



Firearms Section

Firearms Section SOP

Comparative and 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 circumstances on the incident/investigation. Forms, worksheets, checklists, reports, photos, and printouts of computer-based search information are utilized to document examinations. Forms and worksheets also serve as checklists and reminders of the general procedures outlined herein.

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. Markings examined on fired cartridge cases are limited to those produced by a firearm and excludes markings produced by magazines.
- 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 (less than .50 caliber), and shotguns.

2.2. The Firearms Section contributes to the NIBIN database.

- 2.2.1. This database uses ballistic imaging to assist criminal investigations by linking two or more seemingly unrelated criminal investigations together.
- 2.2.2. The section routinely enters fired evidence exhibits as well as test firings from recovered and seized firearms into the NIBIN database.



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 identifications and eliminations if the elimination is based only on differences in individual characteristics.
- 3.1.3. A second examination is not mandatory for, but may be utilized in, comparisons that have been classified as elimination on class, inconclusive, insufficient, or unsuitable.
- 3.1.4. A second qualified examiner shall examine restored serial number characters.
- 3.1.5. A second qualified examiner may be utilized for other conclusions, (i.e. shot pellet size determination, general rifling characteristics, etc.) but this second examination is not required.

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.
- 3.2.2. Reasons for rejecting the conclusion(s) of the primary or second examiner are documented on the appropriate examination documentation.
- 3.2.3. If necessary, the Section Manager (and/or Technical Leader, if a different individual) will assist in the resolution of any issues.
- 3.2.4. If the primary examiner, the second examiner, and the Section Manager/Technical Leader cannot come to a resolution, then the more conservative conclusion will be reported (i.e. inconclusive rather than identification or elimination).
- 3.2.5. Any indication of a significant technical problem is brought to the attention of the Section Manager (and Technical Leader, if a different individual).



4. Instruments, Calibration, And Reagents

4.1. General Requirements for Analytical Instrumentation:

- 4.1.1. All instruments are periodically maintained and properly calibrated in accordance with the manufacturer's recommendations and specifications.
- 4.1.2. Measuring equipment (i.e. calipers/micrometers, balances, steel rules, 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 (i.e. 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.

4.2. Malfunction of an Instrument or Balance:

- 4.2.1. If a performance check fails or a performance problem is detected, the instrument or balance is immediately removed from service, the Section Manager (and Technical Leader, if a different individual) notified, and the problem recorded in the appropriate log. Additionally, the item is clearly marked as being out of service.
- 4.2.2. Following repair, routine quality control procedures (i.e. performance check) is performed to ensure it is working properly before the instrument or balance is returned to service. This information is recorded as described above.

4.3. Comparison Microscopes:

4.3.1. Performance Check

- 4.3.1.1. 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. Maintain a log of the results of calibration and maintenance.
 - 4.3.1.1.1. Place a gauge block of known thickness on one stage and measure the thickness on the other stage using a previously calibrated set of calipers/micrometers.
 - 4.3.1.1.2. The thickness measured should be the same as the thickness of the gauge block. Measured value should be within 10% of the thickness of the gauge block.
 - 4.3.1.1.3. If an acceptable value is obtained, then enter "OK" in the log.



4.3.1.1.4. If an unacceptable measurement is obtained, then “Out of spec” (or similar statement) is entered in the log and the microscope is immediately removed from service. The Section Manager (and Technical Leader, if a different individual) is immediately notified.

4.3.2. Service

4.3.2.1. Comparison microscopes are serviced annually. A record of current annual service is maintained, usually in the form of a sticker affixed to the microscopes. Additional servicing is performed on an as-needed basis.

4.4. Calipers/Micrometers:

4.4.1. Performance Check

4.4.1.1. Conduct a performance check of calipers/micrometers at least once each quarter of the calendar year. Maintain a log of the results of calibration and service.

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

4.4.1.1.2. Measure at least two gauge blocks of different thicknesses and record the measurements.

4.4.1.1.3. If the observed measurement is not within 10% of the thickness of the gauge block, then “Out of spec” (or similar statement) is recorded and the caliper/micrometer is immediately removed from service. The Section Manager (and Technical Leader, if a different individual) is immediately notified. The caliper/micrometer will be sent to the manufacturer for repair or replacement.

4.4.2. Service

4.4.2.1. Calipers/Micrometers are serviced as needed.

4.5. Balances:

4.5.1. Performance Check

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

4.5.1.1.1. Weigh at least two different objects of known weight and record the measurements.

4.5.1.1.2. If the observed measurement is not within 5% of the weight used, then “Out of spec” (or similar statement) is recorded and the balance is immediately removed from service. The Section Manager (and Technical Leader, if a different individual) is immediately notified. The balance will be repaired by an approved vendor or replaced with another balance.



4.5.2. Service

- 4.5.2.1. Balances are calibrated and serviced annually by an external vendor. Maintain a record with the results of the balance checks, service, and calibration. A record of current service, usually in the form of a sticker, is affixed to the balance.

4.6. Steel Rules:

- 4.6.1. Steel rules are calibrated annually by an external service provider and a copy of the calibration certificate is maintained.

