.2.3. Not all firearms will have a serial number. Some firearms are produced without a serial number (“ghost guns” or **privately manufactured firearms (PMF)**). If no serial number can be located and there is no obvious obliteration enter “None”, “Unknown”, “None found” or similar remark. Federal law did not require serial numbers on all firearms until 1968. “N/A” or similar is also an acceptable in these older firearms. Firearms with obvious areas of obliteration are reported as “obliterated”, “oblit” or similar remark.

13.3.1.3. All firearms should be marked with the forensic case number and the item identifier. Firearms are usually marked on the slide or frame/receiver with permanent marker, but other methods of marking are acceptable (e.g., engraving the firearm or attaching a tag/label). Firearms (and accessories) belonging to law enforcement officers that are intended to be released back to the owner do not need to be marked with permanent marker. If they are not immediately released back to the submitting agency, they should be stored in a way to clearly indicate the identity of the item.

### 13.3.2. **Firearms accessories/attachments and unfired cartridges**

13.3.2.1. **The presence of major accessories is noted.** If a major accessory has a specific make, model and/or serial number, **the identifying information is recorded if it is removed during examination/test firing.** If major accessories are not removed no identifying information needs to be recorded. Examples of major accessories include scopes, sights, lasers, and flashlights. If no identifying information is found on major accessories that are removed, that is noted.

**Note: If a major accessory is not securely affixed to an unpackaged long gun that must be transported before it is released to the submitting agency, the identifying information is recorded in case the accessory becomes detached. “Securely affixed” does not imply that the attachment must be permanent.**

13.3.2.2. **Recording the presence of minor accessories like magazines, grip sleeves, straps/slings, rails, etc. or replacement parts is not typically necessary. Their presence is noted if they have a clear impact on the functionality of or the markings made by the firearm. Any identifying information is noted if they are removed during examination/test firing.**



13.3.2.3. Accessories are typically marked with permanent marker if they are submitted separately from the firearm **or if they are removed during testing (see 13.3.1.3 for exceptions for law enforcement firearms). If they are submitted as a separate item, they are also listed in the notification/report.** Accessories that are attached or in the same packaging with a firearm are not typically marked.

13.3.2.3.1. Magazines that are not submitted for analysis at the request of a stakeholder are preserved per the HFSC Magazine Preservation Policy. They are not removed from sealed packaging or marked directly. These magazines may still contain unfired cartridges.

13.3.2.3.2. Magazines submitted loaded with unfired cartridges are described as “Magazine containing unknown number of cartridges” or similar.

### 13.3.3. Unfired cartridges

13.3.3.1. Unfired cartridges are frequently submitted still loaded in magazines. Magazines are not unloaded unless needed as described in other parts of this SOP.

13.3.3.2. Unfired cartridges are usually not removed from sealed packaging or marked individually by the Firearms Section unless they are submitted specifically for comparison purposes. Typically, marking the packaging the items are received in is sufficient.

13.3.3.3. If possible, the quantity and caliber of the unfired cartridges should be recorded. If the items are not opened and inventoried, but they are contained in clear packaging, it should be possible to determine quantity and caliber. The manufacturer/marketer of the cartridges may be recorded at the discretion of the Analyst but must be recorded if the cartridges are to be used in analysis (e.g., for test firing or comparison).

13.3.3.4. If unfired cartridges are received in “commercial packaging” that should be noted. If the contents of the box are inventoried and manufacturer/marketer and caliber are consistent with the contents of the package, no additional documentation is needed. If the cartridges in the package are not consistent with package markings, the discrepancy should be noted. See Section 27.2.3 for more details on commercial packaging.

### 13.3.4. Fired Projectiles (bullets, shot pellets, shot wads)

13.3.4.1. Attributes documented for fired bullets or bullet fragments are:

- “Type” refers to the style of the bullet. Types include, but are not limited to:
  - Jacketed: A bullet with an outer component (jacket) and inner component (core).
  - Jacket: The outer component of a jacketed bullet.
  - Non-Jacketed: A bullet that does not contain a jacket or coating.



- Coated: A bullet that is coated with a material different than the main component of the projectile.
  - Jacket Fragment: A portion of a bullet jacket.
  - Jacketed Fragment: A portion of a jacketed bullet.
  - Core: The inner portion of a jacketed bullet.
  - Fragment: A possible portion of a bullet with that does not exhibit indications of firing (this may include a fragment from a bullet or other piece of metal not related to bullets). Fragments that do not appear to have markings from firing may be grouped together as a single item. It is recommended to separate groups of suspected lead fragments from suspected jacket fragments. When grouped, the description must indicate how many fragments are contained in the group.
  - Other clear descriptions and/or accepted abbreviations may also be used, e.g., FMJ, JHP, etc.
- Weight: Weigh the bullet or fragments using the single pan balance and record the weight. All weights are recorded in grains. Fragment groups are weighed together.
  - Twist: If possible, determine the direction of twist and record in the appropriate field. If the twist is uncertain then record what you believe the twist is followed by a question mark. If you cannot make an educated guess, but there is rifling present, record a question mark. If no rifling is present, the field may be left blank, or a horizontal line placed in the field.
  - Type of rifling: If possible, record the type of rifling, if present. Rifling types include "Cut", "Poly", "Hybrid" and smooth bore. "Cut" rifling may also be referred to as "traditional" rifling. Other rifling types may exist and should be noted similarly.
  - Number of Lands and Grooves: If possible, record the number of land and groove impressions. If some of the land and groove impressions are missing or obliterated, record the number of visible land and groove impressions followed by "vis." If only partial land and groove impressions are visible, record the number of partially visible land and groove impressions followed by "part." "Part. Vis." May be used, if necessary. Use question marks as appropriate. If no rifling is present, the field may be left blank or otherwise noted as none.
  - Mark the bullet specimens with the forensic case number and item identifier on an area that does not bear markings from firing, if possible. In some instances, the fragments may be too small to mark. When that is the case, mark the item with a unique designation for items in the case, if possible, and note in the case record how the item was marked. Any fragments that cannot be marked are placed in a separate "lab bag" including typical package markings. **Occasionally, items may**





**separate or fragment during evaluation, packaging, or transport. These items should be engraved or bagged as soon as they are discovered.**

13.3.4.2. Attributes documented for shot pellets and slugs are:

- Number (of pellets in the grouping)
- Type (magnetic or non-magnetic)
- Weight (in grains). Pellet groupings are weighed together.

13.3.4.3. Shot pellets and slugs are marked as in Section 13.3.4.2. However, shot pellets are typically too small to be marked and require a microscopic examination to determine if any markings are suitable for comparison. Therefore, shot pellets are **placed in a separate “lab bag” including typical package markings.**

### 13.3.5. Cartridge Cases and Shotshells

13.3.5.1. Attributes documented for fired cartridge cases and fired shotshells are:

- 13.3.5.1.1. Caliber/gauge
- 13.3.5.1.2. Brand/marketer

13.3.5.2. Marking cartridge cases and shotshells:

13.3.5.2.1. For NIBIN processing, cartridge cases and shotshells are marked individually to the extent they are packaged individually. Typically, only the packaging is marked (items aren’t marked directly).

13.3.5.2.1.1. If items are received packaged individually, the packages are marked individually. This frequently occurs with submissions collected by CSU.

13.3.5.2.1.2. If items are grouped together in packaging, unique item identifiers will be assigned to the group, but only items “singled out” (e.g., selected for NIBIN imaging or decontaminated) during NIBIN triage are individually marked. Items that are “singled out” are placed in their own lab bags. The lab bags are labeled individually.

13.3.5.2.2. For inventory before firearms examination casework, cartridge cases and shotshells are individually marked. Cartridge cases are typically engraved near the mouth, if possible. Shotshells may be engraved on the metal portion or marked with permanent marker along the side.

### 13.3.6. Shot Wads and Carriers

13.3.6.1. Record the type of composition and type (cardboard wad, paper wad, plastic wad, plastic carrier)

13.3.6.2. Plastic items may be marked with permanent marker, if possible. Marking cardboard/paper directly may be difficult. If not marked directly, items are placed in a lab bag with the packaging marked accordingly.

### 13.3.7. Test Fires

13.3.7.1. All test fire containers are labeled with the following information if it is known:



- Unique case identifier or agency case number. Unique case identifier means the Agency Case #, the Forensic Case #, or any combination of these.
- Item identifier
- Date the firearm was received
- Date the firearm was collected
- Offense
- Date of offense
- Caliber
- Manufacturer
- Model
- Serial number
- Type of firearm (e.g., the NCIC code)
- Ammunition used
- Analyst's name/initials
- IBIS Unit (if imaged)

13.3.7.2. Ideally, test fires are engraved prior to test firing. If test fires are not engraved prior to test firing, or if the engraving is obliterated by the firing process, test fires should be engraved by the end of the shift they were created. If any items cannot be engraved, they must be placed in a bag inside of the test fire package. The inner bag must be marked with the FCN **and** item number.

- Occasionally, items may separate or fragment in the test fire package. These items should be engraved or bagged as soon as they are discovered.

13.3.7.2.1. Test fired cartridge cases (including shotshells) and bullets created by HFSC after 06/08/2015 are marked with the forensic case number and unique item identifier of the set of test fires.

### **13.3.8. Additional Types of Evidence**

13.3.8.1. Other categories or types of evidence may be routinely encountered in the Firearms Section, but these do not require additional attributes to be recorded. The item description (including custom descriptions generated by firearms staff) is sufficient (at log in) for these evidence types. Additional observations may need to be documented in the case record depending on the nature of the stakeholder's request.



## **14. Safe Firearm Handling**

Firearms evidence in the laboratory environment is not dangerous if handled correctly and treated with respect. Caution and due diligence must be used at all times while handling, packaging and transporting firearms and ammunition. All firearms must be treated as though they are loaded. This rule cannot be over stressed and must always be followed. Safe firearm handling within the laboratory environment corresponds with safe firearm handling in general. The only way to prevent accidents is to practice safety at all times. Ammunition is considered live at all times and must be safely handled, transported and stored.

When firearms are being handled, they must be pointed in a safe direction, ideally into the water tank, down the shooting range or at concrete/Armortex® walls in the function testing/test firing areas. A safe direction is one that minimizes risk of injury in case of unintentional discharge and takes into account the potential for ricochets and bullet-resistant barriers.

Section personnel handle evidence while wearing gloves and other necessary PPE until the Analyst determines that there is not an evident hazard posed by obvious blood, bodily fluids, or other hazardous substances. This is done to prevent section personnel from a potential hazardous exposure.

Occasionally, loaded firearms are received as evidence for examination. These, of course, need very special handling (see Section 17 ). If a firearm is received into the Firearms Section in a loaded condition and is not properly marked as such, notify Section Management immediately. As always, make sure the firearm is pointed in a safe direction. Photograph documentation may be needed, so if it is deemed safe to do so, place the firearm in a secure, protected area and await further guidance.

**While the Firearms Section does not perform testing on air guns, staff may be called on to assist other sections in clearing them or we may receive them for unloading from a stakeholder. Air guns are handled in the same general way that firearms are, as outlined in this section.**

### **14.1. General Guidelines**

When receiving a firearm, always assume it is loaded. Firearms received via evidence transfer are typically zip tied and packaged (except for many long guns). A zip tie may help prevent a firearm discharge but does not ensure a firearm is not loaded. Firearms received directly from stakeholders are generally not zip tied.

Handguns are typically submitted in sealed packages and then placed in an unsealed box with other items of evidence. Long guns may or may not be received sealed but are not typically packaged with other items.



- 14.1.1. Before handing a firearm to someone or immediately upon receiving a firearm from someone, verify that the firearm is unloaded by checking the chamber.
- 14.1.2. Do not place a finger or other object on the trigger unless the firearm has been confirmed unloaded and placing a finger on the trigger is necessary for testing.
- 14.1.3. Prior to any further handling, regardless of where or from whom the firearm is received, a competent individual must ascertain the loaded or unloaded condition of the firearm.
- 14.1.4. Live ammunition may be stored nearby in drawers or cabinets in the work area but should not be loose on the work surface or loaded into magazines being tested. See Section 15.3.5 for further details on testing magazines.
- 14.1.5. The muzzle of the firearm must always be pointed in a safe direction, ideally into the water tank, down the shooting range or at concrete/Armortex® walls in the function testing/test firing areas
- 14.1.6. Chamber flags are used to indicate a firearm has been checked. Chamber flags are not needed while a firearm is actively being examined. If a chamber flag is not available or cannot be inserted, store the firearm with the action open (if possible) and pointed in a safe direction.
- 14.1.7. If an Analyst steps away during examination of a firearm, a chamber flag should be inserted, and the firearm pointed in a safe direction.
- 14.1.8. Once examination is complete, firearms should be zip tied and re-packaged. Ensure the firearm is unloaded before zip tying and packaging. If further analysis is anticipated, the firearm can be stored with a chamber flag instead of a zip tie.
- 14.1.9. Before returning to a stakeholder via transfer location, firearms are zip tied.

#### **14.2. Receiving multiple firearms at once via transfer/vault location**

- 14.2.1. Boxes should be opened, and items checked to make sure they are properly labeled. Analysts may also verify the items are suitable for the testing submitted (i.e., NIBIN eligible firearms/offenses) or check for other testing that may need to be done (i.e., multi-discipline requests (MDRs)).
- 14.2.2. Document chain of custody, usually in LIMS.
- 14.2.3. Proceed to the shooting range. Proceeding with due diligence, check each firearm one at a time to ensure it is unloaded. Open sealed packages as needed.
- 14.2.4. Verify the unloaded condition of the firearm.
  - Verify the firearm does not have a magazine inserted.
  - Check the chamber of the firearm.
  - Verify any integrated/tube magazines are clear. Use care if the follower is not immediately visible. Determine if follower is not visible because it is missing or stuck and if there are cartridges in tube.

#### **14.3. Receiving single firearms at once via transfer/vault location**



- 14.3.1. When single items are received, checking the firearm in the shooting range is not necessary as long as the firearm can be pointed in a safe direction during the check.
- 14.3.2. Document chain of custody, usually in LIMS.
- 14.3.3. Verify the firearm is unloaded as in 14.2.4. If the firearm will be immediately examined, a chamber flag is not necessary.
- 14.3.4. Use chamber flags or zip ties to designate any firearm not actively being examined is clear.

#### **14.4. Receiving firearms directly from an individual**

This situation typically occurs in the event of an officer involved shooting. Stakeholders frequently submit firearms in a direct hand-to-hand transfer. These firearms are frequently received for immediate examination.

- 14.4.1. When handed a firearm directly, verify the unloaded condition of the firearm (as in 14.2.4) immediately
- 14.4.2. Document chain of custody. This may be on paper or in LIMS.
- 14.4.3. Consider using a cart or having another Analyst help transport multiple firearms to a safe location.
- 14.4.4. Use chamber flags or zip ties to designate any firearms not actively being examined are clear.
- 14.4.5. If the firearm is released by handing it back to an individual, a chamber flag or zip tie is not necessary. If possible, return the firearm with the chamber open/visible.

#### **14.5. Additional information**

- 14.5.1. Test firing or any examination of the firearm that utilizes live ammunition, or a live ammunition component, is only performed in designated test firing areas.
- 14.5.2. If you observe an Analyst handling a firearm in an unsafe manner, bring it to their attention immediately. If the Analyst does not cease their unsafe practice, notify the Section Management or the section safety representative immediately.
- 14.5.3. If a firearm cannot be unloaded before it must be secured, it must be placed in a safe location within the vault in a location designated for loaded firearms or clearly marked as loaded (or potentially loaded). A firearm should never be released to an individual in a loaded condition. If a firearm must be released in a loaded condition, it must be documented that the condition of the firearm was communicated to the recipient.
- 14.5.4. See additional sections for details on examination and test firing of firearms.

#### **14.6. Literature/Supporting Documentation**

“A Guide to Firearms Safety”, A Safety and Educational Publication of the National Rifle Association, May 1994.



## 15. Examination & Classification of Firearms

### 15.1. Scope

Firearms received for casework and NIBIN Only processing are examined prior to test firing using the procedures outlined below. The procedures in this section should not be seen as a step-by-step guide. However, analysis should flow in the same general order as this section. Analysts document the examination and classification of firearms using the designated fields in JusticeTrax and/or approved worksheets.

If a firearm unfamiliar to an Analyst is encountered, consider using available resources to learn more about the firearm. Available resources include other Analysts, the AFTE forum, owner's manuals, assembly/disassembly guides, parts diagrams, and internet sources. When utilizing internet sources, consider the author/source of the information. Analysts should consider checking for recalls and safety notices/warnings on firearms and ammunition. If any of the above outside sources (e.g., discussion with non-HFSC staff, manuals, guides, diagrams) are utilized, it is documented in the case record.

The term "capable of discharging a cartridge in the condition submitted" means that the firearm can be loaded, cocked, and a cartridge can be discharged as it is received into the Firearms Section.

