



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.



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:

2.1.1. Test firing firearms.

2.1.2. Microscopic examination of firearms related evidence.

2.1.2.1. Markings used in the comparison of bullets, cartridge cases, and unfired cartridges are limited to those produced by a firearm.

2.1.2.2. This excludes markings produced by magazines or tools used to produce ammunition.

2.1.3. General rifling characteristic analysis.

2.1.4. Serial number restoration on firearms.

2.1.5. Rendering safe various submitted firearms including handguns, rifles (up to and including .50 caliber), and shotguns.

2.1.6. Contribution to the NIBIN database.

2.1.6.1. This database uses ballistic imaging to assist criminal investigations by linking two or more incidents together.

2.1.6.2. The section routinely enters fired evidence cartridge case exhibits as well as test fired cartridge cases from recovered and seized firearms into the NIBIN database.

2.2. Staff in the Firearms Section:

2.2.1. The Firearms Section is staffed with a Section Manager who functions as the technical leader for the section and may also do casework as a Firearms Examiner, one or more Supervisors (who may also do casework as Firearms Examiners), Firearms Examiners (including Senior Firearms Examiners), and NIBIN Technicians.

2.2.2. In this SOP, the term “analyst” may refer to the Section Manager (in the role of Firearms Examiner), a Supervisor (in the role of Firearms Examiner), Firearms Examiners, and/or NIBIN Technicians.



3. Utilization of a Second Examiner

3.1. Responsibilities of a Second Examiner:

- 3.1.1. A second qualified examiner may analyze the physical evidence in a case to provide a second opinion.
- 3.1.2. 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.
- 3.1.3. A second qualified examiner shall examine restored serial number characters.
- 3.1.4. 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.
- 3.1.5. 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.
- 3.1.6. 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 analysts.

3.2. When a Primary and Second Examiner Reach Differing Conclusions:

- 3.2.1. If inconsistencies and/or new conclusions are discovered, the second examiner discusses the observation with the primary examiner (consultation).
- 3.2.2. Reasons for rejecting/changing conclusion(s) of the primary or second examiner are documented in the appropriate examination record, and changes to the record are tracked by the Section Manager. The documentation shall include details clearly indicating the reason for the rejection or change.
- 3.2.3. 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.
- 3.2.4. Any indication of a significant technical problem is brought to the attention of the Section Manager.
- 3.2.5. See the Consultation and Conflict Resolution Policy for further details.



4. Blind Verification and Blind Quality Control

4.1. 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.

4.1.1. A percentage (typically 1%) of examination requests completed by the Firearms Section are selected for blind verification. The Section Manager or Supervisor selects the request based on the following criteria:

4.1.1.1. Balance of the need for stakeholders to receive timely results with the need to meet blind verification goals.

4.1.1.2. The request should represent "typical" casework in number of items, apparent complexity, and the nature of the request.

4.1.1.3. The items associated with the request should not have previous work completed on them.

4.1.1.4. The request should not have known pre-existing biases or have easy-to-access extraneous information. Examples include NIBIN Lead verification requests or high-profile cases.

4.1.2. 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.

4.1.2.1. The primary examiner ensures no visible index markings are left on the items of evidence for microscopic examination.

4.1.2.2. The Section Manager 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.

4.1.3. 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.

4.1.3.1. 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.

4.1.3.2. The second examiner provides all casework documentation to the Section Manager.

4.1.4. The Section Manager reviews the results made by the primary and second examiners and determines if consultations are needed.

4.1.5. The Section Manager "unblinds" the request to the second examiner, and the primary and second examiners proceed to finalize conclusions as they do in routine requests.

4.1.6. The Section Manager tracks requests completed as blind verifications.



4.2. 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.

4.2.1. The Section Manager or Supervisor assists the Quality Division in obtaining/creating items for testing

4.2.2. 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:

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

4.2.2.2. 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).



5. Instruments, Calibration, And Reagents

5.1. General Requirements for Analytical Instrumentation:

- 5.1.1. All instruments are periodically performance checked, serviced when required, and properly calibrated (if appropriate) in accordance with the manufacturer's recommendations and specifications.
- 5.1.2. Measuring equipment (i.e., calipers/micrometers, balances, steel rules, and trigger pull 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.

5.2. Out of Service Instruments or Balances:

- 5.2.1. If a performance check fails or a performance problem is detected, the instrument or balance is immediately removed from service, the Section Manager is notified, and the problem is recorded in the appropriate log. Additionally, the item is clearly marked as being out of service.
- 5.2.2. 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.
- 5.2.3. 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.

5.3. Comparison Microscopes:

5.3.1. Performance Check

- 5.3.1.1. 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.
 - 5.3.1.1.1. 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.
 - 5.3.1.1.2. 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:

Gauge block thickness	Lower Limit	Upper Limit
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

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

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

5.3.2. Service

5.3.2.1. 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.

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

5.4. Calipers/Micrometers:

5.4.1. Performance Check

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

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

5.4.1.1.2. 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.

5.4.1.1.3. 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. The Section Manager is immediately notified. The caliper/micrometer will be repaired or replaced as needed.

Upper and lower limits of commonly used gauge blocks:

Gauge block thickness	Lower Limit	Upper Limit
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

5.4.2. Service

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



5.5. Balances:

5.5.1. Performance Check

5.5.1.1. Perform a monthly performance check of the calibration of each balance with at least two standard weights. Perform performance checks whenever the instrument has been moved from one location to another.

5.5.1.1.1. 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.

5.5.1.1.2. 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. The Section Manager 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

5.5.2. Service

5.5.2.1. 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.

5.5.2.2. Balances may be serviced as needed by an approved vendor. A record of any additional service is maintained.

5.6. Steel Rules:

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

5.7. Digital Force Gauges:

5.7.1. 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.



- 5.7.1.1. 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.
- 5.7.1.2. 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. The Section Manager 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

5.7.2. Service

- 5.7.2.1. Digital force gauges are calibrated annually by the manufacturer (or other approved vendor) and a copy of the calibration certificate is maintained in Qualtrax.
- 5.7.2.2. Digital force gauges may be serviced as needed by an approved vendor. A record of any service is maintained.

5.8. Non-Standard Weights:

5.8.1. Balance **Non-Standard** Weights

- 5.8.1.1. Weights used in balance performance checks are checked annually on a calibrated balance.
- 5.8.1.2. 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.
- 5.8.1.3. 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. The Section Manager 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

5.8.2. Trigger Pull **Non-Standard** Weights



- 5.8.2.1. **Non-standard** trigger pull weights are checked annually on a calibrated balance.
- 5.8.2.2. 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.
- 5.8.2.3. 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. The Section Manager 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 (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

5.9. Reference Standards:

5.9.1. 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.

5.9.2. 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.

5.10. NIBIN Section:

5.10.1. IBIS Equipment Calibration Check

After every 50 acquisitions, the system 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.

5.10.2. 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.

5.11. Reagents:

5.11.1. All critical reagents are labeled with the identity of the reagent and the date of preparation (or lot number).



5.11.2. 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

5.11.3. The critical reagents used by the Firearms Section are utilized in serial number restoration and are listed in Section 40.4.6 of this SOP.

5.11.4. Quality testing on critical reagents used for serial number restoration are documented in the case record as described in Section 40.3 of this SOP.

5.11.5. 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:

5.11.5.1. Check the reagent with proper sample controls.

5.11.5.2. Discard the reagent if it fails the quality check, prepare a new reagent, and quality check the new reagent.

5.11.5.3. Cease performing work with the reagent until the problem has been corrected.

5.11.5.4. 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.

5.11.5.5. Inform the Section Manager and Quality Division if the problem persists.

5.11.6. Reagents such as water, bleach, acetone, isopropyl alcohol, and acetic acid are used for cleaning and rinsing only and are not critical.

5.11.6.1. Non-critical reagents do not require quality testing

5.11.6.2. Non-critical reagents are labeled with:

- Reagent name
- Date of preparation (if applicable)
- Preparer's initials (if applicable)

5.11.6.3. 10% bleach solutions for cleaning are typically prepared, used, and discarded by the preparer in the same work day 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.

5.12. Infrequently Performed Analyses:

Analyses conducted fewer than 10 times/year in the section is considered "infrequent."



6. 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 the Agency Case #, the Forensic Case #, or any combination of these.
- “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.

6.1. General Report 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, and

Attachments, if appropriate. 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.

6.1.1. Header and Footer

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



6.1.1.2. Information contained in the header may include, but is not limited to, HFSC testing location, accrediting body, requestor information, offense, offense date, the unique case identifiers, section issuing the report, and the report number.

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

6.1.2. Related Item(s) of Evidence

6.1.2.1. 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.

6.1.2.2. 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.

6.1.2.3. 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 #".)

6.1.3. Results and Interpretations

6.1.3.1. 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.
- The Results of Analysis Completed on [date] are as follows:
(Note: The date used as the results of analysis completed date is the date when all technical aspects of the analysis have been completed for the request, including any analysis completed by a second examiner.)
- 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.)



- For additional clarification regarding conclusion statements, please visit the [Houston Forensic Science Center Record Search at https://records.hfscdiscovery.org](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@houstonforensicscience.org.

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

6.1.4. NIBIN Details

The processing of evidence for NIBIN entry should be addressed in reports. See Specific Wording for the NIBIN Details Section for more information.

6.1.5. Disposition

6.1.5.1. If prior analysis was performed on evidence associated with current request by the firearms section of HFSC or the firearms section of the Houston Police Department Crime Laboratory, add the following statement:

- One or more reports with details of additional analysis of the evidence in [Agency] [ACN] are available. If you cannot locate the report(s), contact HFSC for assistance.

6.1.5.2. Transfer to the submitting agency:

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

6.1.6. Additional Information

6.1.6.1. 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.

6.1.6.2. This section may contain reference to an associated Quality incident number, if present.

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

6.1.7. 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

6.1.8. 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.

6.1.9. Report Ending:

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

6.1.10. Closing Statements:

There may be closing statements automatically generated by LIMS.