4.7. Trigger Pull Spring Gauges:

4.7.1. Performance Check

- 4.7.1.1. Conduct a performance check of the trigger pull spring gauge currently in use at least once each month. Maintain a record of the results of calibration checks and service.
 - 4.7.1.1.1. Weigh at least two trigger pull weight standards and record the measurements.
 - 4.7.1.1.2. If the observed measurements are not within 10% of the weight used, then "Out of spec" (or similar statement) is recorded and the trigger pull spring gauge is immediately removed from service. The Section Manager (and Technical Leader, if a different individual) is immediately notified. The gauge will be repaired by an approved vendor or replaced with another gauge.

4.7.2. Service

- 4.7.2.1. Trigger pull gauges are calibrated annually by the manufacturer (or other approved vendor) and a copy of the calibration certificate is maintained.

4.8. Calibration Standards:

4.8.1. Balance Weight Standards

- 4.8.1.1. Weights used in balance performance checks are checked annually on a calibrated balance.
- 4.8.1.2. This check is recorded in the appropriate log.
- 4.8.1.3. If the observed measurement is greater than 5% difference from the stated weight of the standard, then "Out of Spec" (or similar statement) is recorded and the weight is immediately removed from service. The Section Manager (and Technical Leader, if a different individual) is be immediately notified. The weight will be serviced by an approved vendor or replaced with another weight.

4.8.2. Trigger Pull Weight Standards



- 4.8.2.1. The standard trigger pull weights must be weighed on a calibrated laboratory balance as needed if substantial damage/loss of weight is noticed.
- 4.8.2.2. This check is recorded in the appropriate log.
- 4.8.2.3. If the observed measurement is greater than 5% difference from the stated weight of the standard, then "Out of Spec" (or similar statement) is recorded and the weight is immediately removed from service. The Section Manager (and Technical Leader, if a different individual) is immediately notified. The weight will be serviced by an approved vendor or replaced with another weight.

4.8.3. Gauge Blocks

- 4.8.3.1. The gauge blocks used for caliper/micrometer and microscope performance checks are sent to the manufacturer (or other approved vendor) annually for calibration. A copy of the calibration certificate is maintained.

4.9. NIBIN Section:

4.9.1. IBIS Equipment Calibration Check

- 4.9.1.1. 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 Forensic Technology, Inc. (FTI) personnel.
- 4.9.1.2. Contact FTI for any malfunctions of NIBIN or IBIS equipment and make a record of the contact in the NIBIN log.

4.10. Reagents:

- 4.10.1. All pertinent reagents and solutions are labeled with the identity of the reagent and the date of preparation (or lot number). A list of pertinent reagents is maintained in a log with the following information:
 - Reagent preparation date
 - Preparer's initials
 - Date reagent is discarded/destroyed/consumed
 - Reagent name
- 4.10.2. Quality testing on reagents used for serial number restoration are documented using the form described in the serial number restoration sections of this SOP.
 - 4.10.2.1. Note: Reagents such as bleach, acetone, and 15% acetic acid are used for cleaning and therefore do not require quality testing.
- 4.10.3. 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:

- 4.10.3.1. Check the reagent with proper sample controls.
- 4.10.3.2. Discard the reagent if it fails the quality check, prepare a new reagent, and quality check the new reagent.
- 4.10.3.3. Cease performing work with the reagent until the problem has been corrected.
- 4.10.3.4. 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.
- 4.10.3.5. Inform the Section Manager (and Technical Leader, if a different individual) and Quality Division if the problem persists.

4.11. Infrequently Performed Analyses:

- 4.11.1. Analyses conducted fewer than 10 times/year in the section is considered “infrequent.”



5. Reporting Guidelines

This procedure will serve as a GUIDELINE for possible wording in reports. As much as possible, the suggested wording and punctuation should be utilized in order to provide consistency in reporting. Deviations from this wording may be needed. Significant deviations are approved by the Section Manager, Technical Leader (if a different individual), 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 is no wording provided for the testing or conclusion being reported.

Whenever a report is entered in LIMS, a copy of the report should be printed and retained in the case record. All reports are administratively and technically reviewed using the check lists provided in LIMS. See Section 0 of this SOP for a copy of the check lists. The primary examiner is the author of the report. The second examiner is not a co-author.

NOTE: [Item] represents the unique item identifier(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. Inc. # means incident number.

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

5.1. General Report Format

As a rule, a report should follow the format provided below. Reports should have the following sections (if applicable): Items of Evidence, Results and Interpretations, NIBIN Details, Disposition, and Additional Information. 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's Information Technology (IT) Section and may not necessarily conform to those outlined in this section.

5.1.1. Header and Footer

5.1.1.1. The header and footer section format and information will typically be automatically generated by LIMS. Changes to the header and footer may be made by HFSC's IT Section.

5.1.1.2. Information contained in the header may include, but is not limited to, HFSC testing location (s), accrediting body, client name/address, offense, offense date, the unique case identifier, and additional incidents addressed in the report.