The term "function as expected" means that the firearm functions as designed by the manufacturer.

If field stripping/disassembly of a firearm is needed, as much should be recorded about the firearm functionality as possible prior to disassembly. If determining functionality is specifically requested by the stakeholder, consider test firing the firearm in the condition received before any level of disassembly is performed. If a firearm is disassembled, that is documented in the case record (including to what extent the disassembly was performed). If a firearm poses a bio- or other hazard, Analyst safety is a priority and field stripping/disassembly may need to occur prior to any or some examination of the firearm. It may not be possible to determine the loaded condition prior to decontamination.

### 15.2. Observations

Verify the firearm is not loaded. When handling more than one firearm in a sitting, utilize chamber flags as a visual queue that a firearm has been checked. Do not rely solely on a chamber flag to verify a firearm is not loaded. Treat all firearms as if they are loaded. Keep the firearm pointed in a safe direction at all times. Keep your finger off the trigger except when necessary for testing.



Document any initial observations and/or trace evidence as described in Sections 12 and 13.

Some of the observations listed below are also listed as attributes to be recorded in Section 13. They are repeated here to have all necessary documentation of firearms in one location. This does not imply they are recorded twice.

15.2.1. NIBIN only processing of firearms is completed to the extent needed to document the identity of the firearm, document the condition of the firearm as received, and determine if the firearm can be test fired. It is not a full examination of a firearm. Functionality is not determined or recorded in NIBIN processing. Firearms processed for both NIBIN only and casework are examined for the following and documented in the case record, when applicable:

- Make/manufacturer
- Firearm type (e.g., semiautomatic pistol) (function testing may be required to determine this)
- Model
- Caliber/gauge
- Serial number (see sections 13.3.1.2.1 - 13.3.1.2.3 for more details on serial numbers)
- Extractor and ejector positions
- Bore condition (note any obstructions or defects)
- Damage, alterations, missing parts, or **major accessories/attachments** present (if none are present, it does not need to be documented) (**See 13.3.2.1-13.3.2.2 for guidance on documenting accessories/attachments.**)
- Check for cracks or weaknesses in major parts of the firearm, such as the frame, slide, or barrel (if none are present, it does not need to be documented)
- Receipt of items not examined as part of the request

15.2.2. Firearms processed for casework are additionally examined for the following, when applicable:

- Location of serial number
- Importer and country of origin
- Additional markings, as needed
- Rifling characteristics (i.e., rifling type, number of lands and grooves, direction of twist)
- Finish condition (Typical responses are good, fair, or poor. Any response other than "good" or equivalent is explained further.)
- Designated chamber length capacity (shotguns only)



- Choke information **and settings for any removable choke devices**, if present (shotguns only)
- Capacity of cylinder and direction of cylinder rotation (revolvers only)
- Presence or absence and location of cylinder flares (revolvers only)

### 15.3. Function Testing

Function testing requires repeated pulls of the trigger of a firearm. Live ammunition (including loaded magazines) should not be present at the same workstation where function testing is being performed.

Use caution when dry firing firearms, as the practice may damage certain types of firearms (especially rim fire firearms). Consider using dummy cartridges or snap caps when dry firing susceptible firearms (i.e., rim fire firearms and firearms prone to firing pin breakage).

#### 15.3.1. While function testing a firearm, determine and document the following:

- Safeties present and their operability\*, as needed (if not tested, note as such).
- Is the firearm capable of discharging a cartridge in the condition submitted? If there is a question of operability, consider using a dummy cartridge with a soft substance (e.g., clay) in the primer pocket to check for a firing pin impression.
- Is the firearm capable of firing in full automatic mode? Is this by design or alteration/modification?
- Does the firearm function in all applicable modes of fire (e.g., semiautomatic and full automatic, single and double action)?
- Are there any conditions which have the potential to cause slam firing?

\*If determining operability of safeties requested by the stakeholder, it is reported. Testing of law enforcement officer's firearms as part of an officer-involved shooting investigation includes a standing request for reporting the operability of safeties.

#### 15.3.2. Additional testing in firearms examination requests include determining and documenting:

- Action type (e.g., single/double action/hybrid)\* (see Section 16 for details)
- Specific function of any manual safeties. If field stripping is needed to determine operation of safeties, this should be performed after all other functionality has been determined, including test firing (if appropriate).
- Mechanical condition (Typical responses are good, fair, or poor. Any response other than "good" or equivalent is explained further.)
- Trigger pull\*\* (see Section 16)
- Barrel and overall length (long guns only) (see Section 17)
- Magazine capacity\*\*\* (see Section 15.3.5)





\*Occasionally, the action type can be difficult to determine, especially for newly encountered firearms. Disassembly and/or manufacturer's information on the mechanisms may be required. If an Analyst is unsure of the action type, a description of how the action appears to operate is sufficient. Any disassembly should be completed after all other functionality has been determined, including test firing (if appropriate).

\*\*If a stakeholder did not request functionality of a firearm but the firearm needs to be test fired, trigger pull testing does not need to be completed. If the trigger pull seems extremely light or heavy during bench testing, that qualitative information should be noted for safety considerations (it is not considered a measurement and does not have significance beyond safety).

\*\*\*If a stakeholder did not request functionality of a firearm but the firearm needs to be test fired, magazine capacity is not completed to preserve the magazine for future testing.

15.3.3. Consult additional sections of this SOP as needed to complete examination of firearms.

15.3.4. Checking magazine capacity (if needed)

15.3.4.1. Remove any ammunition from the magazine if it was submitted loaded. Document the number of cartridges present.

15.3.4.2. Use dummy rounds when checking magazine capacity, whenever possible.

15.3.4.3. When dummy rounds are not available, follow the steps below for checking magazine capacity:

15.3.4.3.1. Firearms having a detachable magazine:

- Place the firearm in an area separate from where the magazine capacity will be checked.
- Next, load the magazine to capacity with live cartridges, counting each cartridge as the magazine is loaded.
- Immediately unload the cartridges, counting each one as they are removed from the magazine and record the number in the case record.

15.3.4.3.2. Firearms having an integrated magazine:

- Load the magazine to capacity in the shooting area with the firearm pointed in a safe direction, preferably into the water tank or down range.
- Count each cartridge as the magazine is loaded.
- Immediately unload the cartridges, counting each one as they are removed from the magazine and record the number in the case record.
- Verify that the magazine is empty. Immediately prior to test firing, load the magazine with the desired number of cartridges while in the shooting area.

15.3.5. **Some magazines have a capacity indicated on them; however, it is not uncommon for a magazine to hold more cartridges than the stated capacity. In this event, it is best practice to determine and record:**



15.3.5.1. **If the magazine will properly seat in the firearm.**

15.3.5.2. **If the magazine does seat in the firearm, determine if the extra cartridge(s) will feed properly.**

15.3.6. Since some firearms require the use of a magazine for function testing, DO NOT load cartridges into any magazines until ALL function testing is completed.

#### **15.4. Restoring Non-functional Firearms**

15.4.1. If a firearm is not capable of discharging a cartridge as received and it is to be test fired as part of the request, an attempt to restore the firearm should be made.

15.4.2. A firearm may not be capable of discharging a cartridge for a number of reasons, including, but not limited to:

- Has a magazine disconnect and is not received/submitted with a magazine
- Is received disassembled or incorrectly assembled
- Is received with integral parts broken, rusted, or missing

15.4.3. Frequently, it may be clear during bench testing that a firearm cannot discharge a cartridge as received; however, it may not be clear until test firing is attempted.

15.4.4. Document what attempts were made to restore the firearm, even if they were not successful. The extent to which the attempts were successful is noted.

15.4.4.1. If a reference part is used, that must be noted in the case record. The reference part is removed from the firearm after testing is completed.

15.4.4.2. If the replacement part is one that leaves markings on a bullet or cartridge cases, it is also noted on the test fire envelope and in NIBIN, if appropriate.

15.4.5. Document if the firearm is returned to the condition it was received in and to what extent. The firearm may be partially returned. For example, a firearm may have a missing part and rust preventing it from firing. The part can be replaced and then removed to return the firearm to the received condition. But if rust is removed, it cannot be replaced.

#### **15.5. Interpretation**

This analysis serves to document the routine initial evaluation of firearms prior to test firing.



## 16. Trigger Pull Determination

### 16.1. Scope

One of the routine tests conducted in a firearm evaluation is determining its trigger pull(s). Trigger pull is defined as the amount of force that must be applied to the trigger of a firearm to cause the sear to release. This test can provide vital information regarding the mechanical operating condition of the firearm; however, trigger pull does not have to be performed if the stakeholder has not asked for functionality testing of the firearm. Testing of law enforcement officer's firearms as part of an officer-involved shooting investigation are considered functionality requests and require trigger pull determinations.

Typically, trigger pulls are categorized and tested for all "actions" a firearm can fire in. The term action includes these commonly encountered types:

- Single action – firing the firearm requires the manual cocking of the hammer/striker prior to pulling the trigger
- Double action – pulling the trigger both cocks and then releases the hammer/striker
- Hybrid action – a design that incorporates aspects of both single and double action. For example, the retraction of a pistol slide may partially cock the hammer/striker, but pulling the trigger further cocks the hammer/striker before releasing it.

In addition to the above terms, action also refers to semiautomatic, full automatic, and pump action, as well as less commonly encountered actions (e.g., single shot action, lever action, slide/bolt action).

### 16.2. General Guidelines

16.2.1. Trigger pulls should be performed on all actions a firearm is capable of firing in. For example, a hybrid action Glock that can fire in both semiautomatic and full automatic mode is tested for both semi- and full. A revolver capable of firing in single and double action is tested for both.

16.2.2. For each trigger pull performed, record the approach used (free weights or digital force gauge) and the firearm type and action tested. The digital force gauge is the preferred approach.

16.2.3. If a firearm only has one type of action, the action does not need to be listed on the report but is recorded in the notes. If the firearm has more than one action, the action type is reported with the associated trigger pull. The uncertainty associated with the trigger pull will be available in the case record but is not reported.

16.2.4. The trigger pull of a rim fire firearm should not be performed on an empty chamber. A "dummy" cartridge should be used. The Analyst must also take into consideration the



potential for damage of a center fire firearm and may wish to use a “dummy” cartridge in this instance as well.

### **16.3. Procedure – Digital Force Gauge**

- 16.3.1. Ensure that the firearm is unloaded.
- 16.3.2. Mount the firearm in the vise making sure that there is no source of interference from the vise. The muzzle of the firearm should be as close to horizontal as possible.
- 16.3.3. For each type of trigger pull and/or each trigger (see Scope above) the firearm has:
  - 16.3.3.1. Open the Trigger Pull Gauge Worksheet and complete necessary administrative information.
  - 16.3.3.2. Cock or decock the firearm as needed.
  - 16.3.3.3. The position of the trigger hook attachment of the gauge should be as close to parallel with the barrel of the firearm as possible.
  - 16.3.3.4. Ensure the gauge indicator is “zeroed”.
  - 16.3.3.5. Rest the trigger hook of the gauge on the trigger where an individual’s finger would normally rest. Make sure it is not touching any other part of the firearm.
  - 16.3.3.6. Apply constant, steady, rearward pressure to the gauge until the sear releases.
  - 16.3.3.7. If the reading on the gauge does not appear as expected, seek assistance from another examiner or consult the documentation available. Do not proceed with the next step until any issues are resolved.
  - 16.3.3.8. Press the “send” button on the trigger pull gauge. The peak value for each trigger pull will automatically be recorded in the Trigger Pull Gauge Worksheet. If the value does not appear on the worksheet as a positive number, see above step and do not proceed until the issue is resolved.
  - 16.3.3.9. Repeat for a total of at least five recorded peak values, or once for each revolver cylinder position.
  - 16.3.3.10. Complete and retain as many Trigger Pull Gauge worksheets as needed to record all trigger pull values for the firearm.
  - 16.3.3.11. Record the mean value as calculated by the worksheet in the “Mean Value” field.
  - 16.3.3.12. **The Trigger Pull Gauge worksheet(s) may be printed, initialed, and retained in the case file or digitally created and directly uploaded to LIMS. Printed copies may also be scanned and uploaded into LIMS, but must be retained in the case file.**

### **16.4. Trigger Pull Uncertainty of Measurement**

- 16.4.1. Uncertainty of Measurement has only been calculated using digital force gauges.
- 16.4.2. Uncertainty of Measurement is calculated for the following firearm types and actions:
  - Semiautomatic Pistol, Single Action
  - Semiautomatic Pistol, Double Action
  - Revolver, Single Action



- Revolver, Double Action
- Rifle (semiautomatic)
- Shotgun (pump action)

16.4.3. When recording uncertainty, types of firearms not represented above will be categorized as follows:

- Automatic Pistol: Semiautomatic Pistol, Single Action or Double Action (as appropriate)
- Hybrid Action: Double Action (usually pistols)
- Other actions for shotguns and rifles (e.g., full automatic, single shot, slide action, lever action) are still categorized as shotguns or rifles, as appropriate
- Derringer or similar (3+ barrels): Semiautomatic Pistol (Single or Double Action, as appropriate)
- Carbine: Rifle
- Undetermined action type: The examiner should use his/her best judgement about the action type that most closely approximates the firearm in question.

16.4.4. The estimation of the UM for trigger pull determinations will be evaluated at least once an accreditation cycle (every four years) using the following guidelines:

- 16.4.4.1. In-house studies will be performed to document contributions to the UM from both random (Type A) and systematic (Type B) sources. These values will be used to determine a combined uncertainty using the root sum square method.
- 16.4.4.2. To determine the expanded uncertainty, the combined uncertainty will be multiplied by a coverage factor ( $k = 2$ ) for a confidence level of 95.45% (approximately 95%).
- 16.4.4.3. If a new digital force gauge is placed into service, it will be evaluated against the estimation of certainty.

### **16.5. Non-standard Trigger Pull Weights**

16.5.1. Occasionally, an examiner may feel that the readings provided by the digital force gauge are not representative of what the trigger pull of the firearm is.

16.5.1.1. In this case, an examiner may use the non-standard trigger pull weights to check the accuracy of values produced when using the digital force gauge. Any readings obtained when using the non-standard trigger pull weights do not have an uncertainty associated with them.

16.5.1.2. If the values obtained with the non-standard trigger pull weights are consistent with those obtained by the digital force gauge, the examiner may proceed with recording and reporting the values obtained by the digital force gauge.

16.5.1.3. If the values obtained with the non-standard trigger pull weights are not consistent with those obtained by the digital force gauge, see a more experienced examiner or



Section Management for further guidance. Differences between the obtained values that can be resolved could be due to:

- Incorrect use or malfunction of the digital force gauge
- Incorrect settings on the digital force gauge
- Improper technique in performing trigger pull measurement

16.5.2. If, after addressing the above potential causes, the differences are not resolved, the weights should be used to measure the trigger pull. Trigger pull determinations performed with weights are recorded and reported as an approximate range. Since these values do not have an uncertainty associated with them, they cannot be considered quantitative and examiners cannot testify as to the significance of the value (e.g., that it is lighter or heavier than expected).

#### 16.5.3. Procedure

16.5.3.1. Ensure the firearm is unloaded.

16.5.3.2. Cock or decock the firearm as needed.

16.5.3.3. Hold the firearm with the muzzle vertical.

16.5.3.4. Select the weighted base. There should be 2 options: a 2 pound base and a 500 gram (1.1 pound) base. Typically, the 2 pound base is used.

16.5.3.5. Place the weighted base on a flat surface. Rest the trigger hook of the non-standard weight hanger on the trigger where an individual's finger would normally rest. Make sure it is not touching any other part of the firearm.

16.5.3.6. Slowly and gently raise the firearm upward until the weighted base is no longer supported by the flat surface. If the sear releases using the 2 pound base, switch to the 500 gram (1.1 pound) base.

16.5.3.7. Add the weights until the firearm dry fires, taking care to not use any sudden movements that would increase the effective weight on the trigger.

16.5.3.8. Repeat at least five times, documenting the minimum and maximum combined weight needed to release the sear in the case record. The minimum and maximum weights needed to release the sear are reported as the trigger pull range. (The minimum combined weight may need to be documented as the maximum weight that does not release the sear.)

16.5.3.9. Do not use reference trigger pull weights for this purpose. Reference trigger pull weights are only used for performance checks.

## 16.6. Interpretation

Measurements obtained should be considered approximations given the accuracy limitations of most measuring devices. The trigger pull is reported as a mean of the recorded peak values  $\pm$  the uncertainty (documented on the Trigger Pull Gauge Worksheet), including a 95% confidence interval ( $k=2$ ).