6.1.11. 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]

6.1.12. Amended Reports:

If a report is reissued, the following will serve as a guideline for formatting and wording in the new report:

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

Note: If the report being amended addresses testing originally performed at 1200 Travis, the amended wording must note this.

6.2. Specific Wording for Results and Interpretations Section:

6.2.1. 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.

- 6.2.1.1. 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.

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

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

6.2.1.2.1. 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.

6.2.1.2.2. 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.]

6.2.1.2.3. 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.]

6.2.1.2.4. 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.]

6.2.1.2.5. 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.]

6.2.1.2.6. 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.

6.2.1.2.7. 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.]

6.2.1.3. The results of trigger pull, if applicable:

6.2.1.3.1. Firearm has single and/or double action modes:

- Approximate Trigger Pull(s):
[Item] Single Action: [mean value] ± [UofM]
[Item] Double Action: [mean value] ± [UofM]

6.2.1.3.2. If a firearm has full automatic, three round burst, or other modes of firing, those modes should be designated in a similar format as above.

6.2.1.3.3. The uncertainty of measurement for trigger pull [UofM] is documented on the report in the following format, where X.XX is the calculated uncertainty value (found on the Trigger Pull Gauge Worksheet):

- X.XX pounds at a coverage probability of approximately 95% (k=2)

6.2.1.4. Officers' Firearms:

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



6.2.1.4.2. 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.]

6.2.1.5. 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].

6.2.1.6. 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.)

6.2.1.7. Barrel and Overall Length of Long Guns

6.2.1.7.1. 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".

6.2.1.7.2. If the firearm has a folding stock, the overall length is measured with the stock extended.

6.2.1.7.3. Barrel length less than legal limit:

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

6.2.1.7.4. Overall length less than legal limit:

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

6.2.1.7.5. 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.

6.2.1.7.6. 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).

6.2.2. Comparison of Fired Bullets, Cartridge Cases and Shotshells

6.2.2.1. 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).



6.2.2.2. 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).

6.2.2.3. 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).

6.2.2.4. 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 6.2.3.2.2 of this SOP, if applicable).

6.2.2.5. Insufficient

6.2.2.5.1. There may be times when an item has discernible class characteristics but no individual characteristics. There may be other times when an item does not exhibit class characteristics and has few individual characteristics that are of such poor quality that precludes an examiner from rendering an opinion. In either of these cases, the following statement may be used:

- [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].

6.2.2.5.2. There may be times when an examiner cannot determine if markings on an item were made by a firearm during the firing process. There may also 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/the firing process] (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.

6.2.3. 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.

6.2.3.1. Bullet items where a GRC list can be generated:



6.2.3.1.1. 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.

6.2.3.1.2. 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.

6.2.3.1.3. 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 of this SOP 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].

6.2.3.2. Bullet items when no GRC list can be generated:

6.2.3.2.1. 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.

6.2.3.2.2. Not able to determine caliber:

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

6.2.3.2.3. 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.
- 6.2.3.2.4. 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.
- 6.2.3.3. Cartridge Cases where a GRC list can be generated:
- 6.2.3.3.1. 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.
- 6.2.3.3.2. 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.
- 6.2.3.4. 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 6.2.3.2 for appropriate verbiage.
- 6.2.3.5. Combination of bullet(s) and cartridge case(s):
- 6.2.3.5.1. 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).
- 6.2.3.5.2. 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.

- 6.2.3.6. 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 6.2.3 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...
- 6.2.3.7. 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.
- 6.2.3.8. 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.
- 6.2.3.9. 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.
- 6.2.4. Fired Shotshell Component Determinations
- Fired shotshell components are not suitable for GRC determinations; however, the following wording is used when appropriate:
- 6.2.4.1. Pellets
- [Item] [is/are] consistent with [size/sizes] shot.
- 6.2.4.2. Wadding/Carriers
- [Item] [is/are] consistent with having been loaded in a [X] gauge shotshell.
- 6.2.4.3. Shotshells
- [Item] [was/were] fired in a [X] gauge firearm.
- 6.2.5. 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.

6.2.5.1. Determination if a component is from a specific marketer of ammunition.

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

6.2.5.2. 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].

6.2.5.3. 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.

6.2.6. Serial Number Restoration

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

6.2.6.1. 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].

6.2.6.2. Serial number partially restored

6.2.6.2.1. 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].



6.2.6.2.2. 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.)

6.2.6.2.3. 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).

6.2.6.3. 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.

6.2.6.4. 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.]

6.2.6.5. No area of obliteration observed

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

6.2.7. Functionality of Air Guns:

6.2.7.1. Spring Operated Air Gun

- [Item] is not a firearm. [Item] is a spring-operated air gun. [Item] is capable of propelling a projectile in the condition submitted. [Item] was examined and tested using a [#] shot test group using [stock/evidence] [BBs/pellets] from [source, if applicable] on [date]. This test group is designated [Item]. [Item] functioned as expected.

6.2.7.2. CO₂/Gas Operated Air Gun

Note: If a gas cylinder is received with the air gun, the cylinder is used to test the air gun for operability. If the cylinder does not contain sufficient pressure to propel a projectile, a new cylinder is used.



Note: If the air gun was not received with a gas/carbon dioxide cylinder, or if a cylinder was present but the volume of gas/carbon dioxide was not sufficient to propel a projectile, then the wording under the “Non-Functioning Air Gun” section below is used. However, since it cannot be known if a gas cartridge had sufficient volume after submission but prior to examination, “submitted” in the wording from Section 6.2.7.4 or 6.2.7.5 is replaced with “when examined.”

- [Item] is not a firearm. [Item] is a [gas/carbon dioxide] cylinder-operated air gun. [Item] is capable of propelling a projectile in the condition submitted. [Item] was examined and tested using [the received/a new] [gas/carbon dioxide] cylinder and a [#] shot test group using [stock/evidence] [BBs/pellets] from [source, if applicable] on [date]. This test group is designated [Item]. [Item] functioned as expected.

6.2.7.3. Single-Stroke/Multi-Stroke Pump Air Gun

- [Item] is not a firearm. [Item] is a single-stroke/multi-stroke pump air gun. [Item] is capable of propelling a projectile in the condition submitted. [Item] was examined and tested using a [#] shot test group using [stock/evidence] [BBs/pellets] from [source, if applicable] on [date]. This test group is designated [Item]. [Item] functioned as expected.

6.2.7.4. Non-Functioning Air Gun Restored to Functional Condition

Note: Once restored, use the language in sections above to report testing the air gun.

- [Item] is not a firearm. [Item] is a [action] air gun. [Item] is not capable of propelling a projectile in the condition submitted. [State the reason(s) why air gun is not capable of propelling a projectile.] [Item] was restored to a functional condition. [State how the air gun was restored.] [State if the air gun was returned to the condition as received after testing.]

6.2.7.5. Non-Functioning Air Gun NOT Restored to Functional Condition

- [Item] is not a firearm. [Item] is a [action] air gun. [Item] was examined on [date]. [Item] is not capable of propelling a projectile in the condition submitted. [State the reason(s) why air gun is not capable of propelling a projectile.] Attempts to restore [Item] to an operable condition were unsuccessful. [Item] was not further tested. [State if the air gun was returned to the condition as received.]

6.3. Specific Wording for the NIBIN Details Section:

NIBIN entry addressed in the NIBIN Details Section of a report may be part of casework analysis or part of the NIBIN program.

6.3.1. NIBIN Entry as Part of Casework Analysis

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.

6.3.1.1. 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.

6.3.1.2. 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.

6.3.2. NIBIN Entry as Part of the NIBIN Program Addressed in Casework Analysis

6.3.2.1. This language should be used if the evidence was processed through the NIBIN program, and only a NIBIN notification has been 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.

6.3.2.2. Firearm

6.3.2.2.1. 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.

6.3.2.2.2. 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.



6.3.2.2.3. 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).

6.3.2.2.4. 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.]

6.3.2.2.5. See Section 6.2.1.1 for guidelines on wording for methods of loading.

6.3.2.2.6. 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.

6.3.2.2.7. Not Test Fired:

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

6.3.2.3. Fired Evidence:

6.3.2.3.1. 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.

6.3.2.3.2. Unsuitable for NIBIN Entry/Not Entered into NIBIN

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

6.4. 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:

6.4.1. Results and Interpretations

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

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

6.4.1.2. 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.



6.4.1.3. 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.

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

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

6.5. 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.

6.5.1. 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 6.1.6.1 – 6.1.6.3 of this SOP 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

6.5.2. If evidence in the Firearms Section for NIBIN processing is rejected due to major discrepancies (i.e., those in Section 10.2 of this SOP), 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 6.1.6.1 - 6.1.6.3 of this SOP for further information.]

6.6. High Confidence Correlation Notification (NIBIN Lead):



6.6.1. 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.

6.6.2. 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] [ACN], [Item]

[Agency] [ACN], [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@houstonforensicscience.org.

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](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@houstonforensicscience.org.

6.7. Low Confidence Correlation Result Notification

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

6.7.2. 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 examiner 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] [ACN], [Item]
[Agency] [ACN], [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@houstonforensicscience.org.

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](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@houstonforensicscience.org.

6.8. 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.

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

6.8.1.1. Written permission is obtained from the Section Manager or Supervisor prior to the release of results. A memo written to the case record is the preferred method to document written permission, but initial written permission may take the form of an email. 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.

6.8.1.2. All results (that will be released early) requiring a second examiner (see Sections 3.1.2-3.1.3) 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.

6.8.1.3. 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.

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

6.8.1.5. 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.

6.8.1.5.1. 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.

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

6.8.1.5.2.1. 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.)

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

6.8.1.5.2.3. 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).

6.8.1.5.2.4. Alternative to 6.8.1.5.2.3, 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.

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

6.8.1.5.4. The Firearms Examiner who released the results notifies the Section Manager or Supervisor on the next business day, in addition to adhering to 6.8.2.

6.8.2. 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.



6.9. Literature/Supporting Documentation:

- 6.9.1. National Firearms Act (current edition)
- 6.9.2. ATF Policy on Issuing NIBIN Leads (current edition)



7. Case Record Review

All 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.