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

5.1.2. Items of Evidence



- 5.1.2.1. An accurate description of the items of evidence received for analysis in a case shall appear in the Evidence Received section.
- 5.1.2.2. Examples of evidence descriptions:
- [Item] [caliber] [make] model [model name/number] [action, type of firearm], serial # [serial number]
 - [Item] [#] fired [caliber] cartridge case(s)
 - [Item] [#] fired [projectile description]. 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 #".)
- 5.1.2.3. The following language should be included in reports:
- Additional firearms evidence may be available for analysis in [this incident/these incidents]. If further analysis is needed, please submit a request to the Firearms Section of the Houston Forensic Science Center.
- 5.1.2.4. The Reason the Report Is Being Generated:
- Any of the below statements may be combined/modified as appropriate.
- This report is to detail the results of analysis of the evidence outlined above.
 - This report is to detail the test firing of an officer's firearm.
 - This report is to detail the result of a [confirmed/inconclusive/negative] NIBIN association per a request made by [requestor's title and name] on [date].
 - This report is to detail the results of analysis of the evidence outlined above per a request made by [requestor's title and name] on [date].
 - This report is to detail the work associated with a NIBIN request.
- 5.1.3. Results and Interpretations:
- 5.1.3.1. The following statements are placed in the report, where appropriate:
- 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.)
 - The conclusions in this section are the opinions of Firearms Examiner [name of primary examiner]. When a conclusion is verified, it is also the opinion of the verifier.
 - This conclusion was verified by Firearms Examiner [name]. (For use when a conclusion was verified by a Second Examiner.)
 - This information was verified by Firearms Examiner [name]. (For use when an examiner verifies GRC information recorded by another 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 contact the Firearms Section or go to <http://www.houstonforensicscience.org/sop/Range-of-Conclusions-Firearms-Analysis.pdf>. (For use when a conclusion of Identification, Elimination, Inconclusive, Insufficient, and/or Unsuitable is presented in a report.)
- 5.1.3.2. If technical observations or conclusions are released to a client prior to the issuance of the report, this fact will be documented in the report with a description of the information that was released. Suggested wording is below, but may not fit every situation:
- [Observation/conclusion statement(s)]. This information was released to [title, name] on [date].
- 5.1.3.3. See following sections on how results should be reported.
- 5.1.4. NIBIN Details
- 5.1.4.1. The processing of evidence for NIBIN entry should be addressed in reports. See Specific Wording for the NIBIN Details Section for more information.
- 5.1.5. Disposition
- 5.1.5.1. If prior analysis was performed, add the following statement:
- Further details on evidence received in [agency case #X] are available [in Laboratory Report #[X]/in a report] entered into LIMS under [agency case #X] by [Title] [Name] on [date].
- 5.1.5.2. Transfer to the submitting agency:
- [The above described evidence/[Item]] has been, or will be, released to the submitting agency.
- 5.1.5.3. Release to an individual:
- [The above described evidence/[Item]] [was/were] released to [Title] [Name] on [Date] by [Title] [Name].
- 5.1.5.4. Retained in the Firearms Section:
- [The above described evidence/[Item]] will be retained in the Firearms Section of the Houston Forensic Science Center pending further investigation and/or disposition.
- 5.1.6. Additional Information
- 5.1.6.1. This section of the report is utilized (as needed) to document major item description discrepancies and occurrences when items are received not properly sealed, but the items were still accepted into the firearms section for analysis.



- 5.1.6.2. The wording provided in this section of a report may be dependent on the nature and type of discrepancy, but examples of wording may include:
- [Item] was received in a container that was secure, but without a proper seal.
 - [Item] and [Item] appear to be in containers with the labels switched. The contents of the package labeled [Item] match the description on the packaging of [Item].
- 5.1.6.3. This section may also be used to make other comments as described by this SOP (see Section 5.2.1.3.3) or as approved by the Section Manager or Technical Leader (if a different individual).
- 5.1.7. Report Ending:
- 5.1.7.1. LIMS will automatically apply the signature, name, and title of the Primary Examiner on a completed report.
- 5.1.8. Closing Statements:
- 5.1.8.1. There may be closing statements automatically generated by LIMS.
- 5.1.9. Special Considerations for the Cross Comparison/Hit Report Format
- Clients may request that one or more cases be cross-compared (including the result of a possible NIBIN association notification). The general reporting format is similar, but several variations may be used as illustrated below.
- 5.1.9.1. Related incidents are listed in the “Additional Incidents” field of the report header.
- 5.1.9.2. Evidence items associated with each incident are grouped together under the unique case identifier.
- Note: If the cross comparison pertains to more than one agency’s case, each agency’s case is identified by the agency’s name or abbreviation. Agency abbreviations may be made by using the first letter of each word of the agency (i.e. a Houston Police Department case will have “HPD” in front of the unique case identifier).
- 5.1.9.3. In order to clearly distinguish between the items of evidence in two or more incidents, the following format is used throughout the body of the report when referring to evidence:
- [Item] of [unique case identifier]
- 5.1.9.4. Since the report is issued in only one case, a report is issued in the companion case(s) in LIMS indicating that work has been conducted in the companion case(s) and the reported case.
- Firearms evidence in this case has been compared to firearms evidence in case X (where this represents the name of the agency and the agency’s case). Please refer to the firearms report(s) in case X for additional information.
- 5.1.10. Amended Reports:



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

- 5.1.10.1. The Laboratory Report number in the header will be changed (either manually or by regenerating the report) to reflect the number of the amended report, as identified in LIMS.
- 5.1.10.2. The following language will be used as a guideline to include in the header area of the report:
 - This report has been issued to amend Laboratory Report # [original report number] issued on [date]. This report has been issued with amendments and/or corrections. (This statement does not need to be included if the report itself has not changed). [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.