**16.7. Literature/Supporting Documentation**

- 16.7.1. Gamboe, Tom, "MAFS Firearms Workshop: Trigger Pull Methods," AFTE Journal, Vol. 18, No. 3, p. 77.
- 16.7.2. Rios, Ferdinand and Thorton, John, "Static vs. Dynamic Determination of Trigger Pull," AFTE Journal, Vol. 16, No. 3, p. 84.
- 16.7.3. Ayala, M, and Dupre, J. "Trigger Pull Uncertainty Validation", August 2018.
- 16.7.4. Ayala, M, and Dupre, J, "Trigger Pull Uncertainty Validation Study and Determination of Uncertainty of Measurement", January 2020.



## 17. Barrel & Overall Length Measurement of a Firearm

### 17.1. Scope

One of the routine procedures conducted in a firearms identification examination is determining the barrel length and the overall length of long guns. Generally, the barrel and overall lengths are considered descriptors of the firearm and are not reported. In this case, no uncertainty of measurement is required.

There are minimum legal requirements for the barrel and overall length of long guns. When a long gun's barrel and/or overall lengths do not conform with a statutory requirement, the length(s) that do not conform are reported. If the length(s) are within  $\frac{1}{2}$  inch of the statutory requirement, an uncertainty of measurement is associated and reported with the value. The barrel and overall lengths of long guns encountered in casework are measured whenever possible.

Note: Long guns belonging to law enforcement personnel are considered an exception to this requirement unless specifically requested from a stakeholder.

No statutory requirements are associated with the barrel and/or overall length of handguns, so they do not need to be measured.

Barrel length is defined as the distance between the end of the barrel and the face of the closed breechblock or bolt.

- Barrel length normally should include compensators, flash suppressors, etc., if non-readily removable.
- Readily removable barrel extensions, poly chokes, flash suppressors, etc., are not part of the measured barrel length.

Overall length of a firearm is the distance between the forwardmost point of the barrel and the rearmost portion of the firearm, measured parallel to the axis of the bore.

- Overall length normally should include compensators, flash suppressors, etc., if non-readily removable.
- Readily removable barrel extensions, poly chokes, flash suppressors, etc., are not part of the measured overall length.
- If a long gun has a folding or collapsible stock, the longest length must be recorded. The shortest length may be recorded as a descriptor but is not used to assess conformance with a statutory requirement.

### 17.2. Procedure

17.2.1. Ensure the firearm is unloaded prior to beginning any measuring activities.





- 17.2.2. When measuring barrel and/or overall length, ensure the object you are measuring (firearm or rod) can be placed on a stable surface free of movement and in an area with adequate lighting.
- 17.2.3. Care must be taken if any object is placed down the barrel to help expedite the measurement. Only a non-marring item (e.g., dowel rod) may be placed down the barrel after a visual inspection of the bore has been completed noting any obstructions and the presence of residue.
- 17.2.4. If the barrel and/or overall lengths are within  $\frac{1}{2}$  inch of the legal limit for the firearm, measurements must be made using a NIST traceable measuring device. This may require repeating the measurements with a NIST traceable ruler.
- Measurements are recorded using the  $\frac{1}{32}$ " scale of the ruler, but fractions may be reduced. Note the unique identifier for the NIST traceable device used in the case record.
- 17.2.5. If the barrel and/or overall lengths are outside of the  $\frac{1}{2}$  inch range noted above, a non-NIST traceable device may be used for measuring. No uncertainty is associated with measurements made with a non-NIST traceable device.
- 17.2.6. Barrel Length
- 17.2.6.1. Measure barrel length after the firearm has been test fired, if applicable. Measure the distance from the breech face in a closed and locked position to the muzzle.
- 17.2.6.2. Direct method – If the firearm does not have a recessed breechface or external parts that preclude a direct measurement, you may measure the length of the barrel directly by placing the ruler/tape parallel to the axis of the bore.
- 17.2.6.3. Measuring rod method – If the firearm has a recessed breechface or external parts that make a direct measurement difficult, place a non-marring item (dowel rod) down the barrel. This method may be used for a firearm without a recessed breechface as well.
- Ensure no firearm components are blocking the rod from contacting the breechface.
  - Ensure the firing pin is not protruding, or if it is fixed, ensure the firing pin does not prevent the rod from contacting the breechface.
  - Mark the rod to indicate which end was toward the breechface and where the muzzle ends. Withdraw the measuring rod from the barrel and place it on a flat surface with the ruler/tape to record the length.
  - Be mindful of where the scale begins on the ruler/tape (i.e., not all measuring devices have the very end of the device as the zero mark).
- 17.2.6.4. This measurement is recorded (and reported) in inches (expressed as a fraction, not a decimal).



#### 17.2.7. Overall Length

17.2.7.1. As best as possible, align the firearm so the ruler/tape is parallel with the axis of the bore. The rearmost point of the firearm is rarely along the bore axis, so it is important to ensure the overall length is accurately represented.

- Use a wall or flat block to ensure the line between the rearmost point of the firearm and the ruler/tape is perpendicular to the bore axis.
- Be mindful of where the scale begins on the ruler/tape (i.e., not all measuring devices have the very end of the device as the zero mark).

17.2.7.2. This measurement is recorded (and reported) in inches (expressed as a fraction, not a decimal).

#### 17.3. Uncertainty of Measurement

17.3.1. The estimation of the UM for barrel and overall length determinations will be evaluated at least once an accreditation cycle (every four years) using the following guidelines:

17.3.1.1. In-house studies will be performed to document contributions to the UM from both random (Type A) and systematic (Type B) sources. These values will be used to determine a combined uncertainty using the root sum square method.

17.3.1.2. To determine the expanded uncertainty, the combined uncertainty will be multiplied by a coverage factor ( $k = 2$ ) for a confidence level of 95.45% (approximately 95%).

17.3.1.3. Each NIST Traceable measuring device in use will be evaluated for uncertainty for both barrel and overall length. The Firearms Section may decide to use one uncertainty value that accurately represents all values.

17.3.1.4. If a new measuring device is placed into service or the procedures for obtaining barrel and/or overall length change, the uncertainty will be re-evaluated.

#### 17.4. Interpretation

17.4.1. Measurements obtained are considered only approximations based on the device used to obtain the measurements.

17.4.2. The uncertainty of measurement when using a NIST traceable measuring device to determine barrel length or overall length is reported as the recorded length  $\pm$  the uncertainty in inches (expressed as a fraction, not a decimal), including a 95% confidence interval ( $k=2$ ). The current uncertainty can be found in the most recent Barrel and Overall Length Uncertainty Validation document.

#### 17.5. Literature/Supporting Documentation

17.5.1. "The Proper Method for Measuring Weapons", AFTE Journal, Vol.14, No. 3, p. 10.

17.5.2. Stein, Darrel. "Uncertainty of Measurement Determination Barrel Length/Overall Length of Firearms", September 2010.



## **18. Suspected Loaded Firearms Submitted for Unloading and/or Rendering Safe**

Stakeholders may submit firearms that they cannot render safe, either because they cannot unload the firearm or cannot confirm that it is unloaded. These firearms may be submitted by a stakeholder in person or to the lockers available. This section addresses handling these firearms and the associated request(s) for unloading. **If air guns are submitted for unloading, they are handled in the same general manner as firearms, including safe handling procedures (see Section 14). The Firearms Section may also assist other sections of HFSC in determining the safe condition of firearms or air guns. Air guns are not functioned tested.**

Firearms that were submitted to be rendered safe are stored in a gun safe in the Firearms Section basement vault until they can be processed. If a firearm cannot be placed in the gun safe, they are stored in a way that prevents them from being moved inadvertently. They are clearly marked as “loaded” or similar marking.

### **18.1. Procedure**

- 18.1.1. The safety of personnel is always of the utmost concern when handling firearms. When handling firearms submitted for unloading, examiners with only a few years of experience should consider working under the supervision of a senior examiner, depending on the nature and condition of the submitted firearm.
- 18.1.2. It may be necessary to consult other sections of this SOP, including the sections addressing Safe Firearm Handling, Rusty Firearms and Firearms Found in Fluid, and Potential Biohazards, Decontamination, and Trace/Foreign Material sections.
- 18.1.3. Determine if the stakeholder has requested processing for other types of forensic evidence. If another section’s procedures require that a firearm is confirmed to be unloaded before processing, then the Firearms Section will render the firearm safe first. Examiners should take reasonable precautions to preserve other types of forensic evidence (i.e., latent prints or DNA) by wearing gloves. It may be necessary to consult representatives from other sections for guidance to minimize potential destruction of evidence, if possible. The stakeholder is notified of the potential loss/destruction of fingerprints or DNA prior to rendering the gun safe.
- 18.1.4. Examination of the firearm should take place in an area designated for evaluating or test firing firearms. Additional safety precautions may be necessary, depending on the condition of the firearm submitted.
- 18.1.5. Determine if the firearm is loaded. If the firearm is loaded, it must be unloaded.
- 18.1.6. Unloading a firearm may necessitate a complete disassembly or in some cases, destruction (e.g., cutting). Examiners use the least destructive method possible to unload a firearm. Examiners also avoid damaging parts of the firearm that can be used for individualization. If a part used for individualization is/will be damaged, the following guidelines also apply:



- 18.1.6.1. If a firearm must be rendered inoperable to unload it, or if it is reasonable to assume the firearm may be rendered inoperable in the process of unloading it, do not proceed without consulting with Section Management. Section Management will attempt to obtain clearance from the stakeholder to destroy the firearm in the unloading process.
- 18.1.6.2. If a firearm is received in an inoperable condition, and an examiner does not believe the firearm could easily be rendered operable (e.g., heavily rusted, damaged in a fire, or missing parts integral to the firearm), the stakeholder is notified that the firearm was received in an inoperable condition and may be damaged further in the process of rendering it safe. In this instance, the stakeholder does not need to give clearance before analysis proceeds.
- 18.1.6.3. If an examiner does not anticipate the firearm will be rendered inoperable, it is acceptable to proceed with rendering the firearm safe. If at any point, the examiner believes he/she may need to destroy the firearm (or if the firearm is destroyed in the process of rendering safe), all analysis stops until the stakeholder is notified and clearance is obtained to proceed.
- 18.1.7. Once a firearm is unloaded, it must be rendered safe. Firearms that are received for unloading but are not loaded must be rendered safe. "Rendered safe" means that a visual inspection of the chamber(s) can be performed and clearly demonstrates that the firearm is unloaded. Rendering a firearm safe may necessitate destruction of the firearm. See step 18.1.6 of this section for further details.
- 18.1.8. Additional examination of firearms submitted for unloading:
  - 18.1.8.1. If a firearm is functional and is eligible for NIBIN, it should be processed for NIBIN entry. This can be completed as part of the request for unloading or as a separate NIBIN Only request.
  - 18.1.8.2. If the stakeholder has made a request for additional firearms testing (i.e., function testing, serial number restoration), complete the additional testing requested or notify the Supervisor or Manager if it cannot be completed.
  - 18.1.8.3. If the stakeholder has not made additional requests for analysis, the request may be closed without further examination or testing of the firearm.
- 18.1.9. Firearms that have been unloaded and/or rendered safe are returned to the submitting agency.
- 18.1.10. A report is issued summarizing the actions taken to unload and/or render a firearm safe. If additional firearms testing is completed, that is addressed in a report/notification.



## 19. Rusty Firearms and Firearms Found in Fluid

### 19.1. Scope

19.1.1. Rusty firearms or those found in fluid (usually water) may be submitted for examination.

#### 19.1.2. Firearms recovered from fluid:

19.1.2.1. If the submitter consults with the Firearms Section ahead of time, the agency or individual recovering the firearm in a fluid, such as water, should be instructed to submit the firearm in a container of the fluid it was found in. Items submitted in this method may preserve the item for latent print processing (if requested at the time of submission), but the item will not be eligible swabbing for blood or contact.

19.1.2.2. If the firearm cannot be submitted in the fluid it was recovered in, the agency or individual can be instructed to immediately and thoroughly spray the firearm with a water-displacing product such as ethanol, isopropyl alcohol, WD-40® or other similar product to prevent further deterioration. Items submitted in this method will not be eligible for latent print processing or swabbing for blood/contact.

19.1.2.3. If the submitter does not consult with the Firearms Section ahead of time and/or the section is not aware of how the firearm was recovered, the above guidelines may not be followed.

19.1.2.4. Magazines submitted in fluid are not preserved in accordance with the HFSC Magazine Preservation Policy.

19.1.3. It should be noted that firearms may be too rusted to be functional.

### 19.2. Rusty Firearms

19.2.1. An examiner must take all necessary steps to ensure that the firearm is unloaded. If it cannot be readily verified as being unloaded, it must be examined in an area designated for evaluating or test firing firearms. Determining whether a firearm is unloaded may necessitate a complete disassembly or in some cases, destruction (e.g., cutting). If it is necessary to permanently render a firearm inoperable to unload it, the stakeholder is notified in advance. If a firearm must be rendered inoperable to unload it, or if it is reasonable to assume the firearm may be rendered inoperable in the process of unloading it, do not proceed without consulting with Section 18.1.6.

19.2.2. The stakeholder should be consulted to determine to what extent restoring the firearm is necessary (e.g., for test firing, for recovering manufacturer information, serial number). If the firearm was submitted as a suspected loaded firearm and no other request was made at the time of submission, then it may be presumed no additional testing is needed.

19.2.3. Soak the firearm in penetrating oil, de-rusting solvents, or similar material. Additionally, a dilute acetic acid solution (typically 10%-20%) followed by a water rinse may be used to remove corrosion. Firearms must always be thoroughly dried after a water rinse. See section 12.4.1.7 for details on drying firearms.



- 19.2.4. Periodically check the firearm until the firearm can be rendered safe, functions or the desired information is recovered (as needed).
- 19.2.5. As needed per the nature of the request, clean the firearm with gun cleaning solvent, cleaning patches and cloth or other appropriate solutions/materials. Care must be taken if any object is placed down the barrel. Only a non-marring item should be placed down the barrel. If the firearm can be safely test fired without cleaning the bore, consider doing this before continuing to clean the bore.
- 19.2.6. Once the firearm is restored to the extent necessary, it should be treated with appropriate lubricants, etc. to prevent further corrosion.
- 19.2.7. See the Reporting Guidelines Section for details on reporting the examination of firearms.

### **19.3. Firearms Found in Fluid**

- 19.3.1. If a firearm is submitted in a fluid-filled container, HFSC may ask the stakeholder if the container and fluid may be discarded once the firearm is removed. If the stakeholder approves, the container (with fluid) is photographed for the case record. The approval and the disposal of the packaging are documented in the case record. Firearms should not be stored long-term in fluid and should be removed, dried, and oiled as soon as practicable.
- 19.3.2. If the stakeholder has received an exception approval to have the firearm processed for latent prints, the firearm must remain in the fluid and submitted to the latent print section as is.
- 19.3.3. If the Firearms Section is notified that firearm was found in fluid but not submitted in fluid, the firearm should be dried and oiled as soon as practicable. It is not eligible for latent print processing in this condition.
- 19.3.4. Determine if the firearm is loaded as above. Dry the firearm and treat it with lubricants to prevent corrosion.

### **19.4. Literature/Supporting Documentation**

Denio, Dominic, "Making a Rusted Gun Functional," AFTE Journal, Vol. 13, No. 3, p. 29.



## **20. (Potentially) Malfunctioning Firearm Examination**

### **20.1. Scope**

- 20.1.1. A Firearms Examiner may be called upon to examine a firearm to determine if the firearm will malfunction. Many of these cases will deal with the question: “Can the firearm be fired without a proper pull of the trigger?”
- 20.1.2. Examinations may include external and internal observations or striking or dropping the firearm in attempts to duplicate the incident as reported. A firearm will never be struck or dropped while loaded. A dummy cartridge may be used to simulate a loaded chamber.
- 20.1.3. The examiner should attempt to conduct his/her examinations in a manner so as not to alter the firearm. However, there may be occasions when damage may occur.
- 20.1.4. If it is reasonable to assume that permanent changes to the functionality of the firearm or areas that mark a cartridge case/bullet may occur in this type of testing, do not proceed without consulting with Section Management. Section Management will attempt to obtain clearance from the stakeholder to destroy the firearm in the unloading process.
  - 20.1.4.1. If the stakeholder does not grant permission to proceed, this is considered a request to terminate testing.
  - 20.1.4.2. Consult the Quality Manual for issuing a report when a written request to terminate analysis is received.

### **20.2. Procedure**

No one procedure can sufficiently outline the steps necessary to examine all firearms for any malfunction. However, the following list of examinations serve as a guideline for the examiner. Document all applicable observations.

- 20.2.1. Document the condition of the firearm as received by following the Examination & Classification of Firearms section.
- 20.2.2. Note Any Visual Abnormalities of the Firearm
  - Determine if any parts of the firearm are loose, cracked, blocked, bulged, missing, broken, after-market, etc., and detail any adverse findings in the case record. The following is a list of parts to consider, but not all parts may be present on the firearm (as designed) and this list is not intended to be all-inclusive.