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.

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 (results completion date and name of second examiner). These do not need to be recorded unless the change is not made before the next round of review.**

7.1. Firearms Casework Review Checklist (including report reprint types)

7.1.1. 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.

7.1.2. 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).
- 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.

7.2. NIBIN Only Review Checklist

7.2.1. 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 all information critical to proper correlation in the system.**

7.2.2. 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).
- Any deviations from standard practice, policy, etc. are documented in the case record.
- Case and item information were entered correctly into NIBIN.

7.3. High and Low Confidence NIBIN Correlation Result Notifications Review Checklist

7.3.1. 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.



7.3.2. 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.



8. 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 characteristics abbreviations:

A	Arched	BF	Breechface
C	Circular	CH	Chamber
Char	Characteristics	CIC	Consistent in Class
CIRC	Consistent in Remaining Class	DOT	Direction of Twist
E	Elliptical	FP	Firing Pin
FPI	Firing Pin Impression	G	Granular
GI/GIMP	Groove Impression	H	Hemispherical
Imp	Impressed/Impression	Indv	Individual
IRR	Irregular	L	Left (twist)
L/G (L&G)	Lands and Grooves	LI/LIMP	Land Impression
P	Parallel	Part	Partial
R	Right (twist)	Poly	Polygonal
REC	Rectangular	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	DA	Double Action
ETs	Evidence Test(s)	FA	Firearm
IB	NIBIN/IBIS	Oblit	Obliterated
SA	Single Action	SN (S/N)	Serial Number
Stk	Stock	TF	(Set of) Test Fires

Miscellaneous abbreviations:

#	Number	ACN	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



9. Commonly Used Methods in the Firearms Section

Commonly used methods in the firearms section are listed below. For the 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.

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

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

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

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

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

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

9.4. 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.

9.5. The "range of conclusions" for cartridge components is determined using microscopic examination and comparison. The "range of conclusions" determined using this method are:

- 9.5.1. Identification
- 9.5.2. Elimination
- 9.5.3. Inconclusive
- 9.5.4. Insufficient
- 9.5.5. Unsuitable

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

- 9.6.1. Caliber/gauge/shot size determination
- 9.6.2. Number of land and groove impressions
- 9.6.3. Width of land and groove impressions



- 9.6.4. Twist of land and groove impressions
- 9.6.5. Location of extractor and ejector marks
- 9.6.6. Type of breechface marks
- 9.6.7. Shape of firing pin impression
- 9.6.8. Physical characteristics (e.g., corrosion, style, apparent composition)



10. 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.

Section personnel do not log in 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 and/or DNA screening on an item of evidence.

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

10.1. Receipt of Evidence

10.1.1. In general, the 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.

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

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

10.1.1.1.2. 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.

10.1.1.1.3. 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.

10.1.1.1.4. Other bulky or oversized items may be submitted and should be received and stored at the direction of the Section Manager or Supervisor.

10.1.1.2. If items are received unpackaged and/or not properly sealed and do not meet the conditions outlined in 10.1.1.1.1-10.1.1.1.4, they are handled as follows:

10.1.1.2.1. 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 the packaging appears damaged, the damaged area is photographed as part of the case record documentation.
- **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/packaging 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.

10.1.1.2.2. 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 10.2 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.

10.1.2. Discrepancies between the way an item of evidence is described upon submission and the actual description of the evidence are noted in the case record and communicated to the **stakeholder**.

10.2. Rejecting Evidence

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

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

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

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



10.2.1.4. Evidence received unsealed and where the identity of the item cannot be confirmed another way (refer to Section 10.1.1.2.2 for further information) **or it appears the packaging/seal were tampered with.**

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

10.2.1.5.1. 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.

10.2.1.5.2. Incorrect and ambiguous item descriptions

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.

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

10.2.1.5.2.2. If there is a possibility of switched labels, see Section 10.2.1.5.1 on how to proceed.

10.2.2. 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.**

10.3. 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.

10.3.1. 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.

10.3.2. When repackaging evidence:

10.3.2.1. 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.

- 10.3.2.2. Original packaging is marked with the item(s) of evidence originally found in the package
- 10.3.2.3. New packaging is marked in a way to indicate it was provided by HFSC (typically “lab bag” is written on the package).
- 10.3.2.4. Original packaging is maintained with the newly packaged item(s) that were originally found in the package.
- 10.3.2.5. If there are multiple packages contained inside another package, the method of packaging must clearly indicate which items were found in which packages.
- 10.3.2.6. 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.
- 10.3.2.7. When in doubt, ask for assistance from Section Manager, Supervisor, or more experienced analyst.

10.4. Release of Evidence

- 10.4.1. If necessary, items of evidence are properly packaged and sealed by HFSC staff prior to release to the submitting agency. This is noted in the case record.
- 10.4.2. If items submitted for immediate analysis (see 10.1.1.1.1 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.
- 10.4.3. Firearms will not be released to a private citizen except when it is allowed in accordance with the Quality Manual.



11. Potential Biohazards and Decontamination

11.1. Scope

If an item of evidence poses a biohazard and must be handled by Firearms Section personnel, it is decontaminated. All fired projectiles are decontaminated. The decontamination process is typically accomplished by the application of a 10% bleach solution to the area. Areas contaminated with dried blood (or other body fluids) should have a contact time of at least ten minutes; liquid contamination should have a contact time of at least fifteen minutes. When evidence is decontaminated, a note is made in the case record. 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.

11.1.1. 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:

11.1.1.1. 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.

11.1.1.2. 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 staff member arranges **for the item(s) to be swabbed before proceeding**.

11.1.1.3. If the biohazardous condition was noted by a **stakeholder**/submitting agency representative, HFSC firearms staff will use their discretion and initially examine items(s) for potential biohazards.

11.1.1.3.1. If no potential biohazard is noted, firearms section staff will document the lack of biohazard and processing may proceed. In this instance, decontamination of the item is not **required** and **no additional HFSC staff needs** to evaluate the items.

11.1.1.3.2. If a potential biohazard is noted, or the firearms section staff member has a question about the risk of a biohazard, a firearms section staff member arranges for HFSC **authorized staff to** evaluate the items and obtain swabs, if necessary.

11.1.1.4. If the biohazardous condition is (initially) noted by a firearms section staff member 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.

11.1.2. Decontamination of the item(s) proceeds as needed.

11.2. Procedure

11.2.1. Firearms

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

11.2.1.2. Analyst discretion is used to attempt to determine the functionality of the firearm as received. Analyst safety must be the primary concern.

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

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

11.2.1.3.2. 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.

11.2.1.4. Decontaminate the affected area(s).

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

11.2.1.6. Ensure that the affected area(s) is/are completely dry by using a paper towel (or other cloth material) or heat. Alternatively, acetone or 70% isopropyl alcohol may be used.

11.2.1.6.1. Acetone or excessive heat should not be used on polymer frames.

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

11.2.1.8. If a firearm was disassembled for decontamination, the level of disassembly (if any) is noted in the case record.

11.2.2. Fired cartridge components (bullets, pellets, slugs, and casings)

11.2.2.1. Submerge items in the decontamination solution. If particulate matter is present, remove it prior to submerging into the decontamination solution.

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

11.2.2.3. Ensure that the affected area(s) is/are completely dry by using a paper towel or other cloth material. Alternatively, acetone or 70% isopropyl alcohol may be used.

11.2.3. Repackaging

11.2.3.1. Decontaminated items must not be placed back in the packaging that poses a biohazard.

11.2.3.2. An appropriately labeled laboratory package is used to store the decontaminated items.

11.2.3.3. The new package must be marked to indicate it was provided by the section (e.g., Lab Bag).



- 11.2.3.4. Original packaging is retained.
- 11.2.4. Other evidence items may need to be decontaminated on a case by case basis.



12. Evidence Log-in

12.1. General Guidelines:

- 12.1.1. All items submitted for casework analysis are marked with the forensic case number and item identifier whenever practical.
- 12.1.2. If items of evidence within a package are given "child" or "sub-item" designators, these designators are recorded in LIMS at login if it has not already been completed.
- 12.1.3. Associated packaging is marked with:
 - The forensic case number
 - Initials of the person logging in the evidence
 - The date logged in
 - Item identifiers
- 12.1.4. Sealing of evidence is done in conformance with Quality Manual standards. See Section 10.1 of this SOP regarding how evidence is handled upon receipt.
- 12.1.5. The Firearms Section Inventory Worksheet **or a LIMS-generated equivalent form** is used to document evidence when received.

This worksheet serves to characterize items as received and is not the basis for describing items in examination documentation or reports. Information is also documented in designated evidence fields in LIMS.

12.2. Procedure

- 12.2.1. If any item received **for examination is** contaminated with body fluids, it must be decontaminated. See Section 11 of this SOP for the procedure. Note that it was decontaminated, initial, and date.
- 12.2.2. Evidence Marker Numbers

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.
- 12.2.3. Special Issues Related to Logging In of Firearms
 - 12.2.3.1. **MAKE SURE THE FIREARM IS NOT LOADED!!** Only after verifying that the firearm is unloaded can you continue the log-in process. **If the firearm is received loaded but was not specifically submitted to render safe (Section 15 of this SOP), notify section management, place the firearm in an area designated for loaded weapons, and wait for instructions on how to proceed.**
 - 12.2.3.2. In the section designated for "Firearm" indicate the following:
 - Item identifier
 - Caliber
 - Manufacture
 - Model
 - Type (NCIC code for firearm type)



- Serial Number (complete number, partial number, or obliterated). Not all firearms will have a serial number. Federal law did not require serial numbers on all firearms until 1968. If no serial number can be located and there is no obvious obliteration enter "None", "Unknown", or similar remark.

12.2.3.3. All firearms should be marked with the forensic case number and the item identifier. Semiautomatic firearms are usually marked on the frame/receiver or inside the magazine well. Revolvers may be marked on the frame or on the underside of the top strap. If any of these items is not marked, note this on the Inventory Worksheet. The most common exception to the requirement to mark an evidence firearm is an officer's firearm, magazines, and firearm accessories.