5.2. Specific Wording for Results and Interpretations Section:

5.2.1. 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.

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

5.2.1.1.1. 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 using [#] [stock/evidence cartridges] from [source, if applicable] on [date]. This set of test fires is designated [Item]. [Item] functioned as expected.

5.2.1.1.2. 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 using [#] [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.]

5.2.1.1.3. 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 using [#] [stock/evidence cartridges] from [source, if applicable] on [date]. This set of test fires is designated [Item]. [Item] functioned as expected. [State whether or not the firearm was returned to the condition as received after test firing.]

5.2.1.1.4. 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 using [#] [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 whether or not the firearm was returned to the condition as received after test firing.]

5.2.1.1.5. 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 whether or not the firearm was returned to the condition as received.]

5.2.1.1.6. 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.

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

- [Item] was test fired using [#] [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.]



5.2.1.2. The results of trigger pull, if applicable:

5.2.1.2.1. Firearm has both single and double action modes:

- Approximate Trigger Pull(s):

[Item] Single Action: [range] Double Action: [range]

5.2.1.2.2. Firearm has only single or double action mode:

- Approximate Trigger Pull(s):

[Item] Single Action Only: [range]

- Approximate Trigger Pull(s):

[Item] Double Action Only: [range]

5.2.1.2.3. 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.

5.2.1.3. Officers' Firearms:

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

5.2.1.3.2. Additionally, safeties need to be addressed; in particular, that 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.]

5.2.1.3.3. A timeline associated with test firing an officer's firearm is included in the Additional Information section of the report. The points to be included in the timeline are:

5.2.1.3.3.1. A statement that times are approximate

- All times below are approximate.

5.2.1.3.3.2. The date and time the call is received requesting the examiner's presence.

- Date and time call received – [date, time]

5.2.1.3.3.3. The time the examiner arrives at the requested location.

- Time of Firearms Examiner arrival – [time]

5.2.1.3.3.4. The time the officer's firearm(s) is/are received by the examiner (if multiple firearms are received, the time the first firearm is received is used). Other items received at the same time as the firearm (i.e. magazine, unfired cartridges, etc.) may also be listed here.

- Time [Item] was/were received – [time]

5.2.1.3.3.5. The time the officer's firearm(s) is/are released by the examiner (if multiple firearms are released, the time the last firearm is released is used).

- Time [Item] was/were released – [time]



5.2.1.3.3.6. The time the examiner returns to their final destination.

- Time of Firearms Examiner return – [time]

5.2.1.3.3.7. Not all of the above listed time points may be applicable in every situation, especially if the call out begins and/or ends during an examiner's normally scheduled shift.

5.2.1.3.3.8. If the sequence of these events spans more than one day, then the first event of the next day shall include the new date. Military time is used and expressed as XXXX hours.

5.2.1.4. Cartridges cycled in a Firearm:

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

5.2.1.5. 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.)

5.2.1.6. Barrel and Overall Length of Long Guns

5.2.1.6.1. 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".

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

5.2.1.6.3. Barrel length less than legal limit:

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

5.2.1.6.4. Overall length less than legal limit:

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

5.2.1.6.5. 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.

5.2.1.6.6. In the event that 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. When this occurs, include the following statement:

- The 95% confidence interval (2 standard deviations) is $\pm 1/8$ ".

5.2.2. Comparison of Fired Bullets, Cartridge Cases and Shotshells

5.2.2.1. Identification



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

5.2.2.2. Elimination

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

5.2.2.3. Inconclusive

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

5.2.2.4. 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 5.2.3.2.2 of this SOP, if applicable).

5.2.2.5. Insufficient

5.2.2.5.1. 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] [was/were] microscopically evaluated and determined to exhibit a lack of discernible characteristics (insufficient). This conclusion was verified by Firearms Examiner [name]. Due to the lack of discernible characteristics, [Item] will not be further compared at this time.

5.2.3. General Rifling Characteristics Database Information

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

5.2.3.1.1. 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 cartridge(s)]. In the event that [Item] [was/were] fired in a [specific cartridge(s)] firearm, then [it/they] could have been fired in a firearm of the following [manufacture/caliber and manufacture]:

(Listing of manufacturer information)

5.2.3.1.2. 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 cartridge(s)]. In the event that [Item] [was/were] fired in a [specific cartridge(s)] firearm, then in addition to [Item (the compared firearm)], [it/they] could have been fired in a firearm of the following [manufacture/caliber and manufacture]:

(Listing of manufacturer information)

5.2.3.1.3. 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). In the event that [Item] [was/were] fired in a [caliber family] firearm, then [it/they] could have been fired in a firearm of the following manufacture:

(Listing of manufacturer information)

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

5.2.3.2.1. 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 firearm manufacturers was not generated.