- Barrel/Bore
- Lower and upper receivers
- Slide
- Firing pin
- Ejector
- Extractor



- Screws
- Sights

#### 20.2.3. Condition of the Action (External)

Examine the action of the firearm, considering the following:

- Relationships of the action parts
- Correct assembly
- Proper locking of the action upon closing
- Cylinder rotation (securely locks, correct direction, etc.)
- Hand relationship to the ratchet (worn)
- Trigger (not returning, sticks, broken spring, etc.)
- Determine if the trigger pull is light or heavy for that firearm.

#### 20.2.4. Condition and Functionality of Safeties

Note the condition and functionality of all safeties.

#### 20.2.5. Feeding from Magazine

Determine if the firearm will feed a cartridge correctly by determining the condition of the following parts:

- Magazine
- Carrier or lifter
- Feed ramp
- Magazine lips, seating, etc.

20.2.6. Check for any inherent “quirks” known about the firearm based on literature or case data. Part of this includes checking for manufacturer safety recalls. Determine the possibility of “slam fires.”

#### 20.2.7. Test Fire Firearm

- Note any operational problems.
- Note the ammunition involved.

### **20.3. Special Situational Tests**

Care should be exercised when the force to be used in testing could alter or damage internal parts and their working relationship(s). Damage caused by the examiner may prevent determining the cause of the reported malfunction. Consult a Supervisor or more experienced examiner for guidance on this procedure.

#### 20.3.1. Condition of the Action (Internal)

##### 20.3.1.1. Hammer notch(s)

- Worn
- Burrs
- Dirt, etc.

##### 20.3.1.2. Sear





- Worn
- Broken
- Burrs, etc.

20.3.1.3. Safeties (relationships to other firearm parts)

- Springs
- Weak
- Broken
- Altered, etc.

20.3.1.4. Signs of any tampering or faulty assembly.

**20.4. Interpretation**

Any change to the firearm is specifically documented in the examiner's notes.

**20.5. Literature/Supporting Documentation**

Thompson, Roger C., "Firearms Malfunction Worksheets," AFTE Journal, Vol. 15, No. 1, p. 100.



## 21. Casting

### 21.1. Scope

21.1.1. Chamber casting: Occasionally, firearms are received for which the caliber may not be known or may be different than is designated on the firearm and in the literature. To facilitate firing of test shots that are of the correct caliber for a particular firearm, it may be necessary to make a bore and/or chamber cast. Then, by measuring the cast, the correct cartridge can be selected for test firing.

21.1.2. Casting of bore, chamber, and other firearm parts may also be used to reproduce a toolmark or the surface of a tool (firearm). The cast of a toolmark is a positive cast. The cast of the surface of a tool is a negative cast. This type of casting is typically done to examine/evaluate the physical characteristics (including evaluation for individual or subclass characteristics) of the firearm or marks for forensic or training purposes.

### 21.2. Procedure

Casts can be made using various casting materials such as low melting point metals and silicone rubber compounds (e.g., AccuTrans®).

21.2.1. Ensure that the firearm is unloaded.

21.2.2. Open the action and remove the bolt or bolt assembly, if possible.

21.2.3. Check the bore to make sure it is clear.

21.2.4. Check manufacturer's recommendations on how to prepare the area to be cast. If necessary, clean the area to be cast using an appropriate cleaning solution. Some casting materials may require the area to be dry; others may require the use of an appropriate lubricant.

21.2.5. Prepare the casting material per manufacturer's directions and carefully fill/cover the area to be cast. When casting a chamber or bore, consider inserting a swab or similar item in the middle of the casting material to facilitate removal of the cast.

21.2.6. Do not allow casting material to flow into the breech; it will make extraction difficult.

21.2.7. Some casting materials must be pushed/pulled/forced out of the barrel and are not reusable. Therefore, it is undesirable to let any more of the casting material than necessary go into the barrel.

21.2.8. When casting material is set, gently tap or pull on the end of the cast or swab to loosen cast from the chamber and remove from the breech.

21.2.9. If the cast, for some reason, cannot be loosened, follow manufacturer's recommendations on removal or seek advice from another experienced Analyst.

21.2.10. When casting the bore, consider casting only the last few inches. Consider using a cleaning patch to prevent casting material from flowing beyond the desired area.

21.2.11. Any cast(s) is/are treated as evidence.



### **21.3. Interpretation**

- 21.3.1. The correct caliber of the firearm can be determined by measuring the mouth, base, overall length, rim (if pertinent) and shoulder length of the chamber cast, or the diameter of the bore cast.
- 21.3.2. Class, subclass, and/or individual characteristics may be observable on casts and may assist Firearms Examiners in drawing conclusions.

### **21.4. Literature/Supporting Documentation**

- 21.4.1. Striupaitis, Peter P., "Bore Casting Techniques for Caliber Designation of Rifles," AFTE Journal, Vol. 15, No. 2, p. 88.
- 21.4.2. Poole, Robert A., "Mikrosil Casting Material Information," AFTE Journal, Vol. 15, No. 2, p. 80.



## 22. Primed Cartridge Case/Shotshell

### 22.1. Scope

During the course of examining a firearm, it may be determined that it would be unsafe for the examiner to fire the firearm as received. If it is not necessary to obtain test fires for comparison purposes, the firing condition of the firearm can be tested using a primed empty cartridge case or shotshell.

### 22.2. Procedure

- 22.2.1. Obtain a primed empty cartridge case in the desired caliber or pull the bullet of a live cartridge using an inertia bullet puller, retaining only the primed cartridge case. For shotguns, obtain a primed empty shotshell in the desired gauge or cut open a live shotshell removing all components, retaining only the primed shotshell.
- 22.2.2. Load the primed empty cartridge case, primed empty shotshell or commercial firing pin testing device into the chamber of the firearm and test fire in front of the water recovery tank, cotton box, or bullet trap/backstop.
- 22.2.3. Repeat the above procedure for each firearm action (single/double) as needed to determine functionality. This procedure is not suitable for determining if a firearm is semiautomatic vs. capable of firing in full automatic mode (or 3 round burst).
- 22.2.4. Retain all casings/shotshells.



## 23. Reduced Powder Loads

### 23.1. Scope

- 23.1.1. Reducing the powder load of a cartridge may be helpful to an examiner if intact bullets are needed for microscopic comparison and test firing regular cartridges results in damaged projectiles.
- 23.1.2. Reducing the powder load of a cartridge should only be attempted when the ammunition is not considered a safety concern (e.g., reloaded, damaged).
- 23.1.3. Magnum cartridges should not be utilized in this procedure.

### 23.2. Procedure

- 23.2.1. Mark where the bullet is seated in the cartridge.
- 23.2.2. Pull the bullet from the cartridge using an inertia bullet puller. In the case of rimfire cartridges, an inertia bullet puller is not utilized.
- 23.2.3. Remove and retain the existing gunpowder from each cartridge separately.
- 23.2.4. Weigh the gunpowder from each cartridge separately. Document the weight.
- 23.2.5. Determine  $\frac{2}{3}$  of the weight of the gunpowder (this measure is approximate) present in each cartridge. Document the result.
- 23.2.6. Replace only  $\frac{2}{3}$  of the gunpowder (by weight) in the corresponding cartridge and discard the remainder.
- 23.2.7. If a large gap will remain between the gunpowder and the base of the bullet, consider putting a small amount of tissue (e.g., Kimwipes®) in the cartridge above the gunpowder.
- 23.2.8. Reseat the bullet to the original position by tapping it into place with a plastic or rubber mallet.
- 23.2.9. If the  $\frac{2}{3}$  reduction in gunpowder does not result in the desired outcome, consider repeating the procedure and remove up to  $\frac{1}{2}$  of the gunpowder (by weight).
- 23.2.10. Test fire the firearm, following the procedures in the Test Firing And Recovery Methods Section or the Remote Firing Section. Check the bore for occlusions after each cartridge is fired.

### 23.3. Limitations

- 23.3.1. Consider the *possibility* that a bullet fired from a firearm using a reduced powder load may exhibit slightly different land and groove widths. Bullets fired using this method may not be suitable to use when comparing items to determine consistency in class.
- 23.3.2. Firing a firearm with a reduced powder load could cause a malfunction in the cycling of a semiautomatic or full automatic firearm.
- 23.3.3. Using a reduced powder load could result in a “squib” load where the bullet does not exit the barrel. Check the bore for occlusions after each cartridge is fired.



**23.4. Literature/Supporting Documentation**

- 23.4.1. Molnar, S., "Comments on Random Notes on Test Firing," AFTE Newsletter, No. 3, p.14.
- 23.4.2. Dresser, W., "Minimum Loads in Handguns," The NRA Handloader's Guide (1969), pp. 255-256.



## 24. Test Firing And Recovery Methods

Test firing may be completed to obtain a set of “test fires” known to have been fired in a particular firearm and/or to establish that a firearm can discharge a cartridge.

It is the responsibility of the Analyst to ensure that all appropriate safety function checks are performed on a firearm or item of ammunition prior to test firing. The following is a list of safety checks that should be considered.

### 24.1. Preparations

24.1.1. Complete the examination and classification (Section 15) of a firearm before test firing. If an Analyst is conducting a subsequent test firing on a firearm he/she has already function tested/examined, a simplified check may be completed.

- Prior to loading and firing, the chamber/bore MUST be clear.
- Check for cracks or weaknesses in major parts of the firearm, such as the frame, slide, or barrel.
- Check for any broken or missing parts of the firearm that might compromise the examiner’s safety.
- Check the bore for occlusions.

24.1.2. Determining safety of muzzle loaders

24.1.2.1. Check that the chamber/barrel appears sound.

24.1.2.2. Check percussion nipples for oversized flash holes.

24.1.2.3. If a black powder firearm is received in the loaded condition, it must have the bullet and charge removed. It may then be properly loaded prior to test firing.

24.1.2.4. Check if the firearm is an “original” muzzleloader or a modern reproduction. “Originals” must always be fired remotely. See the Remote Firing section.

24.1.3. If there is a concern that the firearm may not be safe to fire by hand, consider using the remote firing device. If there is a concern that the firearm may not be safe to fire at all, consult Section Management on how to proceed. If safety concerns exist, they are noted in the case record.

24.1.4. Select appropriate ammunition for test firing.

24.1.4.1. Do not load a firearm or magazine until ready to test fire. Do not load a firearm (or insert a loaded magazine into a firearm) until it is pointed in/towards the recovery method.

24.1.4.2. Consider the following guidelines when selecting ammunition for test firing:

- Check to ensure the ammunition appears safe by looking for splits, cracks and/or other significant damage to the cartridge case. Also, examine each cartridge to determine if the bullet is seated properly.



- Check that the ammunition is of the correct caliber. This can be determined by markings on the headstamp, direct comparison to known cartridges or by comparison to reference materials.
  - Check for pre-existing marks on pertinent surfaces of the ammunition.
- 24.1.4.3. Stock ammunition is typically selected for use in NIBIN processing and frequently used in firearms examination requests. Stock ammunition is maintained in a variety of calibers, manufacturers/marketers, and styles. For unfamiliar ammunition, consider checking for recalls or safety warnings.
- 24.1.4.4. "Evidence" ammunition (i.e., ammunition submitted with a firearm) may be used after consideration of the following:
- Evidence ammunition shall not be utilized if there is any reason to believe it may not be safe. Consult the Section Management or a more experienced Analyst for advice and guidance if there is a question about the safety of the ammunition.
  - Check for any firing pin strikes or other firearm/toolmarks on pertinent surfaces of the ammunition.
  - If reloaded or other potentially unsafe ammunition is suspected, exercise caution.
  - Evidence ammunition should not be used if an examiner cannot leave two or more of that same caliber, manufacture, type, style, etc. in the case. If there is a forensic need to use the remaining evidence ammunition of a particular type, consult Section Management before proceeding. Section Management will assist in obtaining permission to consume the ammunition from the stakeholder, or, in an instance where charges have been filed, a court order.
- Note: an exception to the above is when test firing officer's weapons. If the stakeholder requests limiting the number of evidence cartridges collected by HFSC for testing, the Analyst does not have to leave any remaining ammunition. This request can be in the form of a standing agreement between the organizations and does not have to be made with each incident.
- 24.1.4.5. If appropriate ammunition is not available, notify Section Management.

## **24.2. Select Recovery Method**

The recovery method chosen should be appropriate for the type of firearm and based on the need to retain projectiles for comparison.

### **24.2.1. Water Tank**

The water recovery tank is usually used to recover bullets from handguns and most rifles.

24.2.1.1. Ensure that the water level is appropriate, usually even with the bottom of the shooting port.

24.2.1.2. Ensure that the lid of the water recovery tank is closed and the blower is on.

24.2.1.3. Fire the firearm through the shooting port.

### **24.2.2. Shooting Range**





A shooting range is used primarily for test firing long guns where recovery of the fired projectile is not necessary but may be used for test firing other types of firearms.

24.2.2.1. Prior to test firing, ensure the ballistic blocks are intact enough to prevent a projectile from ricocheting.

### **24.3. Test Firing Safety**

24.3.1. Do not load a firearm or magazine until ready to test fire. Do not load a firearm (or insert a loaded magazine into a firearm) until it is pointed in/towards the recovery method.

24.3.2. Prior to test firing:

24.3.2.1. Ensure that the appropriate ventilation systems are turned on and that doors to the shooting room are closed.

24.3.2.2. The "In Use" light should be turned on to designate the shooting room is in use.

24.3.2.3. Proper hearing and eye protection must be worn. Individuals in the function testing area must also wear hearing protection.

24.3.2.4. Stand an appropriate distance away from the chosen recovery method to ensure proper usage and safety.

24.3.2.5. Use additional safety/PPE equipment as needed, including gloves, lab coat, face shield, respirator (e.g., N95 or equivalent), and/or full body shield.

24.3.3. Safety Notifications and Announcements for Test Firing:

Typically, test firing is only done when more than one person is present in the area. In certain circumstances, it is acceptable to test fire when no one else is present (typically for after-hours processing of firearms for officer-involved shooting incidents), but certain additional safety measures will be taken.

24.3.3.1. A verbal announcement is made notifying those present (including people in neighboring areas) that test firing is about to commence. (Typically, a loud announcement of "Preparing to fire," or similar statement is made.)

24.3.3.2. The "In Use" light should be turned on.

24.3.3.3. Firearms personnel present in the area when an individual is test firing all have the responsibility of checking on the safety of an individual if there are long delays with no apparent activity or if there is some indication of a problem or distress. Care must be taken when entering the shooting room when someone may be shooting.

24.3.3.4. If no other individuals are physically present in the area, in addition to the precautions taken above, the Analyst test firing will utilize the Get Home Safe (or equivalent) application and button.

24.3.3.5. If the lone Analyst sends a panic alert or there is an indication he/she is in trouble, the emergency contact(s) (Section Management) notified via the Get Home Safe system follow HFSC procedures and/or use their best judgement on how to handle the situation. This may include attempting to contact the lone Analyst, notifying other HFSC staff members present on-site, and/or contacting 911 for



emergency services. The Crime Scene Unit (CSU) has the ability to access all areas of HFSC and are typically on site 24/7. CSU can be reached after-hours by dialing the HFSC main line (713-929-6760) and following the prompts.

#### **24.4. Test Fire the Firearm**

24.4.1. Do not load the firearm until you are ready to fire the firearm. Do not insert a magazine into the firearm until it is pointed into the water tank or down range. Always point the firearm into the water tank or down range when loading a firearm.

24.4.1.1. Keep your finger away from the trigger until you are ready to fire the firearm.

24.4.1.2. Always be prepared for the possibility of a slam fire or for a firearm to fire in full automatic mode.

24.4.1.3. The Analyst should consider loading no more than three (3) cartridges into a magazine during the initial testing of the firearm.

24.4.2. In order to perform a microscopic comparison of a submitted firearm, a minimum of three (3) shots are fired and recovered, when possible, during initial test firing.

24.4.3. Testing modes of firing

24.4.3.1. If the firearm is capable of firing both single and double action modes, a minimum of one (1) shot per mode should be obtained, if possible.

24.4.3.2. Other modes of firing include full automatic and three round burst. If a firearm can fire in full automatic mode, consider only loading (2) cartridges in a magazine. Be sure to fire three (3) cartridges to test the operability of a firearm in the three round burst mode.

24.4.3.3. If a firearm function tests fully automatic, either by design, alteration, or otherwise, exercise extreme caution when test firing.

24.4.4. It is strongly recommended that all cylinder positions be used when test firing revolvers. When this is done, cylinder positions should be numbered and cartridges fired from each cylinder position should be labeled with the corresponding position's number.

24.4.5. Once you are done test firing, check the chamber of the firearm to ensure that the firearm is unloaded. If possible, lock the slide/bolt back on semiautomatic and bolt/pump action firearms. Open the cylinder on revolvers.

24.4.6. If you need assistance with a firearm during test firing, seek assistance from a qualified Analyst. If necessary to leave to find someone to assist you, make sure the firearm is pointed in a safe direction.