12.2.4. Special Issues Related to Fired Bullets and Bullet Fragments

12.2.4.1. Evidence consisting of fired bullets or bullet fragments is recorded in the area of the Inventory Worksheet designated "Bullets".

12.2.4.2. In the space designated "Type", record 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).
- Other clear descriptions and/or accepted abbreviations may also be used, e.g. FMJ, JHP, etc.

12.2.4.3. Weigh the bullet or fragments using the single pan balance and record the weight in the appropriate area. All weights are recorded in grains.

12.2.4.4. 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.

12.2.4.5. If possible, record the type of rifling, if present. Rifling types include "Cut", "Poly", and "Hybrid". "Cut" rifling may also be referred to as "traditional" rifling.

12.2.4.6. 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.

12.2.4.7. Mark the bullet specimens with the forensic case number and item identifier on the base or near the nose, if possible. In some instances, the fragments may be too small to mark with both numbers. When that is the case, mark the item identifier on the item, if possible, and note on the Inventory Worksheet how the item was marked.

12.2.4.8. If a Medico-Legal number, Medical Record number (or a number that may be one of these types but is not designated as such) is associated with the item, record that number in the field designated "M.L. #." If the number associated with the item is not a Medico-Legal number, or if the source of the number is undetermined, note this on the Inventory Worksheet.

12.2.5. Special Issues Related to Fired Cartridge Cases and Fired Shotshells

12.2.5.1. If there are multiple cartridge cases of the same caliber type and brand, then they may be listed together as a group on the worksheet. Mark each specimen with the forensic case number and the item identifier near the mouth, if possible.

12.2.5.2. Indicate the caliber or gauge and manufacturer information in the appropriate areas.

12.2.5.3. Fired shotshells are logged in the same manner as fired cartridge cases.

12.2.5.4. If a morgue or hospital number is associated with any of the above items, indicate it at the bottom of the Inventory Worksheet under "Observations."

12.2.6. Special Issues Related to Shot Pellets, Slugs and Shot Wads

12.2.6.1. A submission of evidence shot pellets will likely consist of multiple pellets. Each grouping of pellets is assigned a separate item identifier and the packaging marked as above. Pellets do not need to be individually marked.

12.2.6.2. The weight of the grouping of pellets, slug or slug fragments is recorded along with the total number and type (magnetic or non-magnetic) of pellets or slug fragments in the group.

12.2.6.3. Record the type of wad (Cardboard, Plastic, Plastic Shot Carrier, Plastic Shot Wad) in the appropriate area with its identifier.

12.2.6.4. If a morgue or hospital number is associated with any of the above items, record that number in the appropriate space or indicate it at the bottom of the Inventory Worksheet under "Observations."

12.2.7. Special Issues Related to Other Types of Evidence

12.2.7.1. "Other" evidence is a broad general category in which all other types of evidence except those listed above would be recorded.



12.2.7.2. Provide a brief description of the items in the two spaces. If there are multiple items of the same type, then they can be grouped together.

12.2.8. Storage (Short Term)

12.2.8.1. Whenever possible, all items of evidence associated with a case are stored in the same evidence pouch.

12.2.8.1.1. The evidence is stored in the designated areas in the firearms vaults.

12.2.8.1.2. All packages inside the evidence pouch **MUST** be properly sealed if they are not currently in the process of being logged in or examined.

12.2.8.2. Storage of Long Guns and Oversized Items

12.2.8.2.1. 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, Long guns not in the process of being logged in or examined are stored in the Firearms Section vault until they are returned to the submitting agency.

12.2.8.2.2. Oversized items are packaged and sealed, if possible, and stored on the open shelves. The items are marked or tagged with the unique case number(s) and item number.



13. Safe Firearm Handling

Firearms evidence in the laboratory environment is not dangerous if handled correctly and treated with respect. Occasionally, loaded firearms are received as evidence for examination. These, of course, need very special handling (see Section 15 of this SOP). 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. If a firearm is received into the Firearms Section in a loaded condition and is not properly marked as such, notify the Section Manager or Supervisor designee immediately.

13.1. Procedure

- 13.1.1. The muzzle of the firearm must always be pointed in a safe direction (i.e., down at the floor, up at the ceiling, into the water tank, or at Armortex© walls in the function testing/test firing areas.
 - 13.1.1.1. Prior to any examination, regardless of where or from whom the firearm is received, a competent individual must ascertain the loaded or unloaded condition of the firearm.
 - 13.1.1.2. Before handing a firearm to someone or immediately upon receiving a firearm from someone, verify that the firearm is unloaded by checking the chamber.
- 13.1.2. 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.
- 13.1.3. **Checking magazine capacity (if needed)**
 - 13.1.3.1. Use dummy rounds when checking magazine capacity, whenever possible.
 - 13.1.3.2. When dummy rounds are not available, follow the steps below for checking magazine capacity:
 - 13.1.3.2.1. 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.**
 - 13.1.3.2.2. 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.
- 13.1.4. Since some firearms require the use of a magazine to test for a magazine disconnect, DO NOT load cartridges into any magazines until ALL function testing is completed.
- 13.1.5. 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 Manager or the section safety representative immediately.
- 13.1.6. 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 FIREARM. 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.

13.2. Literature/Supporting Documentation

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



14. Examination & Classification of Firearms

14.1. Scope

- 14.1.1. The initial evaluation of any firearm received in case work will occur at log-in and include the completion of a Firearm Section Inventory Worksheet.
- 14.1.2. This worksheet along with the Firearm Examination Worksheet (or LIMS fields dedicated to firearm examination for Case Work and NIBIN) will document the condition of the firearm as received and any test firings conducted with the firearm.

14.2. Procedure

- 14.2.1. Complete the above-referenced forms/fields as a firearm is examined.
- 14.2.2. Firearms processed for NIBIN only and casework are examined for the following, when applicable:
 - 14.2.2.1. **Make/manufacturer**
 - 14.2.2.2. **Firearm type (e.g., semiautomatic pistol)**
 - 14.2.2.3. **Model**
 - 14.2.2.4. **Caliber/gauge**
 - 14.2.2.5. **Serial number**
 - 14.2.2.6. Extractor and ejector positions
 - 14.2.2.7. Bore condition
 - 14.2.2.8. Safeties present
 - 14.2.2.9. Capable of discharging a cartridge in the condition submitted.
 - 14.2.2.9.1. 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.
 - 14.2.2.9.2. 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 with a magazine
 - Is received disassembled
 - Is received with integral parts broken or missing
 - 14.2.2.10. If a firearm is, is not, or cannot be restored to a functional condition, it is noted.
 - 14.2.2.11. 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.
- 14.2.3. Firearms processed for casework are additionally examined for the following, when applicable:
 - 14.2.3.1. Location of serial number
 - 14.2.3.2. Importer **and country of origin**
 - 14.2.3.3. Rifling characteristics (**i.e., rifling type, number of lands and grooves, direction of twist**)



- 14.2.3.4. Trigger pull (see Section 17 of this SOP)
- 14.2.3.5. Magazine/cylinder capacity
- 14.2.3.6. Mechanical condition (Typical responses are good, fair, or poor. Any response other than “good” or equivalent is explained further.)
- 14.2.3.7. Function as expected during test firing (if appropriate).
 - 14.2.3.7.1. The term “function as expected” means that the firearm functions as designed by the manufacturer.
 - 14.2.3.7.2. If a firearm does not function as expected during test firing, it is noted. Reason(s) for the malfunction may also be determined and recorded.
- 14.2.3.8. Barrel and overall length (long guns only) (See Section 18 of this SOP)
- 14.2.3.9. Finish condition (Typical responses are good, fair, or poor. Any response other than “good” or equivalent is explained further.)
- 14.2.3.10. Presence or absence of cylinder flares (revolvers only)
- 14.2.4. Consult Sections 15-20 of this SOP as needed to complete examination of firearms.
- 14.2.5. In general, guns other than firearms (spring operated, gas/carbon dioxide cylinder operated guns) are examined and tested following the same basic protocols utilized for examining and test firing firearms.
 - 14.2.5.1. If a gas operated air gun was not received with a gas/carbon dioxide cartridge, or if a cartridge was present but the volume of gas/carbon dioxide was not sufficient to propel a projectile, the air gun is considered “not capable of propelling a projectile in the condition” submitted/tested. See Section 6.2.7.2 of this SOP for details on reporting.
 - 14.2.5.2. Trigger pull testing is not performed on guns other than firearms.

14.3. Interpretation

- 14.3.1. This analysis serves to document the routine initial evaluation of firearms at log-in and at the time the firearm is examined prior to test firing.



15. 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.

15.1. Procedure

15.1.1. The safety of personnel is always of the utmost concern when handling firearms.

15.1.1.1. 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.

15.1.1.2. No examiner should ever attempt to handle a firearm submitted for unloading when no one else is physically present in the section.

15.1.2. It may be necessary to consult other sections of this SOP, including the sections addressing Safe Firearm Handling, Rusty Firearm Examination, and Potential Biohazards and Decontamination, sections.

15.1.3. Examiners should take reasonable precautions to preserve other types of forensic evidence (i.e., latent prints or DNA) by wearing gloves.

15.1.4. 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.

15.1.5. Attempt to determine if the firearm is loaded. If the firearm is determined to be loaded, it must be unloaded.

15.1.6. 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:

15.1.6.1. 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 the Section Manager or Supervisor. The Section Manager or Supervisor will attempt to obtain clearance from the stakeholder to destroy the firearm in the unloading process. **The quality manual provides further details on the documentation needed for consumption orders.**

15.1.6.2. 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.

- 15.1.6.3. 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.
- 15.1.7. Once a firearm is unloaded, it is rendered safe. This means that a visual inspection of the chamber(s) of the firearm clearly demonstrates that the firearm is unloaded. Rendering a firearm safe may necessitate destruction of the firearm. See step 15.1.6 of this section for further details.
- 15.1.8. Firearms that have been unloaded and/or rendered safe are returned to the submitting agency.
- 15.1.9. A report is issued summarizing the actions taken to unload and/or render a firearm safe.