5.2.3.2.2. Not able to determine caliber:

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

5.2.3.2.3. 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.

5.2.3.2.4. If a client 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.

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

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

- [Item] could have been fired in a [caliber/calibers] firearm of the following [manufacture/caliber and manufacture]:

5.2.3.3.2. 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 [caliber/calibers] firearm of the following [manufacture/caliber and manufacture]:

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

In the event that the condition of a cartridge case precludes a GRC list being generated, refer to section 5.2.3.2 for appropriate verbiage.

5.2.3.5. Combination of bullet(s) and cartridge case(s)

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

- In the event that [Item] were fired in the same firearm, then they could have been fired in a [caliber/calibers] firearm of the following [manufacture/caliber and manufacture]:

(Listing of manufacturer information)

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

- In the event that [Item] were fired in the same firearm, then in addition to [Item (the compared firearm)], they could have been fired in a [caliber/calibers] firearm of the following [manufacture/caliber and manufacture]:

(Listing of manufacturer information)

5.2.3.6. In some instances, an examiner may be reporting 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 5.2.3 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...

5.2.3.7. 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 the report:

- 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.

5.2.3.8. If the GRC program does not return any matching entries, the following statement is provided in the report:

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

5.2.3.9. A GRC disclaimer statement shall appear in the body of the report after the last GRC list is presented.

5.2.3.9.1. When all specific calibers the examiner has mentioned as likely possibilities are listed in the GRC section:

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

5.2.3.9.2. When NOT all specific calibers the examiner has mentioned as likely possibilities are listed in the GRC section, use the prior disclaimer and the following:

- Contact the Firearms Section of the Houston Forensic Science Center for manufacturers lists of additional caliber(s) mentioned above.

5.2.4. Fired Shotshell Component Determinations

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

5.2.4.1. Pellets

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

5.2.4.2. Wadding/Carriers

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

5.2.4.3. Shotshells

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

5.2.5. Serial Number Restoration

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

5.2.5.1. 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 conclusion was verified by Firearms Examiner [name].

5.2.5.2. Serial number partially restored

5.2.5.2.1. 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 conclusion was verified by Firearms Examiner [name].

5.2.5.2.2. 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.)

5.2.5.2.3. 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 asterisk represents [a/an] [character], [a/an] [character], or [a/an] [character]” (listing as many as necessary).

5.2.5.3. 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.

5.2.5.4. 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.]

5.2.5.5. No area of obliteration observed

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



5.2.6. Functionality of Air Guns:

5.2.6.1. 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 3 shot test group on [date]. This test group is designated [Item]. [Item] functioned as expected.

5.2.6.2. CO2/Gas Operated Air Gun

5.2.6.2.1. General Wording for a CO2/Gas Operated Air Gun:

- [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 3 shot test group on [date]. This test group is designated [Item]. [Item] functioned as expected.
- 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.
- If a 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.

5.2.6.3. 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 3 shot test group on [date]. This test group is designated [Item]. [Item] functioned as expected.

5.2.6.4. 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 whether or not the air gun was returned to the condition as received after testing.]

5.2.6.5. 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 whether or not the air gun was returned to the condition as received.]

5.3. 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.

5.3.1. 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.

5.3.1.1. If the item is unsuitable for NIBIN entry

- [Item] [was/were] determined to be unsuitable for NIBIN entry on [date].

5.3.1.2. If the item is 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.

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

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

- The evidence listed below in this section 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.

5.3.2.2. Firearm

5.3.2.2.1. Suitable for NIBIN Entry:

- [Item] was test fired using [#] [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.

5.3.2.2.2. Unsuitable for NIBIN Entry:

- [Item] was test fired using [#] [stock/evidence] cartridges [from source, if applicable] on [date]. This set of test fires is designated [Item] (test fires). [Item] (test fires) is unsuitable for NIBIN entry.

5.3.2.2.3. 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 using [#] [stock/evidence]



cartridges [from source, if applicable] on [date]. This set of test fires is designated [Item] (test fires). [State whether or not 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).

5.3.2.2.4. 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 whether or not the firearm was returned to the condition as received.]

5.3.2.2.5. 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.

5.3.2.2.6. Not Test Fired:

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

5.3.2.3. Fired Evidence:

5.3.2.3.1. 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.

5.3.2.3.2. Unsuitable for NIBIN Entry

- [Item] [was/were] determined to be unsuitable for NIBIN entry on [date]

5.4. 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:

5.4.1. Reason the report is being generated

- 5.4.1.1. This report is to detail how [Item] [was/were] rendered safe per a request made by [requestor's title and name] on [date].

5.4.2. Results (instead of Results and Interpretations)

- 5.4.2.1. Begin with 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.

- 5.4.2.2. Include a brief explanation of 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 in order to unload it.
- The top strap of [Item] was sawed through in order to release the cylinder.

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

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

5.5. 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 with the following wording.

5.5.1. Disclaimer:

- This notification is to detail work associated with the NIBIN program. This notification does not purport to address the complete functionality of the tested firearm(s) and/or this notification does not purport to address the examination of fired evidence. This notification details the suitability of evidence for imaging into the laboratory's ballistic imaging database.