#### **24.5. Specimen Recovery and Documentation**

24.5.1. Every attempt must be made to recover and retain fired cartridge cases and bullets.

Document in the case record and test fire container if any bullets, cartridge cases, or shotshells are not recovered. Note in the case record and on the test fire packaging if any



additional fired components are recovered (e.g., wads/carriers, pellets, tips from hollow points).

- 24.5.2. If a firearm does not function as designed by the manufacturer during test firing, it is noted. Reason(s) for the malfunction may also be determined and recorded. This commonly includes, but is not limited to, failure to extract and/or eject a fired cartridge case or failure to discharge a cartridge (but does on subsequent attempts).
- 24.5.3. Document any additional observations
- 24.5.4. Document the method of loading the firearm in the case record. See Section 7.2.1.1 for examples of methods of loading.
  - 24.5.4.1. If a firearm has a magazine disconnect and the firearm is hand-loaded, document how test firing was accomplished.
  - 24.5.4.2. Revolvers, derringers, single shot, or double barrel firearms are presumed to be hand loaded. No documentation on the method of loading is needed for these firearms unless it is other than hand loading.
- 24.5.5. Mark test fires and packaging in accordance with Section 13.3.7. Test fires are treated as evidence.
  - 24.5.5.1. Test fires created prior to 01/01/2004 are considered "reference". No chain of custody was maintained on these items at the time of creation, and they were not maintained in a sealed condition. Reference test fires may not be used for comparison purposes.
  - 24.5.5.2. All test firings made after 01/01/2004 are sealed and maintained in the same manner as any evidence item.
- 24.5.6. Test fire envelopes are the recommended containers for storage, although the amount of test fires, shotshells, etc., may require containers of other types (zip-lock bag, etc.).

#### **24.6. Literature/Supporting Documentation**

- 24.6.1. "New Ballistics Tank from Detroit-Armor Corporation Allows Fast Recovery Without Projectile Distortion." AFTE Journal, Vol. 16, No. 3, p.106.
- 24.6.2. "Bullet and Cartridge Case Recovery", AFTE Journal, Vol. 16, No. 2, p.75.
- 24.6.3. Newquist, Andrew M., "New Bullet Recovery System", AFTE Journal, February 1973, p.9.
- 24.6.4. Molnar, S., "A Novel Bullet Recovery Method", AFTE Newsletter, No 1, p.17.



## **25. Remote Firing**

### **25.1. Scope**

While examining a firearm, an Analyst may decide to test fire a firearm using the remote firing device rather than holding it as designed.

### **25.2. Procedure**

25.2.1. It is recommended that the Analyst first dry fire the firearm in the remote firing device before using live ammunition. Consider using dummy rounds while dry firing.

25.2.2. Fire the firearm while standing a safe distance away. Use additional appropriate personal protective equipment, such as a face shield and/or the full body shield, to ensure safety.

25.2.3. Retain test fires.

25.2.4. Document the use of the remote firing device in the case record.

### **25.3. Literature/Supporting Documentation**

Biasotti, A. A., "Vise/Rest for Remote Firing," AFTE Journal, Vol. 11, No. 4, p.16.



## 26. Firearms Reference **Collection**

### 26.1. Scope

The Firearms Section, for various reasons, maintains a firearms reference collection. These reasons include the ability to:

- Provide an exemplar resource for training new forensic scientists/evidence technicians or in developing new technology for the scientific examination of firearms.
- Provide an exemplar resource for creating blind quality control or proficiency tests.
- Provide a source of firearm parts for the temporary repair of evidence firearms for test-firing purposes.

### 26.2. Procedure

26.2.1. A record of the firearms in the firearms reference **collection** is maintained.

26.2.2. Custody of reference firearms:

26.2.2.1. When custody does not need to be recorded in asset Manager:

- If a firearm remains in the care, custody, and control of a Firearms Section Analyst on HFSC property.
- If the firearm remains in the controlled areas of the Firearms Section.

26.2.2.2. When custody does need to be recorded in asset Manager:

- If a firearm is loaned to an HFSC staff member not assigned to the Firearms Section (typically for training or other work-related purposes).
- If a Firearms Section Analyst removes a firearm from HFSC property.

26.2.2.3. Reference firearms are not loaned to non-HFSC staff without authorization from Section Management. This authorization must be documented in writing (may be electronic) and will be maintained. If a firearm is loaned to a non-HFSC staff, the custody is recorded in asset Manager. Reference firearms might be loaned to non-HFSC staff (usually colleagues from other accredited laboratories) for training or other discipline-related purposes.

26.2.3. The firearm reference **collection** is maintained in such a manner as to prevent the firearms from deteriorating and to facilitate their inventory, safety, and control.

26.2.4. Reference firearms identified as irreplaceable are identified with a red 'critical' tag or sticker. Irreplaceable firearms include those of high monetary or historical value, critical to training, used in uncertainty budgets, and other critical needs of the section. These firearms are marked so they can be moved or stored away from the floor in preparation of or response to flooding events.

### 26.3. Literature/Supporting Documentation

AFTE Glossary, current edition.



## 27. Physical Examination & Classification of Unfired Cartridges & Fired Cartridge Cases/Shotshells

### 27.1. Scope

The characterization of any unfired cartridges and fired cartridge case evidence is completed using the guidelines below. Observations may be recorded on the Firearms Section Inventory Worksheet or in LIMS-equivalent fields, Mideo fields/worksheets, or other approved examination documentation.

### 27.2. General Guidelines

27.2.1. The nature of the request and examinations needed will determine the level of detail recorded in the case record for unfired cartridges and fired cartridge cases (including shotshells).

27.2.1.1. Typically, no information beyond caliber is required for unfired cartridges.

However, if the cartridges are used to test fire a firearm, then manufacturer/marketer information should also be recorded. If the request is to determine if an unfired cartridge was cycled in a firearm, more of the below details may be appropriate to record.

27.2.1.2. Frequently, cartridges and cartridge cases are treated as a “group” due to consistency in class characteristics. In this case, it may not be necessary to record observations for each item, instead recording observations for the “group”.

27.2.1.3. If fired cartridge cases are received for comparison, caliber determination or GRC evaluation, required class characteristics (those marked with an \*) are documented. **If fired cartridge cases are identified to a known item (i.e., test fires), recording GRC information is not necessary.**

27.2.2. Examination documentation is completed as thoroughly as necessary to complete comparisons and fulfil the stakeholder’s request. This may include determining and documenting any of the following:

- If any trace material is present (see Section 12 for more information)
- Caliber/bore/gauge\*
- Any indications of mis-matched or improper ammunition used in a firearm
- Head stamp information
- The possible manufacturer/marketer of the item
- Shape/class of firing pin impression\*
- Type/class of breechface markings\*
- Relative position of extractor and/or ejector (if present)\*
- Ignition system (such as center fire, rim fire, or other) (commonly encountered calibers readily known by Analysts are not typically documented)
- Description of cartridge case and primer (composition and/or finish)
- Description of shotshell battery cup (composition and/or finish)



- Description of projectile composition, finish, type (unfired cartridges only)
- Description of other markings, to include:
  - Loading/reloading/resizing marks
  - Magazine marks
  - Anvil marks (rim fire only)
  - Length (shotshells only)
  - Partial firing pin impressions
  - Chamber/chambering marks
  - Ejection port marks
  - Type of crimp (shotshells only)
  - Manufacturing marks
  - Other marks present (including damage to pertinent surfaces)

27.2.3. In the event unfired cartridges are received (as evidence) in “commercial packaging” and are requested for analysis by the stakeholder, the information on the package should be documented to the extent necessary to fulfil the stakeholder request. This may include but is not limited to brand name, ammunition description, product or SKU code, lot number, and package capacity.

### **27.3. Class characteristics**

Class characteristics are features of cartridge cases that can indicate a restricted group source resulting from the same or similar design factors of firearms determined prior to manufacture. Fired cartridge cases exhibit class characteristics that can be observed and/or measured and documented. Some of these characteristics can be used to generate a “GRC list” as described in Section 31. Class characteristics can also be utilized in the microscopic comparison of items and can be the basis of elimination (exclusion) conclusions. Some class characteristics are considered required documentation (if they can be observed); however, items can be grouped based on consistency in class and representative items can be chosen for use in documentation. Required characteristics are marked with an \* below. Some are documented only as needed depending on the nature of the evidence and request.

Note: Firearm manufacturers can alter or implement new designs and new manufacturing techniques. The class characteristics listed here are not intended to be all-encompassing. Newly encountered characteristics must be evaluated to determine if they are class, how they should be documented, and how they can be utilized in examinations.

#### **27.3.1. Caliber\***

The specific caliber of a cartridge case can typically be determined because they are typically marked on the headstamp. Most firearms are designed to fire one or a select few specific calibers.

- If a cartridge case is not stamped or is stamped incorrectly, it may be necessary to measure a cartridge case’s dimensions and compare them to available sources. Any dimensions noted are documented.



- A 22 long rifle cartridge cases cannot be distinguished from a 22 long cartridge case since the difference in the cartridges is due to the bullet dimensions. These cartridge cases are documented as 22 L/LR, 22 Long/Long rifle, or similar.
- If a cartridge case has features indicating it was fired in a different caliber firearm, that is documented.

#### 27.3.2. Breechface marks\*

The breechface of the firearm imparts class characteristics to the primer of the cartridge case. The characteristics on the primer from the firearm breechface are also referred to as the breechface. Breechface class characteristics are typically recorded as:

- Smooth
- Granular
- Parallel
- Arched
- Crosshatch
- Circular
- Unknown/other

#### 27.3.3. Firing pin shape\*

The firing pin of the firearm creates an impression in the primer of the cartridge case (or along the rim of a rim fire cartridge case). The characteristics of the impression on the cartridge case are also referred to as the firing pin or firing pin impression.

Firing pin class characteristics are recorded based on the shape of the impression.

Typically encountered impressions are recorded as:

- Hemispherical (circular shaped impression with a rounded bottom)
- Circular (circular shaped impression with a flat bottom)
- Elliptical (can be oriented vertically or horizontally)
- Rectangular (can be oriented vertically or horizontally)
- Rim fire rectangle
- Rim fire circle

#### 27.3.4. Firing pin aperture

The firing pin aperture is hole in the breechface of a firearm through which the firing pin protrudes. The aperture shape can be considered a class characteristic. The aperture shape is not always documented, but it can be useful for determining what type of firearm may have fired the item. Typical firing pin aperture shapes include circular, rectangular (squared or oval), and tear drop.

#### 27.3.5. Extractor and ejector

The extractor and ejector of a firearm leave markings on cartridge cases during the firing process.





27.3.5.1. The most common feature recorded for extractor and ejector is their relative position\*, recorded as clock positions. Recording this orientation is considered required if they can be determined. A typical position for extractors in firearms is 3 o'clock, so cartridge cases are also frequently recorded with the extractor at 3 o'clock. With the extractor mark on the cartridge case positioned at 3, the relative position of the ejector is recorded as a clock position.

- These markings are left on cartridge cases in a dynamic process and the relative positions on a cartridge case DO NOT NECESSARILY match their position in the firearm.
- While 3 o'clock is a common position for an extractor, it is not always at 3 o'clock. For example, a cartridge case with a 3 extractor/9 ejector orientation could also be observed/recorded as a 2/8.
- Not all firearms have an extractor or ejector, either by design or defect.
- In some firearms, the firing pin acts as the ejector. If the cartridge case exhibits signs that the firing pin is the ejector, the ejector position is recorded as FP, firing pin, or similar.

27.3.5.2. The shape of the ejector can be considered a class characteristic. It may be difficult to fully document the shape in writing and may be better suited for photographing. The shape of the ejector is not always recorded. However, if the shape is being used as a basis for a comparison conclusion or to determine the type of firearm that may have fired the item, it must be documented.

#### 27.3.6. Other possible class characteristics

There can be other characteristics that are imparted to the cartridge case from a firearm due to the type/design of the firearm. These can be considered class characteristics. Their presence/appearance are not always documented, but if they are used as a basis for a conclusion, they are documented.

27.3.6.1. Firing pin drag – Cartridge cases frequently have firing pin drag marks. A drag mark may indicate the cartridge case was fired in a firearm with an unlocking/dropping barrel. However, the firing pin can leave a drag marking during the extraction/ejection process even if the barrel does not drop. Other types of markings can sometimes mimic drag marks.

27.3.6.2. Markings in the firing pin impression –Like the breechface, firing pin impressions can be characterized by the patterns on the surface. Their presence or absence may not always be clear, and a smooth-appearing firing pin impression may not indicate a smooth firing pin. However, clear markings in the impression usually indicate those features are present on the firing pin.



27.3.6.3. Rotating bolt marks – Firearms that have a rotating bolt can leave distinctive markings on the headstamp area. Their clear presence can indicate a cartridge case was or was not fired in a firearm with a rotating bolt.

#### **27.4. Interpretation**

This examination serves to document the evaluation of cartridge case evidence. The comparison procedure is outlined in the SOP entitled, "Microscopic Comparison".

#### **27.5. Literature/Supporting Documentation**

- 27.5.1. Howe, Walter, J., "Laboratory Work Sheets" AFTE Newsletter Number Two, August 1969, p.13.
- 27.5.2. AFTE Glossary, current edition.



## 28. Physical Examination & Classification of Fired Bullets/Projectiles

### 28.1. Scope

The characterization of any fired projectile evidence is completed using the guidelines below. Observations may be recorded on the Firearms Section Inventory Worksheet or in LIMS-equivalent fields, Mideo fields/worksheets, or other approved examination documentation.

### 28.2. General Guidelines

28.2.1. The nature of the request and examinations needed will determine the level of detail recorded in the case record for fired bullets/projectiles.

28.2.1.1. If fired bullets are received for comparison, caliber determination, or GRC evaluation, required class characteristics (those marked with an \*) are documented.

If bullet items are identified to a known item (i.e., test fires), recording GRC information is not necessary.

28.2.1.2. Frequently, shot pellets and small bullet fragments are treated as a “group” if they are consistent in size and/or composition. Additionally, multiple bullet items exhibiting the same/similar (remaining) class characteristics may be treated as a “group” for class characteristic purposes. In these cases, it may not be necessary to record observations for each item, instead recording observations for the “group”.

28.2.1.3. If the observations made and recorded during the log in process are accurate, they do not need to be repeated.

28.2.2. Examination documentation should be completed as thoroughly as necessary. This may include determining and documenting any of the following:

- If any trace material is present (see Section 12 for more information)
- Diameter/caliber family\*
- Weight (in grains)\*
- Number of observable lands and grooves on fired bullet\*
- Type of rifling\*
- Direction of twist\*
- Measured width of the land impressions\*
- Measured width of the groove impressions\*
- Bullet/projectile design
- Possible manufacturer/marketer of the bullet/projectile
- Possible composition (core, jacket, shot pellets)
- A description of the base of the bullet
- Type, number, and position of cannelures
- Any extraneous markings, such as skid marks, shave marks, forcing cone marks, slippage, flared base, indications of mismatched ammunition, and/or other marks



- Condition of the fired evidence when examined (damage to or causing difficulty in visualizing pertinent surfaces)

### 28.3. Class Characteristics

Class characteristics are features of bullets that can indicate a restricted group source resulting from the same or similar design factors of firearms determined prior to manufacture. Fired bullets exhibit class characteristics that can be observed and/or measured and documented. Some of these characteristics can be used to generate a “GRC list” as described in Section 31. Class characteristics can also be utilized in the microscopic comparison of items and can be the basis of elimination (exclusion) conclusions. Some class characteristics are considered required documentation (if they can be observed); however, items can be grouped based on consistency in class and representative items can be chosen for use in documentation. Required characteristics are marked with an \* below. Some are documented only as needed depending on the nature of the evidence and request.

Note: Firearm manufacturers can alter or implement new designs and new manufacturing techniques. The class characteristics listed here are not intended to be all-encompassing. Newly encountered characteristics must be evaluated to determine if they are class, how they should be documented, and how they can be utilized in examinations.

#### 28.3.1. Caliber family\*

Specific calibers are grouped into caliber families. Caliber families are grouped based on the diameter of the bullet at the widest part of the bearing surface. Caliber family can be determined using a variety of methods described further in Section 29.

- Bullets may be fired in firearms with a larger or smaller bore than what they were designed. If a bullet exhibits evidence of this, it is documented.
- The specific caliber of a bullet (or a group of specific calibers) may be determined using other physical characteristics of the bullet.

#### 28.3.2. Rifling type\*

Rifling type is a description of the appearance of the rifling (land and grooves) both in the bore of the firearm and what is imparted on the bullet. Commonly encountered rifling types include traditional/“cut”, polygonal (poly), hybrid, and smooth bore.

- Damage, overuse, or poor manufacturing can cause one rifling type to mimic another. A “shot out” barrel may have rifling that mimics polygonal rifling.