16. Pre-Firing Safety Examination

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. The analyst must be mindful that individual case situations may require a more extensive function test process than that which is listed here.

Analysts should be aware of firearm safety, including potential recalls, prior to test firing a firearm.

If an analyst encounters a weapon he or she is not familiar with, the analyst should attempt to determine if the weapon has a recall or safety warning associated with it.

16.1. Procedure

16.1.1. If there is any question as to the safety of a firearm, immediately alert the Section Manager, Supervisor, or a more experienced analyst for advice and guidance.

16.1.2. Conditions for firing a firearm from the normal hand-held position:

- 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.
- The firearm should function as you would expect it to during bench testing.
- The correct ammunition must be utilized.
- Check for any missing parts of the firearm that might compromise the examiner's safety.

16.1.3. Determining if it is appropriate to utilize the evidence ammunition:

- 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.
- Evidence ammunition shall not be utilized if there is any reason to believe it may not be safe. Consult the Section Manager, Supervisor, or a more experienced Firearms Examiner for advice and guidance if there is a question about the safety of the ammunition.
- Check that the ammunition is of the correct caliber. This can be determined by direct comparison to known cartridges or by comparison to reference materials.
- Check for existing tool marks on pertinent surfaces of the ammunition.
- Check for any firing pin strikes upon the unfired cartridge's primer region.
- 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 the Section Manager or Supervisor before proceeding. The Section Manager or Supervisor will assist in obtaining permission to consume the



ammunition from the stakeholder, or, in an instance where charges have been filed, a court order.

16.1.4. Determining safety of muzzle loaders

- Check that the chamber/barrel appears sound.
- Check percussion nipples for oversized flash holes.
- 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.
- Check if the firearm is an "original" muzzleloader or a modern reproduction. "Originals" must always be fired remotely. See the Remote Firing section of this SOP.

16.2. Interpretation

16.2.1. If any of the above considerations cause concern and test firing is necessary, the firearm must be remotely fired. If any questions exist, consult the Section Manager for guidance.



17. Trigger Pull Determination

17.1. Scope

- 17.1.1. One of the routine tests conducted in a firearm evaluation is determining its trigger pull(s).
- 17.1.2. 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.
- 17.1.3. The trigger pull of a firearm can be obtained utilizing standard trigger weights that contact the trigger at a point where the trigger finger would normally rest.
- 17.1.4. Typically, trigger pulls are categorized as "Single Action" or "Double Action"; however, firearms may have additional or differently categorized trigger pulls.
- 17.1.5. 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.
- 17.1.6. 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:
 - 17.1.6.1. 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.
 - 17.1.6.2. 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%).
 - 17.1.6.3. If a new digital force gauge is placed into service, it will be evaluated against the estimation of certainty.

17.2. Procedure – Digital Force Gauge

- 17.2.1. Ensure that the firearm is unloaded.
- 17.2.2. 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.
- 17.2.3. For each type of trigger pull and/or each trigger (see 17.1.4 above) the firearm has:
 - 17.2.3.1. Open the Trigger Pull Gauge Worksheet and complete necessary administrative information.
 - 17.2.3.2. Cock or decock the firearm as needed.
 - 17.2.3.3. The position of the trigger hook attachment of the gauge should be as close to parallel with the barrel of the firearm as possible.
 - 17.2.3.4. Ensure the gauge indicator is "zeroed".



- 17.2.3.5. 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.
- 17.2.3.6. Apply constant, steady, rearward pressure to the gauge until the sear releases.
- 17.2.3.7. 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.
- 17.2.3.8. Repeat for a total of five recorded peak values, or once for each revolver cylinder position.
- 17.2.3.9. Complete and retain as many Trigger Pull Gauge worksheets as needed to record all trigger pull values for the firearm.
- 17.2.3.10. Record the mean value as calculated by the worksheet in the "Mean Value" field.
- 17.2.4. 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
 - Shotgun
- 17.2.5. Types of firearms not represented above will be categorized as follows:
 - Derringer or similar (3+ barrels): Semiautomatic Pistol (Single or Double action, as appropriate)
 - Automatic Pistol: Semiautomatic Pistol, Single Action
 - Carbine: Rifle

17.3. **Non-standard Trigger Pull Weights**

- 17.3.1. 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.
 - 17.3.1.1. 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 are documented in the case record, but are not documented in the report and do not have an associated uncertainty.
 - 17.3.1.2. 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.
 - 17.3.1.3. If the values obtained with the **non-standard** trigger pull weights are not consistent with those obtained by the digital force gauge, see the Section Manager for further guidance. Differences between the obtained values could be due to:
 - Incorrect use or malfunction of the digital force gauge
 - Incorrect settings on the digital force gauge



- Design of the firearm
- Improper technique in performing trigger pull measurement

17.3.2. Procedure

- 17.3.2.1. Ensure the firearm is unloaded.
- 17.3.2.2. Cock or decock the firearm as needed.
- 17.3.2.3. Hold the firearm with the muzzle vertical.
- 17.3.2.4. 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.
- 17.3.2.5. 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.
- 17.3.2.6. Repeat at least five times, documenting the weight needed to dry fire the firearm in the case record.
- 17.3.2.7. Do not use reference trigger pull weights for this purpose. Reference trigger pull weights are only used for performance checks.

17.4. 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 ($k=2$).

17.5. Literature/Supporting Documentation

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



18. Barrel & Overall Length Measurement of a Firearm

18.1. Scope

18.1.1. One of the routine procedures conducted in a firearms identification examination is determining the barrel length and the overall length of long guns.

18.1.2. 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 permanently affixed.

18.1.3. Overall length of a firearm is defined as the dimension measured parallel to the axis of the bore from muzzle to a line at right angles to the axis and tangent at the rearmost point of the butt plate or grip.

- Removable barrel extensions, poly chokes, flash suppressors, etc., are not part of the measured barrel length or overall length.
- If a long gun has a folding or collapsible stock, the longest length must be recorded. The length with the stock folded or collapsed may be recorded, but is not required.

18.1.4. There are minimum legal requirements for the barrel and overall length of long guns. Therefore, the barrel and overall lengths of long guns encountered in casework are measured whenever possible.

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

18.1.6. 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:

18.1.6.1. 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.

18.1.6.2. 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%).

18.1.6.3. If a new steel rule is placed into service, it will be evaluated against the estimation of certainty.

18.2. Procedure

18.2.1. Care must be taken if any object is placed down the barrel to help expedite the measurement. Only a non-marring item may be placed down the barrel after a visual inspection of the bore has been completed noting any obstructions and the presence of residue.

18.2.2. Barrel Length



- Measure the distance from the breech face in a closed and locked position to the muzzle.
- This measurement can be done directly or by placing a non-marring item down the barrel, marking the distance from the breech end of the barrel to the muzzle and measuring this item.
- This measurement is recorded in inches (**expressed as a fraction, not a decimal**).

18.2.3. Overall Length

- Measure the distance from the butt to the muzzle.
- Measurement is made parallel to the bore and recorded in inches (**expressed as a fraction, not a decimal**).

18.2.4. If the barrel and/or overall length are within one-half of one inch under the legal limit for the firearm, measurements must be made using a NIST traceable measuring device. **Measurements are recorded using the 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.

18.3. Interpretation

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

18.3.2. 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.

18.4. Literature/Supporting Documentation

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

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



19. Rusty Firearm Examination

19.1. Scope

- 19.1.1. Rusty firearms or those found in water, etc. may be submitted for examination.
- 19.1.2. If consulted, the examiner should instruct an agency or individual recovering the firearm in a fluid, such as water, to submit the firearm in a container of the fluid.
- 19.1.3. If this is not practical, the agency or individual can be instructed to immediately and thoroughly spray the firearm with a water-displacing product such as WD-40® or other similar product to prevent further deterioration.
- 19.1.4. It should be noted that the firearm may be too rusted to be functional.

19.2. Procedure

- 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 the Section Manager or Supervisor.
- 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). 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.
- 19.2.3. Periodically check the firearm until the firearm functions or the desired information is recovered.
- 19.2.4. 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.
- 19.2.5. Once the firearm is restored to the extent necessary, it should be treated with appropriate lubricants, etc. to prevent further corrosion.
- 19.2.6. See the Reporting Guidelines Section of this SOP for details on reporting the examination of firearms.

19.3. Literature/Supporting Documentation

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



20. 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 may occur in this type of testing, a written court order and an indication that defense counsel was given an opportunity to object must be obtained before proceeding with testing. See Section 15.1.6 of this SOP and the Quality Manual for further details on this process.
- 20.1.5. Additionally, consult the Supervisor or Section Manager prior to testing.

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 in case notes.

20.2.1. Physical Check (Condition of firearm as received if received as recovered)

- Follow the Pre-Firing Safety Examination section of this SOP.
- Determine if any cartridges or cartridge cases are stuck anywhere in the action of the firearm.
- Determine and note the presence and location of any flares on the cylinder face of revolvers.

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. Bore & Chamber Casting

21.1. Scope

21.1.1. 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. In order 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. Bore and/or chamber casting may also be used for other 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.

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 have to 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 Firearms Examiner or the Section Manager.

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. Test Firing And Recovery Methods

22.1. Scope

- 22.1.1. 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.
- 22.1.2. 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.
- 22.1.3. Any recovered components are retained. Note in the case record and on the test fire packaging 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.
- 22.1.4. Recovery methods include the water tank and shooting range. The type of firearm and ammunition tested will usually dictate the type of recovery method used.
- 22.1.5. Test fired projectiles/cartridge cases (or shotshells) are returned to the agency submitting the firearm used to create the test fires. 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.). All test firings made after 01/01/2004 are sealed and maintained in the same manner as any evidence item.
- 22.1.6. Test fired cartridge cases (including shotshells) and bullets created by HFSC after 06/08/2015 will, as often as is practical, be marked with the forensic case number and unique item identifier of the set of test fires. Some items may not easily lend themselves to marking (small fragments) and therefore may not be marked individually.
- 22.1.7. 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.
- 22.1.8. 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)

22.2. Procedure

22.2.1. Safety Considerations Before Test Firing:

- Ensure that the appropriate ventilation systems are turned on and that doors to the shooting room are closed.
- The "In Use" light should be turned on to designate the shooting room is in use.
- Proper hearing and eye protection must be worn.
- The analyst should consider loading no more than three (3) cartridges into a magazine during the initial testing of the firearm.
- Stand an appropriate distance away from the chosen recovery method to ensure proper usage and safety.
- Use additional safety/PPE equipment as needed, including gloves, lab coat, face shield, respirator, and/or full body shield.