Please contact the Firearms Section of the Houston Forensic Science Center if a full examination of this evidence is needed.

Notification Details:

Laboratory testing associated with IBIS analysis in firearm(s) and/or fired cartridge case(s) submitted in this incident has been completed. The appropriate investigative agency(ies) and/or division(s) will be notified of any possible NIBIN associations with this evidence.

5.5.2. **If evidence in the Firearms Section for NIBIN processing is rejected due to major discrepancies (i.e.: those in Section 8.1.6 of this SOP), the Notification Details section will not contain the above wording. Instead, the Notification Details section will contain a summary of the issue(s) with the evidence (why the evidence is being rejected) as well as the following statement:**

- [Item] was rejected for NIBIN processing.

5.6. High Confidence Correlation Notification:

There may be times when a possible IBIS hit is identified between two or more cases. When a high confidence correlation is identified, notification is provided **using the language provided below. If a possible IBIS 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.

- 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:

Case X (where this represents the name of the agency and the agency's case #), [Item]

Case X (where this represents the name of the agency and the agency's case #), [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 via the Houston Forensic Science Center's Laboratory Information Management System (LIMS). If you do not have access to LIMS, please contact HFSC for LIMS access or for assistance in submitting a request at: 1-844-473-6742 or 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 contact the Firearms Section or go to <http://www.houstonforensicscience.org/sop/Range-of-Conclusions-Firearms-Analysis.pdf>.

5.7. Administrative and Technical Review Check Lists:

The following criteria are used when conducting reviews (not all criteria apply to all cases/requests):

5.7.1. Administrative Review

- 5.7.1.1. Spelling and grammar in report and case record are correct.
- 5.7.1.2. Abbreviations used are easily understood or documented in SOPs.
- 5.7.1.3. Cross outs, interlineations, and additions are initialed (and dated, if appropriate).
- 5.7.1.4. Written case record is free from obliterations (only single-line strikethroughs).
- 5.7.1.5. All handwritten material is done in ink.
- 5.7.1.6. Chain of custody is clear and complete.
- 5.7.1.7. Every page (both administrative and exam) has the unique case identifier.



- 5.7.1.8. Name, initials, or secure electronic equivalent, are on every page of exam documentation.
- 5.7.1.9. Name, initials, or secure electronic equivalent, of the individual adding administrative documentation to the case record are on administrative documents.
- 5.7.1.10. Dates that exams, etc. were conducted are recorded.
- 5.7.1.11. Report issued addresses request that was made. (Multiple reports may be needed to address some requests)
- 5.7.1.12. Report(s) and documentation follow lab policy (formatting, headers, correct versions of worksheets).
- 5.7.1.13. Any deviations from standard practice, policy, etc. are documented in the case record.
- 5.7.1.14. Printed and/or written laboratory generated examination records are page numbered indicating the total number of pages.
- 5.7.2. Technical Review
 - 5.7.2.1. Laboratory and section policy was followed in examination procedures.
 - 5.7.2.2. All conclusions that require a second examiner have been reached by a second, qualified examiner.
 - 5.7.2.3. All conclusions/opinions in report are supported by exam documentation in the case record.
 - 5.7.2.4. All (final) conclusions/opinions in case file are documented in the report.
 - 5.7.2.5. All manual calculations and data transfers are checked (i.e. GRC information).

5.8. Literature/Supporting Documentation:

- 5.8.1. National Firearms Act (current edition)



6. 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
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
P	Parallel	LI/LIMP	Land Impression
Poly	Polygonal	Part	Partial
REC	Rectangular	R	Right (twist)
XH	Crosshatch	Vis	Visible
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	CoC	Chain of Custody
FCN	Forensic Case Number	IPB	In Progress Box
ME	Medical Examiner	ML #	Medico Legal Number
MRN or MR #	Medical Record Number		



7. Decontamination

7.1. Scope

- 7.1.1. 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 for ten minutes. When evidence is decontaminated, a note is made in the case record.
- 7.1.2. Prior to decontamination of items other than projectiles and/or items associated with a Medico-Legal or MRN/hospital number, the following steps are taken:
- 7.1.2.1. When there is an indication (in LIMS item description, on packaging, visual inspection, etc.) that an item of evidence is contaminated with a biohazard (i.e. blood, bodily fluids, etc.), follow the current procedure of checking LIMS to determine whether or not there is a pending **DNA Screening** request for the item in LIMS. If there is uncertainty about whether or not the item is contaminated, consult a Firearms Section Supervisor or the Manager.
- 7.1.2.1.1. If a **DNA Screening** request exists, notify a Firearms Section Supervisor or Manager of the request. Return the evidence to the designated section of the Firearms vault.
- 7.1.2.1.2. If no **DNA Screening** request exists, check the Reports tab **and/or the chain of custody** in LIMS to determine if **DNA Screening** on the item has been completed. If **DNA Screening** has been completed, testing may begin (assuming that there is no Latent Print testing request on the item(s)).
- 7.1.2.1.3. **If no DNA Screening request exists and no DNA Screening request has been completed, check the case record for correspondence between HFSC and the customer. If the customer has already been contacted and waived screening on the item, testing may begin (assuming that there is no Latent Print testing request on the item).**
- 7.1.2.1.4. **If DNA Screening has not been completed on the item and the customer has not already waived screening on the item(s),** notify a Firearms Section Supervisor or Manager via email, providing the agency case #, LIMS item #, and a brief description of the contamination (i.e. item is marked as biohazard, blood on item, etc.). Return the evidence to the designated section of the Firearms vault.
- 7.1.2.2. Once Firearms Section personnel complete step **7.1.2.1.4**, they will not proceed with any handling of the evidence until written notice is provided by the Firearms Section Manager or designee as to how to proceed.