#### 28.3.3. Twist\*

The lands and grooves of a barrel twist to the right or left. This twist can be determined by examining the bore of a firearm or the bullets fired from it.

- Damage can make determining the twist difficult



- Some rifling can have such a slight twist that it can be difficult to determine.

#### 28.3.4. Land and groove impression width\*

Lands and grooves are the raised and lowered areas inside the barrel of a firearm. The lands of a barrel leave a land impression on a bullet; the groove of a barrel leaves a groove impression on a bullet.

- Land and groove impressions can be measured on a bullet using the air gap method described in Section 30.
- Damage to a bullet may make measurements difficult or unreliable.
- The Firearms Section of HFSC does not measure polygonal or hybrid land and groove impressions. They are recorded as 0.000”.

#### 28.3.5. Slippage and/or forcing cone marks

When bullets are fired in a revolver, they may exhibit signs they were fired in a firearm with a rotating cylinder (revolver).

- Slippage marks/skid marks are created when the bullet is first engaging with the rifling.
- Forcing cone marks/misalignment marks are created when the chamber is not aligned properly with the bore.
- These markings may be mimicked in other types of firearms.

### **28.4. Interpretation**

This examination serves to document the evaluation of fired evidence. The comparison procedure is outlined in the Microscopic Comparison section.

### **28.5. Literature/Supporting Documentation**

28.5.1. Howe, Walter, J., “Laboratory Work Sheets” AFTE Newsletter Number Two, August 1969, p.13.

28.5.2. AFTE Glossary, current edition.



## 29. Caliber Family and Number of Lands and Grooves Determination

### 29.1. Scope

Caliber/caliber family is one of the class characteristics of a fired bullet. The determination of caliber/caliber family aids the examiner during the identification or elimination of a suspect firearm. If no firearm is submitted, the bullet's caliber is used in helping to determine the General Rifling Characteristics (GRC) of the firearm involved.

Land and groove impressions on a bullet can typically be directly counted. However, if the bullet is damaged and not all areas are present, it may still be possible to determine how many land and groove impressions there are.

The GRC reference tables published by AFTE are based on the formula below:

$$\text{Bullet diameter} = \frac{\text{\# of LIs and GIs} * (\text{LI width} + \text{GI width})}{\pi}$$

The reference tables published by AFTE reduce the risk of a calculation error made by Analysts and should be utilized when available for an item. Measurements for the above calculation are made in inches.

### 29.2. Procedure

29.2.1. The following may be utilized to determine the caliber/caliber family of a fired bullet.

The condition of the bullet determines which steps can be used. All measurements must be made and recorded in inches. Document which method(s) were used to determine caliber family.

29.2.1.1. Compare the evidence bullet directly with bullets of known caliber family.

29.2.1.2. Measure the diameter of the evidence bullet at the widest point of the bearing surface using calipers/micrometers and compare this measurement to the GRC reference tables published by AFTE. This method is referred to as "base diameter" measurement even though the base may not be part of the bearing surface.

29.2.1.3. Determine the number and widths of the lands and grooves and compare to the GRC reference tables published by AFTE. Record the microscope number and caliper/micrometer number used during these determinations.

29.2.1.4. Physical characteristics of the evidence bullet, such as weight, bullet shape, composition, nose configuration, and number and placement of cannelures may aid in caliber determination.

29.2.2. The following may be used to determine the number of land and groove impressions on a fired bullet when the bullet is damaged and not all land and groove impressions can be directly counted. All measurements must be made and recorded in inches. If one of the below methods was used, it must be documented.



- 29.2.2.1. Measure the diameter of the evidence bullet at the widest point of the bearing surface using calipers/micrometers. Measure a land impression and a groove impression (using a method accepted by HFSC) and add the values together. Compare these measurements to the GRC reference tables published by AFTE.
- 29.2.2.2. Observe the distribution of the land and groove impressions on the bullet and compare the evidence bullet to bullets with similar caliber family and land and groove impression width.

### **29.3. Interpretation**

- 29.3.1. Caliber/caliber family is written as a numerical term and may be depicted with or without the decimal point.
- 29.3.2. If the bullet is mutilated, the examiner may only be able to determine that the evidence is consistent with a range of calibers/caliber families.
- 29.3.3. In some instances, the examiner may not be able to determine a caliber/caliber family or the number of lands and grooves.

### **29.4. Literature/Supporting Documentation**

- 29.4.1. Mathews, J. Howard, Firearms Identification Vol. I, 1973.
- 29.4.2. Barnes, Frank C., Cartridges of the World, 7<sup>th</sup> Edition, 1993.
- 29.4.3. AFTE Glossary, current edition.
- 29.4.4. Lutz, Monty C. and Ward, John G., "Determination of Bullet Caliber from an X-ray," AFTE Journal, Vol. 21, No. 2, p. 168.



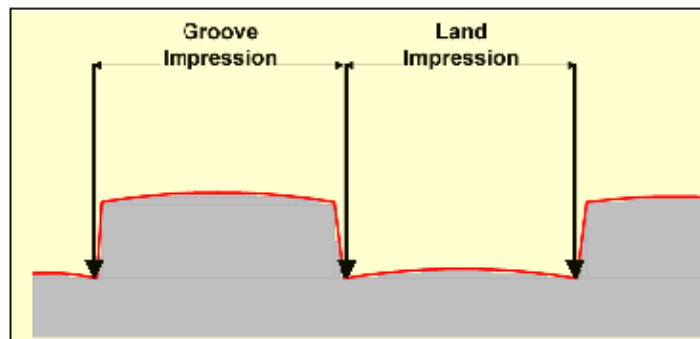
## 30. Air Gap

### 30.1. Scope

The width of the land and groove impressions on a bullet is one of the class characteristics used in the discipline of firearms identification. These measurements aid the examiner during the identification or elimination of a suspect firearm. If no firearm is submitted, these measurements can be used in helping to determine the General Rifling Characteristics (GRC) of the firearm involved. The air gap procedure utilizes a comparison microscope and calipers/micrometers.

### 30.2. Procedure

30.2.1. In measuring a fired bullet to determine the width of the land impression or the groove impression, it is paramount that the points used for beginning and ending a measurement comply with the discipline-wide practice. This practice utilizes the anchor points shown below:



30.2.2. The fired bullet in question is mounted on one stage of the comparison microscope. The caliper/micrometer is placed on the other stage. The same magnification must be used for each stage. Ensure that the land or groove being measured is at the highest point of the arc before conducting the measurements.

30.2.3. Align the image of the measurement gap (opening) of the caliper/micrometer with the image of the appropriate land impression being measured and record the measurement to the nearest thousandth of an inch or appropriate measurement. Record a land impression width minimum and maximum measurement.

30.2.4. Repeat the above utilizing the groove impression.

### 30.3. Interpretation

It may be necessary to measure several land and groove impressions in order to obtain a reliable measurement.

### 30.4. Limitations





Damaged bullets or fragments may exhibit stretching or splitting. The lands and grooves may not be suitable for measurement.

**30.5. Literature/Supporting Documentation**

- 30.5.1. U.S. Department of Justice, Federal Bureau of Investigation, NCIC, Criminalistics Laboratory Information System (CLIS) Operating Manual, 1978.
- 30.5.2. Walsh, J. F., "Accuracy, Speed and Conversion in Rifling Measurements," AFTE Journal, Vol. 9, No. 1, p. 50.
- 30.5.3. AFTE Newsletter, No. 4, December 1969, p. 28.



## 31. General Rifling Characteristics Utilization

### 31.1. Scope

The FBI's General Rifling Characteristics database can be utilized when attempting to determine a list of possible firearms that could have fired an evidence bullet or cartridge case when a questioned firearm has not been submitted.

Note: Unless markings on a fired cartridge case indicate otherwise, it is reasonable to expect that the extractor (if present) is located at the 3 o'clock position.

### 31.2. Procedure

31.2.1. The General Rifling Characteristics (GRC) database can be accessed using the GRC computerized database in Microsoft Access.

31.2.2. The examiner may conduct a GRC search on a fired bullet, a fired cartridge case or, if appropriate, a combined search of both a fired bullet and fired cartridge case.

31.2.3. When conducting a search of the GRC database, the appropriate administrative information is completed (e.g., agency case number, forensic case number, item numbers).

31.2.4. If the search involves the evaluation of a fired bullet, the examiner will enter information in as many of the fields as can be determined. All fields do not have to be completed to conduct a GRC search.

31.2.5. After entering the data in the appropriate fields, the examiner must specify the type of search to be conducted. The searches available are narrow-narrow, narrow, and broad search. The type of search selected only matters when land/groove impression widths have been recorded in the GRC database. If no LI or GI widths are recorded, the type of search chosen has no effect on the list produced.

Note: The GRC database automatically adds 0.003" to land and groove width maximum measurements and subtracts 0.003" from land and groove width minimum measurements recorded.

- The narrow-narrow search is the most restrictive and may be used when the land and groove impressions are well defined. A narrow-narrow search restricts the GRC list produced to manufactures in the database where recorded minimum *and* maximum land *and* groove measurements fall between the land impression width range *and* the groove impression width ranges in the database.
- The narrow search is less restrictive and would be appropriate when the land and groove impressions are not well defined. The examiner may choose to utilize the narrow search, even if the land and groove impressions are well defined, so as not to exclude possible matching firearms. A narrow search restricts the GRC list produced to manufactures in the database where recorded minimum *and*



maximum land *and* groove width measurements fall between the land impression width range *or* the groove impression width ranges in the database.

- The broad search is the least restrictive and should be considered only after attempting to obtain results with one of the two other searches or when the land and groove impressions are poorly defined. A broad search restricts the GRC list produced to manufacturers in the database where recorded minimum *or* maximum land *or* groove width measurements fall between the land impression width range *or* the groove impression width ranges in the database.
- Example: An examiner measures the following land and groove widths on a bullet:  
LI width minimum: 0.099", LI width maximum: 0.100"  
GI width minimum: 0.115", groove width maximum: 0.116"  
When these values are entered into the database, 0.003 is added or subtracted to the measurements to increase the range.  
Searched LI range: 0.096" – 0.103", Searched GI range: 0.112" – 0.119"
  - A narrow-narrow search returns a list of manufacturers in the database that have a LI minimum *and* maximum value between 0.096" – 0.103" *and* the GI minimum *and* maximum value fall between 0.112" – 0.119".
  - A narrow search returns a list of manufacturers in the database that have a LI minimum and maximum value between 0.096" – 0.103" *or* the GI minimum and maximum value fall between 0.112" – 0.119".
  - A broad search returns a list of manufacturers in the database that have a LI minimum *or* maximum value between 0.096" – 0.103" *or* the GI minimum *or* maximum value fall between 0.112" – 0.119".
- Polygonally and hybrid rifled bullets are entered with a range of 0.000" – 0.000" for both land and groove impression widths.

31.2.6. When conducting a GRC search for a fired cartridge case, the examiner will enter information in as many of the fields as can be determined. All fields do not have to be completed to conduct a GRC search. If there are any questions about what to enter into these fields, consult the GRC database or a more experienced Firearms Examiner. Searches for cartridge cases are not dependent upon a search option (i.e., narrow-narrow, narrow, broad).

31.2.7. A combined search simply combines the information for a fired bullet and cartridge case. Conduct the appropriate search based on the criteria for the fired bullet. If no results are obtained using the narrow-narrow search, a search using a less restrictive search type (i.e., narrow or broad) may be performed.

31.2.8. Results of the computerized search maintained in the case record. The examiner reviews the results and may, if appropriate, add entries to the list based on the examiner's knowledge and experience. The examiner records justification for any addition and initial and dates the changes. All printouts of the search results must



include handwritten initials (or secure electronic equivalent) of the examiner since it is part of the examination documentation.

31.2.9. A manual search may be conducted in some instances. In this case the examiner compiles a list of manufacturers that produce firearms that could have fired the fired specimen. The examiner manually records the appropriate information related to the class characteristics of the specimens and then records the results of the search.

31.2.10. There may be situations in which an examiner should consider not narrowing the GRC list to one specific caliber. Examples of this are as follows:

31.2.10.1. There may be specific cartridges that can be fired in more than one specific caliber of firearm, but the fired evidence may not exhibit signs of having been fired in a different caliber firearm (e.g., a 38 Special cartridge can be fired in a 357 Magnum firearm, but the 38 Special cartridge case may not exhibit signs of being fired in a 357 Magnum chamber).

31.2.10.2. Bullets typically loaded in a specific caliber cartridge may be indistinguishable from bullets typically loaded in another specific caliber cartridge of the same caliber family (e.g., bullets loaded in a 40 S&W or 10mm Auto cartridge may be so similar that they cannot be distinguished).

### **31.3. Interpretation**

The GRC File is an investigative aid and should not be construed as an all-inclusive list of firearms available with those particular rifling characteristics.

### **31.4. Limitations**

31.4.1. Not all firearm manufacturers or models may be in the database.

31.4.2. The general rifling characteristics recorded for this purpose are similar to, but may not be the same as, class characteristics of fired bullets and cartridge cases/shotshells. Items with the same general rifling characteristics may still be eliminated based on class characteristics.

### **31.5. Literature/Supporting Documentation**

31.5.1. U.S. Department of Justice, Federal Bureau of Investigation, NCIC, Criminalistics Laboratory Information System (CLIS) Operating Manual, 1978.

31.5.2. Walsh, J. F., "Accuracy, Speed and Conversion in Rifling Measurements," AFTE Journal, Vol. 9, No. 1, p. 50.

31.5.3. Molnar, S., "A Simplified Technique for L&G Measurements", AFTE Newsletter, No. 4, December 1969, p. 28.



## **32. Wadding Determination**

### **32.1. Scope**

By examining shotshell wadding, the examiner may be able to determine the gauge size, manufacture, and if the wad contains markings suitable for comparison, the firearm that discharged it.

### **32.2. Procedure**

32.2.1. Determine gauge size by one or both of the following means:

- Directly comparing the evidence to known laboratory reference samples of similar manufacture or composition by comparing the base of evidence to the bases of the reference samples until a similar size is found.
- Measuring the base diameter of the wad and comparing these measurements to known measurements. Take and record measurements by directly measuring with calipers/micrometers.

32.2.2. Manufacturers' data can be determined by locating information stamped into the wad (if present) or by comparing the wad to known samples and/or references.

32.2.3. Although rare, microscopic examination may reveal striations suitable for identification of the wad back to the shotgun that fired it.

32.2.4. If evidence shotshells are submitted, it may be necessary to disassemble one for the determination of consistency with the fired component(s). The disassembled shotshell (and its components) is documented and retained as evidence using an item identifier that is a subset of the evidence shotshell item identifier.

32.2.5. Record all information in the appropriate LIMS fields.

### **32.3. Interpretation**

Consult known wadding sizes in the AFTE Glossary, other reference materials, or known reference samples and determine the corresponding type.

### **32.4. Limitations**

32.4.1. If the wad is mutilated or soaked with blood or other fluids, the examiner may not be able to specifically determine gauge size.

32.4.2. The examiner should also recognize that multiple manufacturers may use the same shotshell components.



### 33. Shot Size Determination

#### 33.1. Scope

By examining recovered shot pellets, the examiner may be able to determine the actual shot size. The determined size can then be compared to the shot size loaded in submitted unfired shotshells or to the size that the submitted discharged shotshell was marked to have contained.

#### 33.2. Procedure

The examiner shall use two or more of the below techniques to determine shot size. The shot size determined may be reported as a range or with several shot sizes as options, depending on the results of the testing outlined below.

##### 33.2.1. Visual/Microscopic Comparison

- Determine the total number of pellets received.
- Determine the number of pellets suitable for **size determination** purposes. Make note if all pellets appear to be similar in size. If several different sizes are present, **group them and** determine **the number of** each **approximate** size.
- If available, compare laboratory reference samples of known shot sizes side by side with the evidence pellets until a known shot size is determined. A stereo microscope may aid in this determination. This can be done one size at a time or several sizes at a time. If more than one size is used at a time, however, care should be taken not to mix up the shot.
- Record findings in the appropriate LIMS fields.

##### 33.2.2. Comparison by Weight

- Determine the number of pellets suitable for weighing. Make note if all pellets appear to be similar in size. If several different sizes are present, **group them and** determine **the number of** each approximate size.
- Weigh the pellets in grains.
- Divide the weight of the pellets by total number weighed.
- Determine the magnetic properties of the pellets. The examiner may need to determine the most likely composition of the shot (lead, steel, tungsten) to use this method.
- Consult known pellet weights in the AFTE Glossary or other reference and determine the most consistent shot size that corresponds to the evidence shot pellets.
- Record findings on the appropriate in the appropriate LIMS fields.
- The weight of the evidence pellets can also be directly compared to the weight of the reference samples using the same number of pellets until a similar known weight is obtained.