22.2.2. 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.

22.2.2.1. If one or more additional individuals is in the area, a verbal announcement is made notifying those present that test firing is about to commence. (Typically, a loud announcement of "Preparing to fire," or similar statement is made.)

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

22.2.2.2. If no other individuals are physically present in the area, the **staff member** test firing **will utilize the Get Home Safe (or equivalent) application and button.**

If the lone staff member sends a panic alert or there is an indication the staff member is in trouble, the emergency contact(s) 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 staff member, notifying other staff members present on-site, and/or contacting 911 for emergency services.

22.2.3. Test Firing Procedures



22.2.3.1. Determine the recovery method and evaluate it prior to test firing. Special considerations for each recovery method are listed below in Sections 22.2.4.1 - 22.2.4.2 below.

22.2.3.2. Test fire the firearm.

22.2.3.2.1. Document the method of loading the firearm in the case record. See Section 6.2.1.1 for examples of methods of loading.

22.2.3.2.2. Do not load the firearm until you are ready to fire the firearm. Always point the firearm into the water tank or down range when loading a firearm. Always be prepared for the possibility of a slam fire. Do not insert a magazine into the firearm until it is pointed into the water tank or down range.

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

22.2.3.2.4. Testing modes of firing

- 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.
- Other modes of firing include full automatic and three round burst. A firearm designed to fire in these modes normally indicates so on the firearm. Be sure to fire three (3) cartridges in the three round burst mode to test operability.
- If a firearm function tests fully automatic, either by design, alteration, or otherwise, exercise extreme caution when test firing.

22.2.3.3. 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.

22.2.3.4. 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.

22.2.3.5. Every attempt must be made to recover and retain fired cartridge cases and bullets. Document in the case record and test fire container if a component could not be recovered.

22.2.4. Recovery Methods:

22.2.4.1. Water Tank

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

- Ensure that the water level is appropriate, usually even with the bottom of the shooting port.
- Ensure that the lid of the water recovery tank is closed and the blower is on.
- Fire the firearm through the shooting port.

22.2.4.2. Shooting Range, if present

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.



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

22.3. Literature/Supporting Documentation

22.3.1. "New Ballistics Tank from Detroit-Armor Corporation Allows Fast Recovery Without Projectile Distortion." AFTE Journal, Vol. 16, No. 3, p.106.

22.3.2. "Bullet and Cartridge Case Recovery", AFTE Journal, Vol. 16, No. 2, p.75.

22.3.3. Newquist, Andrew M., "New Bullet Recovery System", AFTE Journal, February 1973, p.9.

22.3.4. Molnar, S., "A Novel Bullet Recovery Method", AFTE Newsletter, No 1, p.17.



23. Primed Cartridge Case/Shotshell

23.1. 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.

23.2. Procedure

- 23.2.1. 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.
- 23.2.2. 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.
- 23.2.3. Repeat the above procedure for each firearm action (single/double).
- 23.2.4. Retain all casings/shotshells.



24. Reduced Powder Loads

24.1. Scope

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

24.2. Procedure

- 24.2.1. Mark where the bullet is seated in the cartridge.
- 24.2.2. Pull the bullet from the cartridge using an inertia bullet puller. In the case of rimfire cartridges, an inertia bullet puller is not utilized.
- 24.2.3. Remove and retain the existing gunpowder from each cartridge separately.
- 24.2.4. Weigh the gunpowder from each cartridge separately.
- 24.2.5. Calculate $\frac{2}{3}$ of the weight of the gunpowder present in each cartridge.
- 24.2.6. Replace only $\frac{2}{3}$ of the gunpowder (by weight) in the corresponding cartridge and discard the remainder.
- 24.2.7. 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.
- 24.2.8. Reseat the bullet to the original position by tapping it into place with a plastic or rubber mallet.
- 24.2.9. 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).
- 24.2.10. Test fire the firearm, following the procedures in the Test Firing And Recovery Methods Section or the Remote Firing Section of this SOP.

24.3. Limitations

- 24.3.1. 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.
- 24.3.2. Firing a firearm with a reduced powder load could cause a malfunction in the cycling of a semiautomatic or full automatic firearm.
- 24.3.3. 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.

24.4. Literature/Supporting Documentation

- 24.4.1. Molnar, S., "Comments on Random Notes on Test Firing," AFTE Newsletter, No. 3, p.14.



24.4.2. Dresser, W., "Minimum Loads in Handguns," The NRA Handloader's Guide (1969), pp. 255-256.



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 Library

26.1. Scope

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

- 26.1.1. Identify the make, model and source of evidence firearms.
- 26.1.2. Provide exemplar firearms for various scientific testing purposes which might otherwise compromise an evidence firearm.
- 26.1.3. Provide an exemplar resource for training new forensic scientists/evidence technicians or in developing new technology for the scientific examination of firearms.
- 26.1.4. Provide a source of firearm parts for the temporary repair of evidence firearms for test-firing purposes.
- 26.1.5. Provide a resource for the identification of firearm parts recovered at a crime scene.
- 26.1.6. Provide a resource for the location and style of firearm serial numbers.

26.2. Procedure

26.2.1. A record of the firearms in the firearms reference library is maintained in a database.

26.2.2. Custody of reference firearms:

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

26.2.2.1.1. If a firearm remains in the care, custody, and control of a firearms section staff member on HFSC property.

26.2.2.1.2. 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:

26.2.2.2.1. If a firearm is loaned to an HFSC staff member not assigned to the firearms section (typically for training or other work-related purposes).

26.2.2.2.2. If a firearms staff member removes a firearm from HFSC property.

26.2.2.3. Reference firearms are not loaned to non-HFSC staff without authorization from the Section Manager or Supervisor. 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 library is maintained in such a manner as to prevent the firearms from deteriorating and to facilitate their inventory, safety, and control.

26.3. Literature/Supporting Documentation

AFTE Glossary, current edition.



27. Caliber/Caliber Family Determination

27.1. 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.

27.2. Procedure

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.

- 27.2.1. Compare the evidence bullet directly with known reference bullets.
- 27.2.2. Measure the diameter of the evidence bullet at the widest point of the bearing surface using calipers/micrometers and compare this measurement with known measurements published in reference literature.
- 27.2.3. 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.
- 27.2.4. 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.

27.3. Interpretation

- 27.3.1. Caliber/caliber family is written as a numerical term and may be depicted with or without the decimal point.
- 27.3.2. 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.
- 27.3.3. In some instances, the examiner may not be able to determine a caliber/caliber family.

27.4. Literature/Supporting Documentation

- 27.4.1. Mathews, J. Howard, Firearms Identification Vol. I, 1973.
- 27.4.2. Barnes, Frank C., Cartridges of the World, 7th Edition, 1993.
- 27.4.3. AFTE Glossary, current edition.
- 27.4.4. Lutz, Monty C. and Ward, John G., "Determination of Bullet Caliber from an X-ray," AFTE Journal, Vol. 21, No. 2, p. 168.



28. Air Gap

28.1. 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.

28.2. Procedure

28.2.1. 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:



28.2.2. 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.

28.2.3. 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.

28.2.4. Repeat the above utilizing the groove impression.

28.3. Interpretation

It may be necessary to measure several land and groove impressions in order to obtain a reliable measurement.

28.4. Limitations



Damaged bullets or fragments may exhibit stretching or splitting. The lands and grooves may not be suitable for measurement.

28.5. Literature/Supporting Documentation

- 28.5.1. U.S. Department of Justice, Federal Bureau of Investigation, NCIC, Criminalistics Laboratory Information System (CLIS) Operating Manual, 1978.
- 28.5.2. Walsh, J. F., "Accuracy, Speed and Conversion in Rifling Measurements," AFTE Journal, Vol. 9, No. 1, p. 50.
- 28.5.3. AFTE Newsletter, No. 4, December 1969, p. 28.



29. General Rifling Characteristics Utilization

29.1. 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.

29.2. Procedure

29.2.1. The General Rifling Characteristics (GRC) database can be accessed using the GRC computerized database in Microsoft Access.

29.2.2. 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.

29.2.3. When conducting a search of the GRC database, the appropriate administrative information is completed (e.g., agency case number, forensic case number, item numbers).

29.2.4. 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.

29.2.5. 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".

29.2.6. 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).

29.2.7. 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.

29.2.8. 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.



29.2.9. 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.

29.2.10. 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:

29.2.10.1. 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).

29.2.10.2. 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).

29.3. 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.

29.4. Limitations

29.4.1. **Not all firearm manufacturers or models** may be in the database.

29.4.2. **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.**

29.5. Literature/Supporting Documentation

29.5.1. U.S. Department of Justice, Federal Bureau of Investigation, NCIC, Criminalistics Laboratory Information System (CLIS) Operating Manual, 1978.

29.5.2. Walsh, J. F., "Accuracy, Speed and Conversion in Rifling Measurements," AFTE Journal, Vol. 9, No. 1, p. 50.

29.5.3. Molnar, S., "A Simplified Technique for L&G Measurements", AFTE Newsletter, No. 4, December 1969, p. 28.



30. Wadding Determination

30.1. 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.

30.2. Procedure

30.2.1. 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.

30.2.2. 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.

30.2.3. Microscopic examination may reveal striations suitable for identification of the wad back to the shotgun that fired it.

30.2.4. 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.