- 7.1.2.3. The Firearms Section Manager, or designee, will contact the submitter (or other appropriate point of contact) to inquire as to whether or not he/she wants the item screened.
- 7.1.2.4. If the submitter (or other appropriate point of contact) wants the item screened, he/she is instructed to submit a request in LIMS for the testing. Place the evidence in the designated section of the Firearms vault.
- 7.1.2.5. If the submitter (or other appropriate point of contact) does not want the item screened, Firearms personnel will proceed with testing.

7.2. Procedure

7.2.1. Firearms

- 7.2.1.1. Every effort is made to ensure that the firearm is unloaded before decontamination begins.
- 7.2.1.2. Examiner/technician discretion is used to attempt to determine the functionality of the firearm as received. Examiner/technician safety must be the primary concern.
- 7.2.1.3. Determine the extent to which a biohazard exists on the firearm. Be certain to wear appropriate personal protective equipment.
 - 7.2.1.3.1. If the biohazard is present on the external surface(s) of the firearm, disassembly may not be necessary.
 - 7.2.1.3.2. 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.
- 7.2.1.4. Decontaminate the affected area(s).
- 7.2.1.5. Rinse the treated area(s) with water.
- 7.2.1.6. 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.
 - 7.2.1.6.1. Acetone or excessive heat should not be used on polymer frames.
- 7.2.1.7. Once dry, apply a light coat of gun oil or other appropriate lubricant to the affected area(s) to prevent corrosion.
- 7.2.2. Fired cartridge components (bullets, pellets, slugs, and casings)
 - 7.2.2.1. Submerge items in the decontamination solution. If particulate matter is present, remove it prior to submerging into the decontamination solution.
 - 7.2.2.2. Rinse the treated area(s) with water.
 - 7.2.2.3. 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.
- 7.2.3. Repackaging



- 7.2.3.1. Decontaminated items must not be placed back in the packaging that poses a biohazard.
- 7.2.3.2. An appropriately labeled laboratory package is used to store the decontaminated items.
- 7.2.3.3. The new package must be marked to indicate it was provided by the section (i.e. Lab Bag).
- 7.2.3.4. Original packaging is retained.
- 7.2.4. Other evidence items may need to be decontaminated on a case by case basis.



8. 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 examiner/technician 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.

Section personnel conform to any policies clients may have pertaining to a delay in handling firearms and firearm-related evidence.

8.1. Receipt of Evidence

8.1.1. In general, the staff member receiving evidence ensures that the item is appropriately labeled, packaged, and/or sealed.

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

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

8.1.2.2. 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.

8.1.2.3. 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 or tagged with the agency case number and item identifier.

8.1.2.4. Other bulky or oversized items may be submitted and should be received and stored at the direction of the Section Manager, Technical Leader (if a different individual), or designee.

8.1.2.5. If items are received unpackaged and/or unsealed under the conditions outlined in 8.1.2.1-8.1.2.4, it is noted in the case record and may be noted in a report.

8.1.3. If items are received packaged but not under proper seal and do not meet the conditions outlined in 8.1.2.1-8.1.2.4, it is documented as follows:

8.1.3.1. Items received for casework analysis will be noted in the case record and in a report.



- 8.1.3.2. Items received for NIBIN only processing are noted in the case record.
- 8.1.4. If items received for casework analysis or NIBIN only processing are not packaged or packaged but not secured (no attempt has been made to close the package with tape, etc.) and do not meet the conditions outlined in 8.1.2.1-8.1.2.4, see the Section Manager, Technical Leader (if a different individual), or designee for details on how to handle the evidence.
- 8.1.5. 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.
 - 8.1.5.1. This may be accomplished by making a comment on administrative or examination documentation.
 - 8.1.5.2. It may also be accomplished when the accurate description is provided in a report, while the original description remains in LIMS (or other part of the case record).
- 8.1.6. If evidence submitted to the Firearms Section meets the below criteria, consult the Section Manager, Technical Leader (if a different individual), or designee for details on how to proceed:
 - 8.1.6.1. Inconsistent case identifiers on evidence and submission form or LIMS equivalent.
 - 8.1.6.2. Absence of unique case identifier or item identifier (if applicable).
 - 8.1.6.3. Inconsistent evidence descriptions so egregious that the identity of the evidence is called into question.

8.2. Release of Evidence

- 8.2.1. 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 according to the guidelines provided in 8.1.3 and 8.1.4 above.
- 8.2.2. If items submitted for immediate analysis (see 8.1.2.1 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.
- 8.2.3. Firearms will not be released to a private citizen except what is allowed in accordance with the Quality Manual.