##### 33.2.3. Measuring Pellet Size



- Determine the number of pellets suitable for measurement purposes. Make note if all pellets appear to be similar in size. If several different sizes are present, **group them and** determine **the number of** each approximate size.
- Choose the best specimen(s) and measure the diameter using calipers/micrometers. Record the appropriate measurement in hundredths or thousandths of an inch.
- Consult known pellet sizes in the AFTE Glossary or other reference and determine the shot size, which corresponds to the evidence shot.
- Record findings in the appropriate LIMS fields.

### **33.3. Limitations**

- 33.3.1. If the shot is mutilated, the examiner may not be able to determine shot size.
- 33.3.2. Depending on the consistency in the manufacturing process, the shot size stated on a shot shell may not match the shot size contained in the shotshell.

### **33.4. Literature/Supporting Documentation**

AFTE Glossary, current edition.



## 34. Microscopic Comparison

### 34.1. Scope

34.1.1. Firearm identification is primarily concerned with determining if a bullet, cartridge case, or other ammunition component was fired in a particular firearm. This is possible because the surfaces of a firearm that contact ammunition components, as a result of manufacturing as well as wear and tear on the firearm, have tiny irregularities that transfer to the ammunition components. These irregularities result in markings on the ammunition components observable at a microscopic level (individual characteristics).

34.1.1.1. Sufficient agreement of the markings (individual characteristics) allows an Analyst to establish a link between the firearm and the ammunition components it contacts. (Significant disagreement allows an examiner to determine there is no link.)

34.1.1.2. Subclass carryover must be ruled out as a potential cause of markings before an Analyst can determine two items were fired in the same firearm. Subclass characteristics are features that may be produced during manufacture that are consistent among firearms/firearm parts manufactured by the same tool in the same approximate state of wear. These features are not determined prior to manufacture and are more restrictive than class characteristics but are not individual.

34.1.1.2.1. The existence of subclass carryover is difficult to establish as fact since multiple firearms manufactured by the same tool in the same state of wear must be examined. Instead, examiners must evaluate markings for their *potential* to be subclass in nature.

34.1.1.2.2. Subclass and individual characteristics may both exist on the same firearm part.

34.1.1.2.3. The existence of potential subclass carryover does not preclude an identification, as long as those markings are not used in the identification.

34.1.1.3. Sufficient agreement means there is significant repetition of the pattern/combination of patterns of surface contours (specifically the relative height, depth, width, curvature, and overall spatial relationship of the peaks, ridges, and furrows) between two or more items.

34.1.1.4. Significant repetition means the amount of repetition/agreement is consistent with what is typically observed in items that were fired in the same firearm. It also means that the amount of agreement observed exceeds the best correspondence of markings made in items fired by different firearms (best known non-match).

34.1.1.5. Conclusions made by examiners regarding the individualization of an ammunition component to a firearm is subjective, based on scientific principles as well as the examiner's training and experience.

34.1.1.6. Examiners are encouraged to be conservative when reporting conclusions and their significance.





- 34.1.2. For an examiner to identify an item of fired evidence back to the firearm that produced it or to another piece of fired evidence, a microscopic comparison utilizing a comparison microscope must be performed. The comparison microscope allows the examiner to place evidence on one stage of the microscope and the known test fire, or another piece of evidence, on the other stage of the microscope and make a direct comparison of the specimens.
- 34.1.3. Comparisons between cartridge cases or between bullets of different caliber families will not be performed unless there is a specific request from a stakeholder, obvious distortions to the evidence are observed, or there is another forensic reason to do so.
- 34.1.4. When no firearm is received, examiners should consider that fired cartridge cases and/or bullets fired in two different barrels of the same firearm (e.g., derringers, double barrel shotguns) will exhibit different individual characteristics and may be eliminated from each other. When encountering evidence fired in this type of firearm, it may be necessary to use clarifying language indicating the items were or were not fired in the same barrel (vs. not fired in the same firearm). There may be other similar scenarios with gun parts other than barrels that may also require clarifying language.

#### **34.2. Procedure**

- 34.2.1. A fired bullet or cartridge case (unknown) is evaluated for suitability before comparison to test fires (knowns). If the evaluation of the item(s) results in a determination that the unknown item is suitable for comparison, the examiner may continue with a comparison and does not need to document the initial determination of suitability. (Unless explicitly stated, a determination of suitability is implicit in the microscopic comparison of one item to another.) If the evaluation of the item(s) results in a determination that the item is not suitable for comparison, the examiner documents the result of the evaluation (unsuitable or insufficient).
- 34.2.2. The steps below do not have to be performed in the order listed. All steps, however, must be considered and/or addressed.
- Select the correct objective (magnification) setting and ensure that the objectives are locked in place.
  - The illumination (lights) used must be properly adjusted. Oblique lighting is usually preferred.
  - If a firearm (or test fires) is/are included as part of the evidence, evaluate the test fires to each other and determine what microscopic characteristics have reproduced. Record this evaluation in the examination documentation (as agreement of test fires). If there is no fired evidence for the test fires to be compared to, it is not necessary to inter-compare test fires. If multiple sets of test fires from the same firearm exist but were not used in the comparison(s), it is not necessary to inter-compare the un-compared test fires.



- Compare unknown fired evidence to either another piece of unknown fired evidence or a test fire. When a test fired component is compared to an unknown and a conclusion is recorded, the test fired component is placed in a container, such as a Ziploc-type bag, and then returned to the container from which it was taken. This process is followed for additional test fired components (in the same set of test fires) used when a conclusion is recorded. When this occurs, the components (if of the same type of evidence – e.g., two or more cartridge cases) are marked in such a way as to differentiate which component was used in which comparisons.
  - Evaluate the items to determine if they are consistent in **discernible** class.
  - Evaluate the items for the potential of subclass carryover.
  - Comparison of all available identifying marks should be considered.
- 34.2.3. If a determination of identification or elimination is not initially made, the examiner should consider the following factors:
- Angle of lights
  - Type of lights
  - The need for additional known test fires
  - The position of the evidence, the tests or both
  - The possibility of cleaning the firearm or fired evidence
  - The possibility that the firearm itself has changed
- 34.2.4. All conclusions and/or observations are documented using the appropriate examination documentation.
- All microscopic comparisons must be documented using an Itemized Worksheet.
  - All identifications and eliminations on individual characteristics must be documented with a representative image. In the event an elimination is made but it is unclear if the characteristics used for determination are class, subclass, or individual, a representative image is required. The preferred method for documenting identifications and eliminations on individual characteristics is the use of imaging. If multiple specimens are being compared using the same markings, then it is permissible to capture an image that is representative of the markings used for the conclusion and note this fact on the examination record.
  - The documentation of all inconclusive, insufficient, and unsuitable results must include a description and/or reason for the result.
- Note: This requirement does not extend to determining if an item is suitable or not suitable for NIBIN entry.
- 34.2.5. While documenting identifications and eliminations on individual characteristics using imaging is required, it is also strongly recommended that imaging be used to document other observations and/or conclusions as well. The guiding principle is to use the



imaging capabilities to assist the examiner in providing documentation for the conclusion(s) made.

34.2.6. Documenting observations and/or conclusions using imaging is accomplished using the following procedure:

- Capture the image(s) using the Mideo software.
- Record the appropriate information in the data fields associated with the image(s) that is/are used for examination documentation. It is possible for an examiner to capture images in Mideo that are not ultimately used to document observations and/or conclusions. The examiner may consider placing a statement in the comments field making it clear that the image taken is representative of the markings used for the conclusion but not necessarily inclusive of all markings that were the basis for the determination. In addition, it may be necessary to photograph more than one area on a specimen to adequately document the basis of the conclusion.
- Once the appropriate data fields are completed by the primary examiner, select the correct "Printed Report" template(s), and preview the draft examination record(s).
- If applicable, the examiner responsible for conducting an independent examination of the evidence completes the data fields associated with "Second Examination" and/or GRC verification fields in Mideo.
- The examiner(s) responsible for the technical and administrative reviews complete(s) the data fields associated with the "Technical Review" and "Administrative Review" in Mideo.
- Once all appropriate data fields are completed by primary, second, and reviewing examiners, a "printed report" is generated in Mideo and uploaded into LIMS. This "printed report" is digital. If a copy of the printed report is retained in the paper file, the primary places their hand-written initials on the page.

### 34.3. Interpretation

It is possible for firearms to be altered or parts replaced, and these alterations may not be apparent. If items are identified or eliminated as having been fired in a firearm, it is important to note it is in that firearm *as received* by HFSC.

Based upon the markings present on the evidence, one of the following results is reported:

34.3.1. Identification\*: Agreement of all **discernible** class characteristics and a sufficient correspondence of individual characteristics will lead the examiner to the conclusion that both items (evidence and tests) originated from the same source.

\*Identification **means that in the examiner's opinion, it is extremely unlikely any other firearm is capable of producing the markings used in forming their conclusion.**

**In this context, the judgement of "extremely unlikely" is based on:**



- Extensive empirical research and validation studies that have been conducted in the field  
AND
- The cumulative results of training and the casework examinations that have either been performed, peer reviewed, or published in a peer-reviewed forensic journal.

34.3.2. Inconclusive: **Agreement of any/all discernible class characteristics but a lack of agreement or disagreement of individual characteristics will lead the examiner to the conclusion that they cannot determine if the items are from the same or different sources.**

**Note: The above definition of inconclusive is the minimum threshold a comparison of items meets to be considered inconclusive. Examiners may be more specific in the case record regarding the level of agreement or disagreement of individual characteristics seen in an inconclusive comparison determination.**

- Agreement of all **discernible** class and some correspondence of individual characteristics, but not sufficient for identification
- Agreement of all **discernible** class but a lack of agreement or disagreement of individual characteristics
- Agreement of all **discernible** class and some disagreement of individual characteristics, but not sufficient for elimination

34.3.3. Elimination: A disagreement of class characteristics between items of evidence will lead the examiner to the conclusion that the items did not originate from the same source. In some instances, it may be possible to support a finding of elimination even though the class characteristics are similar when there is marked disagreement of individual characteristics.

34.3.4. Unsuitable: A lack of **(or very poor quality) class or individual markings from the firing process on an item** will lead the examiner to **determine that they cannot form any sort of source conclusion (identification, elimination, or inconclusive) about the item.**

34.3.5. **Insufficient:** There may be times when an examiner may feel that an item is **not** suitable for comparison but does not conform to the definition of unsuitable. In this instance, an Analyst may make a determination of "insufficient". A conclusion of insufficient is rendered when examining a single item, not a comparison between two items. Examiners may render an opinion that markings on an item are insufficient when:

- An item that has discernible class characteristics **and no (or very few) individual characteristics but is** useful for elimination conclusions.

**Note: An item may have characteristics useful for elimination and a determination of insufficient may be made even if no eliminations are made to the item.**

- The examiner cannot determine if markings are individual or subclass.  
Insufficient should only be used in this instance if no individual markings can be



found. If only some markings are potentially subclass in nature, it is noted in the case record, but the item(s) may still be compared.

**34.4. Literature/Supporting Documentation**

- 34.4.1. Howe, Walter, J., "Laboratory Work Sheets" AFTE Newsletter Number Two, August 1969, p.13.
- 34.4.2. AFTE Glossary, current edition.
- 34.4.3. DeForest, Gaensslen, and Lee, Forensic Science: An Introduction to Criminalistics, McGraw-Hill, New York, 1983.



## **35. National Integrated Ballistic Information Network – NIBIN**

### **35.1. Scope**

- 35.1.1. The National Integrated Ballistic Information Network (NIBIN) is managed by the Bureau of Alcohol, Tobacco, Firearms, and Explosives (ATF) and utilizes IBIS (Integrated Ballistic Identification System) hardware and software to acquire images of fired cartridge cases. HFSC uses IBIS Brasstrax to acquire images of the headstamp area of fired cartridge cases using optical and electronic technology. These images are stored in databases, and algorithms are used to correlate the images against each other using filters such as caliber and the date of offense. These correlations produce lists of possible matches sorted by score. Images can be selected and viewed side-by-side on a monitor.
- 35.1.2. If a possible association (a NIBIN Lead) is found during the correlation review process, the associated agency(ies) and/or division(s) are notified via a notification issued in LIMS. The microscopic comparison of the evidence in the potential association may not be completed until a request is received. If the association is confirmed (i.e., the cartridge cases are identified), it is considered a NIBIN Hit.
- 35.1.3. On November 01, 2010, the section's Integrated Ballistic Identification System (IBIS) was replaced with BrassTRAX. This unit is not capable of imaging bullets. Therefore, from this date forward, only fired cartridge cases are being imaged.

### **35.2. Procedure**

- 35.2.1. The NIBIN Standard Image Capture Protocols are followed when making entries into the system.
- 35.2.2. The Analyst must ensure that:
- Criteria for items selected for entry include non-revolver cartridge cases and shotshells.
  - Any cartridge cases selected for entry into NIBIN have sufficient individual characteristics within the firing pin impression and/or within the breech face marks on the primer to identify a possible association.
  - If there is more than one cartridge case suitable for entry into NIBIN, the Analyst selects the best one for entry. If the markings on items are significantly different from each other, more than one cartridge case may be selected for entry. This process is referred to as “triage”.
- 35.2.3. If an item or items are unsuitable for NIBIN, or if an item or items are imaged into NIBIN, it is recorded in the appropriate exam documentation.
- 35.2.3.1. If an item (test fire, single fired cartridge case) or multiple items (cartridge cases grouped in triage) are not imaged, the reason is recorded in the case record. Reasons include:
- None or too few markings in the firing pin impression or on the breechface.



- Ineligible offense
- Ineligible caliber
- Item fired in an ineligible type of firearm
- Item(s) too damaged to image
- A representative image from the offense is already imaged

35.2.3.2. Items that do not meet the criteria for entry may be rejected for NIBIN processing prior to work commencing. In that event, a notification of rejection is issued.

35.2.3.3. If an item was not processed for NIBIN, the above reasons are not applicable.

### **35.3. Interpretation**

Two or more specimens that show a high degree of similarity on the NIBIN system may represent a NIBIN lead.

### **35.4. Limitations**

35.4.1. Mutilated or deformed evidence

35.4.2. Sufficient markings for inclusion in database

35.4.3. Database search may not include all viable possible matches



## 36. NIBIN Processing

HFSC processes firearms and cartridge cases for NIBIN entry following the “Minimum Required Operating Standards for National Integrated Ballistic Information (NIBIN) Sites” document (MROS), or the guidelines set forth by the Bureau of Alcohol, Tobacco, Firearms, and Explosives (ATF) for NIBIN processing and entry. The Section Manager operates as the NIBIN Program Administrator as defined by the MROS. If the Section Manager is unavailable, a designee will be appointed.

### 36.1. Scope

- 36.1.1. Firearms evidence is routinely processed through the section’s NIBIN program. Semi-automatic firearms, fully automatic firearms, semiautomatic and pump-action shotguns (12 gauge only), fired shotshells, and fired cartridge cases fired in semiautomatic and fully automatic firearms are eligible for entry into NIBIN. Firearms belonging to law enforcement personnel are not eligible for entry without a request from a stakeholder.
  - 36.1.1.1. Only crime gun evidence and fired ammunition components pursuant to a criminal investigation are entered into NIBIN.
  - 36.1.1.2. Firearms taken into law enforcement custody through gun buy-back programs, domestic disturbance investigations, property damage crimes involving firearms, and found or abandoned firearms are also eligible for NIBIN entry; however, entry may be restricted by local laws or policies.
  - 36.1.1.3. HFSC will image other non-crime evidence at the request of a stakeholder on a case-by-case basis. **Examples of “non-crime” offense categories include suicides, natural deaths, and firearms submitted as “safe keeping.”**
- 36.1.2. There may be instances when firearms evidence ineligible for entry is inadvertently imaged by HFSC into NIBIN. Examples include no indication of an ineligible offense or missing offense information. Questions regarding eligible offenses are directed to a Section Management. If identified, the ineligible NIBIN entries are deleted by the person making the entries or by a designee approved by Section Management.
- 36.1.3. Items are acquired into the NIBIN database utilizing IBIS equipment. Entries are made using protocols established by the IBIS vendor. Data like class characteristics may be recorded during entry, but this information is not the same as “class characteristics” used in microscopic comparisons or while recording GRC information.

### 36.2. NIBIN acquisition timeline

In general, the Firearms Section will strive to meet the following timeline from receipt of firearms-related evidence to the release of any potential NIBIN lead:

- 36.2.1. Suitable evidence is imaged into NIBIN within 2 business days of the evidence being received by HFSC.
  - 36.2.1.1. “Received by HFSC” means the evidence items are in the care, custody, and control of HFSC staff or an evidence location *and* any stakeholder requested delay in





handling the evidence has passed. If the Crime Scene Unit collects evidence to be submitted directly to a technical section of HFSC, the date/time of receipt begins once the evidence is accessible for testing.

36.2.1.2. "Suitable evidence" determinations may be based on evidence type, evidence quality, crime type, requests from stakeholders, or some combination of these.