30.2.5. Record all information in the appropriate LIMS fields.

30.3. Interpretation

Consult known wadding sizes in the AFTE Glossary, other reference materials, or known reference samples and determine the corresponding type.

30.4. Limitations

30.4.1. If the wad is mutilated or soaked with blood or other fluids, the examiner may not be able to specifically determine gauge size.

30.4.2. The examiner should also recognize that multiple manufacturers may use the same shotshell components.



31. Shot Determination

31.1. 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.

31.2. Procedure

The examiner shall use two or more of the below techniques to determine shot size.

31.2.1. Visual/Microscopic Comparison

- Determine the total number of pellets received.
- Determine the number of pellets suitable for comparison purposes. Make note if all pellets appear to be similar in size. If several different sizes are present, determine each specific 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.

31.2.2. Comparison by Weight

- Determine the number of pellets suitable for weighing. Make note if all pellets appear to be similar in size. If several sizes are present, determine 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.
- 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.

31.2.3. 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, determine each approximate size.



- Choose the best specimen 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.

31.3. Limitations

31.3.1. If the shot is mutilated, the examiner may not be able to determine shot size.

31.3.2. **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.**

31.4. Literature/Supporting Documentation

AFTE Glossary, current edition.



32. Physical Examination & Classification of Fired Bullets

32.1. Scope

The examination of any fired bullet evidence includes the completion of a Firearms Section Inventory Worksheet along with other examination documentation. These worksheets include the physical description of the fired evidence and serve to document the condition of the evidence received at the time of examination and log-in and any tests or comparisons performed.

32.2. Procedure

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;
- Presence of gunpowder and/or powder imprints adhering to the base
- Caliber*
- 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 style
- Possible manufacturer/marketer of the bullet/projectile
- A description of the base of the bullet
- Type and position of cannelures
- Any extraneous markings, such as skid marks, shave marks, flared base, and/or other marks
- Condition of the fired evidence when examined

*Items with an asterisk are accepted as required by the discipline.

32.3. Interpretation

This examination serves to document the evaluation of fired evidence. The comparison procedure is outlined in the Microscopic Comparison section of this SOP.

32.4. Literature/Supporting Documentation

32.4.1. Howe, Walter, J., "Laboratory Work Sheets" AFTE Newsletter Number Two, August 1969, p.13.

32.4.2. AFTE Glossary, current edition.



33. Physical Examination & Classification of Fired Cartridge Cases & Shotshells

33.1. Scope

The examination of any fired cartridge case evidence includes the completion of a Firearms Section Inventory Worksheet along with other examination documentation. These worksheets include the physical description of the fired cartridge case and serve to document the condition of the evidence as received and any tests or comparisons performed.

33.2. Procedure

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

- 33.2.1. If any trace material is present
- 33.2.2. Caliber*
- 33.2.3. The possible manufacturer/marketer of the item
- 33.2.4. Ignition System (such as center fire, rim fire, or other)
- 33.2.5. Description of cartridge case and primer
- 33.2.6. Head stamp information*
- 33.2.7. Description of Firing Pin Impression *
- 33.2.8. Description of other markings, to include:
 - Breech Face Markings*
 - Position of extractor
 - Position of ejector
 - Resizing Marks
 - Chamber Marks
 - Magazine Marks
 - Ejection Port Markings
 - Anvil Marks (Rim fire cartridge cases only)
 - Type of Crimp (Shotshells Only)
 - Other Marks Present

*Items with an asterisk are accepted as required by the discipline.

33.3. Interpretation

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

33.4. Literature/Supporting Documentation

33.4.1. Howe, Walter, J., "Laboratory Work Sheets" AFTE Newsletter Number Two, August 1969, p.13.

33.4.2. 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. Sufficient agreement means there is significant repetition of the pattern/combination of patterns (specifically the relative height, depth, width, curvature, and overall spatial relationship) between two or more items.
- 34.1.1.3. 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).
- 34.1.1.4. 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.
- 34.1.1.5. 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.

34.2. 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. Generally, test fires are placed on the right stage and unknown fired evidence is placed on the left stage for comparison. 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.
- 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. Once the “printed report” is finalized and uploaded into LIMS, a copy is printed and placed in the case record. The handwritten initials of the primary, second, and reviewing examiners are placed on the copy wherever the electronic equivalents appear.

34.3. Interpretation

Based upon the markings present on the evidence, one of the following results is reported:

- 34.3.1. Identification*: A sufficient correspondence of individual characteristics between items of evidence will lead the examiner to the conclusion that both items (evidence and tests) originated from the same source.
- 34.3.2. Inconclusive: An insufficient correspondence of individual and/or class characteristics between items of evidence will lead the examiner to the conclusion that no identification or elimination could be made with respect to the items examined.
 - 34.3.2.1. There may be times when an examiner may be able to further clarify an inconclusive result with 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:
 - 34.3.2.1.1. An item that has discernible class characteristics (useful for elimination conclusions) but no individual characteristics.
 - 34.3.2.1.2. An item that does not exhibit class characteristics and has few individual characteristics of such poor quality that precludes an examiner from rendering an opinion.
 - 34.3.2.1.3. The examiner cannot determine if markings on an item were made by a firearm during the firing process.
 - 34.3.2.1.4. The examiner cannot determine if markings are individual or subclass.
- 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 between items of evidence.
- 34.3.4. Unsuitable: A lack of suitable microscopic characteristics on a single item of evidence will lead the examiner to the conclusion that the item is unsuitable for identification/comparison.
- 34.3.5. Explanation of the significance of a result of identification:
 - *The identification of cartridge case/bullet toolmarks is made to the practical, not absolute, exclusion of all other firearms. This is because it is not possible to examine all firearms in the world, a prerequisite for absolute certainty. The conclusion that



sufficient agreement for identification exists between toolmarks means that the likelihood that another firearm could have made the questioned toolmarks is so remote as to be considered a practical impossibility.

Note: The phrase “practical impossibility,” which currently cannot be expressed in mathematical terms, describes an event that has an extremely small probability of occurring in theory, but which empirical testing and experience has shown will not occur. In the context of firearm and toolmarks, “practical impossibility” means that 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
- No tools other than those identified in a particular case will be found that produce marks exhibiting sufficient agreement for identification.

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. Trace Material

35.1. Scope

Firearms-related evidence recovered during an investigation may contain trace material transferred from the crime scene. This trace material may be in the form of tissue, plaster, paint, hairs, fibers, glass, etc. At the request of a stakeholder, removal/collection of trace material for testing purposes is completed by the Forensic Biology Section.

35.2. Procedure

35.2.1. If there is a request to have the trace material removed/collected, contact the Forensic Biology section, the firearms section Supervisor, or Manager for clarification on how to proceed.

35.2.2. If the trace material is not collected by the Forensic Biology Section, proceed with the following steps:

- Remove loose material by rinsing the fired evidence with acetone or water.
- Remove plaster by rinsing the fired evidence in a dilute acetic acid solution (typically 10%-20%).
- Remove paint by soaking the fired evidence in 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.

35.3. Literature/Supporting Documentation

35.3.1. Howe, Walter, J., "Laboratory Work Sheets" AFTE Newsletter Number Two, August 1969, p.13.

35.3.2. AFTE Glossary, current edition.

35.3.3. DeForest, Gaensslen, and Lee, Forensic Science: An Introduction to Criminalistics, McGraw-Hill, New York, 1983.

35.3.4. Silverwater, Howend, et. al. "Cross Infection of Infectious Diseases as Applied to Forensic Firearms Examinations and the Means to Prevent It". AFTE Journal, Summer 2001. Vol. 33. Number 3, pp. 227-32.



36. National Integrated Ballistic Information Network – NIBIN

36.1. Scope

- 36.1.1. The National Integrated Ballistic Information Network (NIBIN) is comprised of hardware and software used in acquiring and storing the images of fired cartridge cases. NIBIN equipment acquires images of the headstamp, primer, and ejector areas 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.
- 36.1.2. If a possible association is found during the correlation review process, the associated agency(ies) and/or division(s) are notified. The microscopic comparison of the evidence in the potential association may not be completed until a request is received.
- 36.1.3. 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.

36.2. Procedure

- 36.2.1. The NIBIN Standard Image Capture Protocols are followed when making entries into the system.
- 36.2.2. The examiner must ensure that:
 - Criteria for items selected for entry include non-revolver cartridge cases and shotshells.
 - Any evidence cartridge case 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 examiner 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.
- 36.2.3. 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.
 - 36.2.3.1. **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
- 36.2.3.2. 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.
- 36.2.3.3. If an item was not processed for NIBIN, the above reasons are not applicable.

36.3. Interpretation

Two or more specimens that show a high degree of similarity on the NIBIN system may represent a NIBIN lead.

36.4. Limitations

- 36.4.1. Mutilated or deformed evidence
- 36.4.2. Sufficient markings for inclusion in database
- 36.4.3. Database search may not include all viable possible matches



37. 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 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, the staff member designated to act on behalf of the Section Manager also acts as the NIBIN Program Administrator.

37.1. Scope

- 37.1.1. Firearms evidence is routinely processed through the section’s NIBIN program. Semi-automatic firearms, fully automatic firearms, 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.
 - 37.1.1.1. Only crime gun evidence and fired ammunition components pursuant to a criminal investigation are entered into NIBIN.
 - 37.1.1.2. 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.
 - 37.1.1.3. HFSC will image other non-crime evidence at the request of a **stakeholder** on a case-by-case basis.
- 37.1.2. 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 Supervisor or the Section Manager. If identified, the ineligible NIBIN entries are deleted by the person making the entries or by a Section Manager-approved designee.
- 37.1.3. **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.**

37.2. 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:

- 37.2.1. Suitable evidence is imaged into NIBIN within 2 business days of the evidence being received by HFSC.
 - 37.2.1.1. “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.

37.2.1.2. "Suitable evidence" determinations may be based on evidence type, evidence quality, crime type, requests from **stakeholders**, or some combination of these.

37.2.1.3. This 2-business day timeframe includes processing by other technical sections within HFSC, as well as any other processing done within the firearms section.