36.2.1.3. This 2-business day timeframe includes processing by other technical sections within HFSC, as well as any other processing done within the Firearms Section.

36.2.2. Correlations are reviewed by an authorized Analyst within 2 business days of image acquisition.

Note: Correlations created as part of a quality audit, proficiency test, or other non-casework related activity are not subject to this timeline.

36.2.2.1. If additional correlations are conducted after an item's acquisition date (e.g., manual correlations, new automatic correlations due to a change in the search criteria), the results are reviewed within 2 business days of the creation of the correlation.

36.2.3. If a NIBIN lead is identified, a hit notification is released within 1 business day of the correlation being reviewed.

### **36.3. NIBIN Only Processing**

If the evidence is being processed as part of a NIBIN-only request, document the work in a NIBIN only request in LIMS. Evidence is processed for NIBIN following the workflows detailed in Sections 36.3.3 (Firearms) and 36.3.4 (Cartridge Cases/Shotshells) below.

#### **36.3.1. Multidiscipline Requests**

36.3.1.1. The Magazine Preservation Policy in conjunction with the Quality Manual detail when firearms and magazines are processed for biological material and/or latent prints, how those requests are approved, and the order of testing.

36.3.1.2. If an item of evidence needs to be processed by another section of the laboratory prior to NIBIN processing, work with Section Management to route the evidence as needed in a timely fashion.

#### **36.3.2. Assigning the Request**

36.3.2.1. Take custody of the evidence and verify it is eligible for NIBIN entry.

36.3.2.2. Self-assign the request, if not already done.

36.3.2.3. Check all seals on the outer packaging for initials and proper seal. Inventory the items and treat any discrepancies per lab policy. Follow the procedure outlined in Sections 12.2-12.3 if any evidence is noted to pose a potential biohazard.

#### **36.3.3. Firearms**

36.3.3.1. Follow the applicable SOPs for examining and test firing firearms. Complete the work up of the firearm, including writing on packaging, test firing the firearm,



creating test fires in LIMS, filling out appropriate fields in LIMS, and engraving test fires.

36.3.3.1.1. Firearms processed for NIBIN are not test fired using submitted magazines and/or unfired ammunition. Reference magazines or hand-loading are typically utilized to complete test firing.

- Some firearms may not be able to fire if they are hand loaded. If a firearm cannot be test fired by hand loading and a reference magazine is not readily available for use, consult Section Management for guidance on how to proceed.
- Stock ammunition is used to test fire firearms for NIBIN. If the Firearms Section does not have stock ammunition needed to test fire a firearm, consult Section Management on how to proceed.

36.3.3.2. Repackage and seal the evidence (not test fires) and place in the transfer location.

36.3.3.3. For each firearm that did not function (or was not test fired), complete the appropriate fields in LIMS and proceed to step 36.3.5.3.

36.3.3.4. Organize test fires in such a way that you are aware of what items need to be evaluated and imaged into IBIS.

36.3.3.5. Evaluate the test fires. Personnel microscopically evaluate the test fired cartridge cases for NIBIN entry and record the date of evaluation in LIMS at the time of evaluation. If any test fires are determined to be unsuitable for NIBIN entry, the appropriate fields in LIMS are completed and the Analyst proceeds to step 36.3.5.3.

36.3.3.6. Because test fires are considered evidence, store them per applicable SOPs.

36.3.4. Cartridge cases/Shotshells:

Microscopically evaluate the cartridge cases to determine which item(s), if any, is/are suitable for imaging. Complete the appropriate fields in the request in LIMS. If a firearm and fired cartridge case(s) are submitted, an authorized Analyst microscopically evaluates the cartridge case(s) and test fire(s) to determine which item(s) if any, is/are suitable for imaging.

36.3.4.1. Follow the procedure outlined in Sections 12.2-12.3 if any evidence is noted to pose a potential biohazard.

36.3.4.2. Sub-item the evidence in LIMS, if needed, and record evidence markers as appropriate.

36.3.4.3. Screen the evidence to determine which item(s), if any, is/are suitable for imaging.

36.3.4.4. Create and label new lab bags, if needed.

36.3.4.5. Complete the fields in LIMS.

36.3.5. NIBIN Entry and Completing Draft Notification

36.3.5.1. Enter the evidence into NIBIN as needed.

36.3.5.2. Complete the fields regarding NIBIN entry in the appropriate fields in LIMS.

36.3.5.3. Create/review worksheet(s).

36.3.5.4. Complete the draft report in LIMS.



- 36.3.5.5. Ensure you have completed the appropriate LIMS fields for each item/group of items you have examined.
- 36.3.5.6. Transfer the evidence to the appropriate location and place worksheets in the designated area.
- 36.3.6. Correlation Review
- 36.3.6.1. Correlations are reviewed by an authorized Analyst.
- 36.3.6.2. Firearms staff review, at a minimum, the top 30 results from the rank sort list in the NIBIN system.
- 36.3.6.3. Correlation reviews are documented by the Analyst conducting the review. The documentation of the review includes the case number, item/exhibit number(s), the date of the review, and if a lead (and type of lead-High or Low Confidence) was identified. The documentation of the review is maintained in a legible and retrievable format.
- 36.3.7. NIBIN Leads
- 36.3.7.1. HFSC issues NIBIN Lead notifications for High and Low Confidence Correlation results.
- 36.3.7.1.1. A High Confidence Correlation result is one that meets the standards set by the ATF in the "Policy on Issuing NIBIN Leads". Per this policy, "the level of similarity of individual markings between the images has to be sufficient enough that the technician/examiner is confident that were the cartridge cases in question examined by a firearm examiner, they would be identified as having been fired in the same firearm using traditional comparative microscopy." See Section 7.6 for reporting guidelines.
- 36.3.7.1.2. In a Low Confidence Correlation Result, an Analyst may see some similarity between two or more items, but not enough to issue a NIBIN Lead per the ATF "Policy on Issuing NIBIN Leads". See Section 7.7 for guidelines.
- Note: The ATF standard required to issue a NIBIN Lead may result in some missed Leads. However, these missed Leads could be meaningful to an investigation. Therefore, HFSC will issue notifications to stakeholders informing them of these Low Confidence Correlation Results.
- 36.3.7.2. Once a high or low confidence lead is identified by the correlation reviewer, the lead is reviewed by another Analyst authorized to review correlations. The review of the lead is conducted as part of the documented technical review performed on NIBIN Lead Notifications issued in LIMS. The purpose of this review is, in part, to verify that the lead meets HFSC's guidelines for a High or Low Confidence Lead notification.
- Note: The review of the lead may be conducted by reviewing a printout of the linked items from the NIBIN system.



## **37. Serial Number Restoration – Polishing**

### **37.1. Scope**

- 37.1.1. Various processes are used to apply serial numbers. These processes typically produce a plastic change of the metal in the area immediately surrounding, and a short distance below, the penetration of the tool used to produce the characters. The serial number may be restored if the removal/obliteration is not taken past the compression zone.
- 37.1.2. It is desirable to remove (polish) the grinding and filing scratches introduced during obliteration. The polishing procedure can be effective independently but is more often used in conjunction with various chemical or heat restoration procedures.

### **37.2. Procedure**

- 37.2.1. Perform an initial inspection of the serial number area for coatings, trace material, or any character remnants as well as a possible method of obliteration.
- 37.2.2. Note and record any visible characters or partial characters prior to polishing on the appropriate worksheet.
- 37.2.3. Polish the area of the obliteration using either a rotary tool with a sanding/polishing disc or fine grit sandpaper.
- 37.2.4. Depending on the extent of the obliteration, continue polishing until the surface is mirror-like, removing all scratches. If the obliteration is severe, it may not be possible or desirable to remove all the scratches.

### **37.3. Interpretation**

- 37.3.1. Note and record any characters that become visible. A second qualified examiner must verify any reported characters.
- 37.3.2. If characters do not become visible, proceed to the appropriate chemical or magnetic restoration procedure.
- 37.3.3. Examiners are encouraged to capture restored characters with photographs, but a second examiner may not verify restored characters from a photograph.

### **37.4. Literature/Supporting Documentation**

- 37.4.1. Treptow, R.S., Handbook of Methods for the Restoration of Obliterated Serial Numbers, NASA (1978).
- 37.4.2. Polk, D.E., Giessen, B.C., "Metallurgical Aspects of Serial Number Recovery," AFTE Journal, Vol. 21, No. 2, p. 174.
- 37.4.3. Bureau of Alcohol, Tobacco and Firearms Laboratory, Serial Number Restoration Handbook (1999).



## **38. Serial Number Restoration – Magnetic Technique**

### **38.1. Scope**

- 38.1.1. The magnetic technique is used by metallurgists to detect surface or substrate flaws in iron or steel. Magnetic particles are applied to a magnetized specimen and outline the obliterated characters in a successful restoration. A side effect of the cold-working in the die-stamping of metal is the change in the medium's magnetism.
- 38.1.2. The utilization of the magnetic technique affects the compressed area of the obliterated number rather than the surrounding area. This procedure, in conjunction with the polishing procedure, is an effective method to restore an obliterated serial number in magnetic metal. The magnetic technique is nondestructive and can be applied without hindering other restoration methods. Therefore, this technique is preferable to attempt serial number restoration first, if applicable.

### **38.2. Equipment, Materials, and Reagents**

- Yoke magnets
- Y-7 AC/DC Yoke electromagnet
- Oil-based magnetic particle suspension prepared bath (7HF or similar)

### **38.3. Procedure**

- 38.3.1. Test the suitability of the specimen for magnetic technique by placing a magnet on the area of obliteration. The specimen is considered suitable if it can be magnetized. Consider the possibility that surrounding areas and/or parts may be magnetic while the area of obliteration is not.
- 38.3.2. Polish the area of obliteration in accordance with the Serial Number Restoration - Polishing section.
- 38.3.3. Place the magnet with the poles on either side of the area of obliteration. The firearm should be held or mounted so the area of obliteration is parallel to the floor. Either powered or unpowered magnets may be used.
- 38.3.4. Apply Prepared Bath to the area of obliteration with a plastic disposable pipette. The bath may need to be shaken prior to use. If the product originates in a spray can, spray some into a small container so a pipette can be used. If the magnetic particles do not move with magnet activity discard what is in the pipette and/or small container. If the particles still do not move, contact Section Management.
- 38.3.5. Adjust the placement of the magnets, as needed, to maximize the visibility of the obliterated numbers/characters.
- 38.3.6. Record method used and any results obtained for each step of this procedure on the appropriate worksheet.



#### **38.4. Interpretation**

- 38.4.1. Note and record any characters that become visible. A second qualified examiner must verify any reported characters.
- 38.4.2. If characters do not become visible, the examiner may consider a chemical technique.
- 38.4.3. Examiners are encouraged to capture restored characters with photographs, but a second examiner may not verify restored characters from a photograph.

#### **38.5. Literature/Supporting Documentation**

- 38.5.1. Treptow, R.S., Handbook of Methods for the Restoration of Obliterated Serial Numbers, NASA (1978).
- 38.5.2. Polk, D.E., Giessen, B.C., "Metallurgical Aspects of Serial Number Recovery," AFTE Journal, Vol. 21, No. 2, p. 174.
- 38.5.3. Bureau of Alcohol, Tobacco and Firearms Laboratory, Serial Number Restoration Handbook (1999).



## 39. Serial Number Restoration – Chemical Restoration

### 39.1. Scope

- 39.1.1. The chemical restoration procedure (or chemical etching procedure) is suitable for restoration of serial numbers in metal. The die-stamping process is a form of “cold-working” metal. A side effect of cold-working, as well as other methods of serial number application, is an alteration in the medium’s ability to resist chemical attack.
- 39.1.2. The utilization of chemical etching will affect the compressed area of the obliterated number differently than the surrounding area. This procedure, in conjunction with the polishing procedure, is an effective method to restore obliterated serial numbers in metal.

### 39.2. Equipment, Materials, and Reagents

Preparation of all reagents is recorded in the reagent log at the time of preparation.

#### 39.2.1. Fry’s Reagent

- 90 g Cupric chloride ( $\text{CuCl}_2$ )
- 120 mL Concentrated hydrochloric acid (HCl)
- 100 mL Distilled water ( $\text{H}_2\text{O}$ )

#### 39.2.2. Turner’s Reagent

- 2.5 g Cupric chloride ( $\text{CuCl}_2$ )
- 40 mL Concentrated hydrochloric acid (HCl)
- 25 mL Ethyl alcohol
- 30 mL Distilled water ( $\text{H}_2\text{O}$ )

#### 39.2.3. Davis Reagent

- 5 g Cupric chloride ( $\text{CuCl}_2$ )
- 50 mL Concentrated hydrochloric acid (HCl)
- 50 mL Distilled water ( $\text{H}_2\text{O}$ )

#### 39.2.4. 25% Nitric Acid

- 25 mL Concentrated nitric acid ( $\text{HNO}_3$ )
- 75 mL Distilled water ( $\text{H}_2\text{O}$ )

#### 39.2.5. Acidic Ferric Chloride

- 25 g Ferric chloride ( $\text{FeCl}_3$ )
- 25 mL Concentrated hydrochloric acid (HCl)
- 100 mL Distilled water ( $\text{H}_2\text{O}$ )

#### 39.2.6. Ferric Chloride

- 25 g Ferric chloride ( $\text{FeCl}_3$ )
- 100 mL Distilled water ( $\text{H}_2\text{O}$ )

#### 39.2.7. 10% Sodium Hydroxide (NaOH)



- 10 g Sodium hydroxide (NaOH)
- 100 mL Distilled water (H<sub>2</sub>O)

39.2.8. Phosphoric/Nitric Acid

- 50 mL Concentrated phosphoric acid
- 3 mL Concentrated nitric acid

### 39.3. Standards and Controls

For each day of use, all prepared reagents listed above must be tested for their reactivity using the following reference materials:

39.3.1. For Fry's, Turner's, and Davis reagents:

- Certified ACS aluminum metal (one example is Fisher Scientific, A557-500)
- Oxidation reaction should be observed.

39.3.2. For 25% nitric acid and phosphoric/nitric acid:

- Certified pure grade iron chips (one example is Analytical Reference Materials International, IARM 27D)
- Oxidation reaction should be observed.

39.3.3. For acidic ferric chloride and ferric chloride:

- Mix a drop of each with an equal amount of 10% sodium hydroxide.
- A red-brown precipitate of ferric oxide should be observed.

39.3.4. The reactions observed from the tests above are recorded in the appropriate LIMS fields. A record of the quality check is included in each case record in which these reagents are used, for each day of use.

39.3.5. If the expected reaction cannot be confirmed, discard the etchant, prepare a new batch, and repeat the test.

### 39.4. Procedure

39.4.1. Perform an initial inspection of the serial number area for coatings, trace material, or any character remnants as well as a possible method of obliteration.

39.4.2. Utilize the Polishing Procedure as necessary.

39.4.3. Determine whether the serial number medium is magnetic or non-magnetic.

39.4.4. Utilize appropriate chemical reagent by applying the chemical solution in the area of obliteration with plastic pipettes or swabs.

39.4.5. Record each method used and any results obtained for each step of this procedure on the appropriate worksheet.

39.4.6. It should be noted that the information below is a general guideline and it is not unusual to encounter a magnetic medium that exhibits better results with reagents listed for non-magnetic media, and vice versa.





Magnetic Media:

(rinse with acetone as needed)

Fry's reagent

Turner's reagent

Davis reagent

25% Nitric acid

Non-Magnetic Media:

(rinse with distilled water as needed)

Ferric chloride

Acidic ferric chloride

25% Nitric acid

10% Sodium hydroxide

Phosphoric/nitric acid

- Reagents can be diluted with water to reduce their oxidizing ability.
- Ferric chloride (and/or acidic ferric chloride) used in combination with nitric acid may be beneficial when used on frames/receivers containing zinc.
- Sodium hydroxide used in combination with nitric acid may be beneficial when used on frames/receivers containing aluminum.
- Phosphoric acid used in combination with nitric acid may be beneficial when used on frames/receivers containing zinc and/or aluminum.

### **39.5. Interpretation**

39.5.1. Note and record any characters that become visible.

39.5.2. A second qualified examiner must verify any reported characters.

39.5.3. Examiners are encouraged to capture restored characters with photographs, but a second examiner may not verify restored characters from a photograph.

### **39.6. Limitations**

Character restoration may not be successful if the obliteration and/or the restoration attempt destroys the area of deformation caused by the application of the serial number.

### **39.7. Literature/Supporting Documentation**

39.7.1. Treptow, R.S., Handbook of Methods for the Restoration of Obliterated Serial Numbers, NASA (1978).

39.7.2. Polk, D.E., Giessen, B.C., "Metallurgical Aspects of Serial Number Recovery," AFTE Journal, Vol. 21, No. 2, p. 174.

39.7.3. Bureau of Alcohol, Tobacco and Firearms Laboratory, Serial Number Restoration Handbook (1999).