37.2.2. Correlations are reviewed by an authorized staff member 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.

37.2.2.1. 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.

37.2.3. If a NIBIN lead is identified, a hit notification is released within 1 business day of the correlation being reviewed.

37.3. 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 37.3.3 (Firearms) and 37.3.4 (Cartridge Cases/Shotshells) below.

37.3.1. Multidiscipline Requests

37.3.1.1. Refer to the current version of the Houston Forensic Science Center Firearm Magazine Preservation Policy **and the Quality Manual** for details on how and when firearms and magazines with a NIBIN request are processed for biological material and/or latent prints.

37.3.1.2. 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.

37.3.2. Assigning the Request

37.3.2.1. Take custody of the evidence and verify it is eligible for NIBIN entry.

37.3.2.2. Self-assign the request, if not already done.

37.3.2.3. 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 11.1.1-11.1.2 of this SOP if any evidence is noted to pose a potential biohazard.

37.3.3. Firearms

37.3.3.1. 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.

37.3.3.1.1. Firearms processed for NIBIN are not test fired using submitted magazines and/or unfired ammunition. Reference magazines are typically utilized to complete test firing.

37.3.3.1.1.1. If a reference magazine is not available, hand loading a firearm for test firing is permissible.

37.3.3.1.1.2. 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, refer to the Firearm Magazine Preservation Policy and/or section management for guidance on how to proceed.

37.3.3.1.1.3. 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 with a Firearms Section Supervisor or Manager on how to proceed.

37.3.3.2. Repackage and seal the evidence (not test fires) and place in the transfer bin.

37.3.3.3. For each firearm that did not function (or was not test fired), complete the appropriate fields in LIMS and proceed to step 37.3.5.3.

37.3.3.4. Organize test fires in such a way that you are aware of what items need to be evaluated and imaged into IBIS.

37.3.3.5. Because test fires are considered evidence, store them per applicable SOPs.

37.3.3.6. 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 37.3.5.3.

37.3.4. 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, authorized personnel microscopically evaluate the cartridge case(s) and test fire(s) to determine which item(s) if any, is/are suitable for imaging.

37.3.4.1. Follow the procedure outlined in Sections 11.1.1-11.1.2 of this SOP if any evidence is noted to pose a potential biohazard.

37.3.4.2. Sub-item the evidence in LIMS, if needed, and record evidence markers as appropriate.

37.3.4.3. Screen the evidence to determine which item(s), if any, is/are suitable for imaging.

37.3.4.4. Create and label new lab bags, if needed.

37.3.4.5. Complete the fields in LIMS.

37.3.5. NIBIN Entry and Completing Draft Report

37.3.5.1. Enter the evidence into NIBIN as needed.



- 37.3.5.2. Complete the fields regarding NIBIN entry in the appropriate fields in LIMS.
- 37.3.5.3. Create/review worksheet(s).
- 37.3.5.4. Complete the draft report in LIMS.
- 37.3.5.5. Ensure you have completed the appropriate LIMS fields for each item/group of items you have examined.
- 37.3.5.6. Transfer the evidence to the appropriate location and place worksheets in the designated area.
- 37.3.6. Correlation Review
 - 37.3.6.1. Correlations are reviewed by an authorized staff member.
 - 37.3.6.2. Firearms staff review, at a minimum, the top 50 results from the rank sort list in the NIBIN system.
 - 37.3.6.3. Correlation reviews are documented by the staff member 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.
- 37.3.7. NIBIN Leads
 - 37.3.7.1. HFSC issues NIBIN Lead notifications for High and Low Confidence Correlation results.
 - 37.3.7.1.1. 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 6.6 of this SOP for reporting guidelines.
 - 37.3.7.1.2. 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 6.7 of this SOP for reporting 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.
 - 37.3.7.2. Once a high or low confidence lead is identified by the correlation reviewer, the lead is reviewed by another Firearms staff member 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.



38. Serial Number Restoration – Polishing

38.1. Scope

- 38.1.1. 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.
- 38.1.2. 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.

38.2. Procedure

- 38.2.1. 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.
- 38.2.2. Note and record any visible characters or partial characters prior to polishing on the appropriate worksheet.
- 38.2.3. Polish the area of the obliteration using either a rotary tool with a sanding/polishing disc or fine grit sand paper.
- 38.2.4. 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.

38.3. Interpretation

- 38.3.1. Note and record any characters that become visible. A second qualified examiner must verify any reported characters.
- 38.3.2. If characters do not become visible, proceed to the appropriate chemical or magnetic restoration procedure.
- 38.3.3. Examiners are encouraged to capture restored characters with photographs, but a second examiner may not verify restored characters from a photograph.

38.4. Literature/Supporting Documentation

- 38.4.1. Treptow, R.S., Handbook of Methods for the Restoration of Obliterated Serial Numbers, NASA (1978).
- 38.4.2. Polk, D.E., Giessen, B.C., "Metallurgical Aspects of Serial Number Recovery," AFTE Journal, Vol. 21, No. 2, p. 174.
- 38.4.3. Bureau of Alcohol, Tobacco and Firearms Laboratory, Serial Number Restoration Handbook (1999).



39. Serial Number Restoration – Magnetic Technique

39.1. Scope

- 39.1.1. The Magnaflux 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.
- 39.1.2. 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 Magnaflux 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.

39.2. Equipment, Materials, and Reagents

- Yoke magnets
- Y-7 AC/DC Yoke electromagnet
- 7HF or 9CM Prepared Bath

39.3. Procedure

- 39.3.1. 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.
- 39.3.2. Polish the area of obliteration in accordance with the Serial Number Restoration - Polishing section of this SOP.
- 39.3.3. Place the magnet with the poles on either side of the area of obliteration.
- 39.3.4. Apply Prepared Bath to the area of obliteration with a plastic disposable pipette.
- 39.3.5. Adjust the placement of the magnet, as needed, to maximize the visibility of the obliterated numbers/characters.
- 39.3.6. Record each method used and any results obtained for each step of this procedure on the appropriate worksheet.

39.4. Interpretation

- 39.4.1. Note and record any characters that become visible. A second qualified examiner must verify any reported characters.
- 39.4.2. If characters do not become visible, the examiner may consider a chemical technique.
- 39.4.3. Examiners are encouraged to capture restored characters with photographs, but a second examiner may not verify restored characters from a photograph.



39.5. Literature/Supporting Documentation

- 39.5.1. Treptow, R.S., Handbook of Methods for the Restoration of Obliterated Serial Numbers, NASA (1978).
- 39.5.2. Polk, D.E., Giessen, B.C., "Metallurgical Aspects of Serial Number Recovery," AFTE Journal, Vol. 21, No. 2, p. 174.
- 39.5.3. Bureau of Alcohol, Tobacco and Firearms Laboratory, Serial Number Restoration Handbook (1999).



40. Serial Number Restoration – Chemical Restoration

40.1. Scope

40.1.1. 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.

40.1.2. 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.

40.2. Equipment, Materials, and Reagents

Preparation of all reagents is recorded in the reagent log at the time of preparation.

40.2.1. Fry’s Reagent

- 90 g Cupric chloride (CuCl_2)
- 120 mL Concentrated hydrochloric acid (HCl)
- 100 mL Distilled water (H_2O)

40.2.2. Turner’s Reagent

- 2.5 g Cupric chloride (CuCl_2)
- 40 mL Concentrated hydrochloric acid (HCl)
- 25 mL Ethyl alcohol
- 30 mL Distilled water (H_2O)

40.2.3. Davis Reagent

- 5 g Cupric chloride (CuCl_2)
- 50 mL Concentrated hydrochloric acid (HCl)
- 50 mL Distilled water (H_2O)

40.2.4. 25% Nitric Acid

- 25 mL Concentrated nitric acid (HNO_3)
- 75 mL Distilled water (H_2O)

40.2.5. Acidic Ferric Chloride

- 25 g Ferric chloride (FeCl_3)
- 25 mL Concentrated hydrochloric acid (HCl)
- 100 mL Distilled water (H_2O)

40.2.6. Ferric Chloride

- 25 g Ferric chloride (FeCl_3)
- 100 mL Distilled water (H_2O)

40.2.7. 10% Sodium Hydroxide (NaOH)



- 10 g Sodium hydroxide (NaOH)
- 100 mL Distilled water (H₂O)

40.2.8. Phosphoric/Nitric Acid

- 50 mL Concentrated phosphoric acid
- 3 mL Concentrated nitric acid

40.3. Standards and Controls

For each day of use, all prepared reagents listed above must be tested for their reactivity using the following reference materials:

40.3.1. For Fry's, Turner's, and Davis reagents:

- Certified ACS aluminum metal (one example is Fisher Scientific, A557-500)
- Oxidation reaction should be observed.

40.3.2. 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.

40.3.3. 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.

40.3.4. 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.

40.3.5. If the expected reaction cannot be confirmed, discard the etchant, prepare a new batch, and repeat the test.

40.4. Procedure

40.4.1. 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.

40.4.2. Utilize the Polishing Procedure as necessary.

40.4.3. Determine whether the serial number medium is magnetic or non-magnetic.

40.4.4. Utilize appropriate chemical reagent by applying the chemical solution in the area of obliteration with plastic pipettes or swabs.

40.4.5. Record each method used and any results obtained for each step of this procedure on the appropriate worksheet.

40.4.6. 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.

40.5. Interpretation

40.5.1. Note and record any characters that become visible.

40.5.2. A second qualified examiner must verify any reported characters.

40.5.3. Examiners are encouraged to capture restored characters with photographs, but a second examiner may not verify restored characters from a photograph.

40.6. 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.

40.7. Literature/Supporting Documentation

40.7.1. Treptow, R.S., Handbook of Methods for the Restoration of Obliterated Serial Numbers, NASA (1978).

40.7.2. Polk, D.E., Giessen, B.C., "Metallurgical Aspects of Serial Number Recovery," AFTE Journal, Vol. 21, No. 2, p. 174.

40.7.3. Bureau of Alcohol, Tobacco and Firearms Laboratory, Serial Number Restoration Handbook (1999).