9. Evidence Log-in

9.1. General Guidelines:

9.1.1. All items submitted for casework analysis are marked with the forensic case number and item identifier whenever practical.

9.1.2. 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.

9.1.3. Associated packaging is marked with:

- The forensic case number
- Initials of the person logging in the evidence
- The date logged in
- Item identifiers

9.1.4. Sealing of evidence is done in conformance with Quality Manual standards. See the **Error! Reference source not found.** Section of this SOP regarding how evidence is handled upon receipt.

9.1.5. The Firearms Section Inventory Worksheet is used to document evidence when received.

9.1.5.1. This worksheet serves to characterize items as received and is not the basis for describing items in examination documentation or reports.

9.2. Procedure

9.2.1. If any item is received contaminated with body fluids, it must be decontaminated. See the **Error! Reference source not found.** Section of this SOP for the procedure. Note at the bottom of the Inventory Worksheet that it was decontaminated, initial, and date.

9.2.2. Special Issues Related to Logging In of Firearms

9.2.2.1. MAKE SURE THE FIREARM IS NOT LOADED!! Only after verifying that the firearm is unloaded can you continue the log-in process.

9.2.2.2. 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.



- 9.2.2.3. 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. The most common exception to the requirement to mark an evidence firearm is an officer's firearm, magazines, and firearm accessories. If any of these items is not marked, note this on the Inventory Worksheet.
- 9.2.3. Special Issues Related to Fired Bullets and Bullet Fragments
- 9.2.3.1. Evidence consisting of fired bullets or bullet fragments is recorded in the area of the Inventory Worksheet designated "Bullets".
- 9.2.3.2. 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, i.e. FMJ, JHP, etc.**
- 9.2.3.3. Weigh the bullet or fragments using the single pan balance and record the weight in the appropriate area. All weights are recorded in grains.
- 9.2.3.4. 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.
- 9.2.3.5. **If possible, record the type of rifling, if present. Rifling types include "Cut", "Poly", and "Hybrid".**
- 9.2.3.6. 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 a horizontal line placed in the field.

9.2.3.7. 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.

9.2.3.8. 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.

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

9.2.4.1. 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.

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

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

9.2.4.4. 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."

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

9.2.5.1. 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.

9.2.5.2. 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.

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

9.2.5.4. 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."

9.2.6. Special Issues Related to Other Types of Evidence

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



- 9.2.6.2. 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.
- 9.2.7. Storage (Short Term)
- 9.2.7.1. Whenever possible, all items of evidence associated with a particular case are stored in the same evidence pouch.
- 9.2.7.1.1. The evidence pouches are stored in the designated filing cabinets in ascending order by unique case identifier.
- 9.2.7.1.2. All packages inside the evidence pouch MUST be properly sealed if they are not currently in the process of being logged in or examined.
- 9.2.7.2. Storage of Long Guns and Oversized Items
- 9.2.7.2.1. 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 agency case number, forensic case number, and item identifier. Long guns not in the process of being logged in or examined are stored on racks or shelves in the Firearms Section vault until they are returned to the submitting agency. Note the storage location of the firearm in the case record or in LIMS.
- 9.2.7.2.2. Oversized items are packaged and sealed, if possible, and stored on the open shelves. The items are marked or tagged with the agency case number, forensic case number, and item identifier.
- 9.2.8. Enter case and evidence information into LIMS.
- 9.2.9. Once the log in process has been completed, the case record is provided to the Section Manager, or designee, for assignment to an examiner.



10. Examination & Classification of Firearms

10.1. Scope

- 10.1.1. 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.
- 10.1.2. This worksheet along with the Firearm Examination Worksheet (Case Work and IBIS) will document the condition of the firearm as received and any test firings conducted with the firearm.

10.2. Procedure

- 10.2.1. Complete the above-referenced forms as a firearm is examined.
- 10.2.2. Consult the Malfunctioning Firearm Examination or Rusty Firearm Examination procedures, if necessary.
- 10.2.3. 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.

10.3. Interpretation

- 10.3.1. 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.



11. Suspected Loaded Firearms Submitted for Unloading and/or Rendering Safe

Clients 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 client in person or to the lockers available. This section addresses handling these firearms and the associated request(s) for unloading.

11.1. Procedure

- 11.1.1. The safety of personnel is always of the utmost concern when handling firearms.
 - 11.1.1.1. When handling firearms submitted for unloading, examiners with only a few years of experience should consider working under the supervision of a senior examiner or supervisor, depending on the nature and condition of the submitted firearm.
 - 11.1.1.2. No examiner should ever attempt to handle a firearm submitted for unloading when no one else is physically present in the section.
- 11.1.2. It may be necessary to consult other sections of this SOP, including the sections addressing Safe Firearm Handling, Rusty Firearm Examination, **Error! Reference source not found.**, and Trace Material sections.
- 11.1.3. Examiners should take reasonable precautions in an attempt to preserve other types of forensic evidence (i.e. latent prints or DNA) by wearing gloves. If a client submits a firearm for unloading in person, he/she should be consulted to determine if forensic biology or latent print processing will also be needed on the item submitted.
- 11.1.4. 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.
- 11.1.5. Attempt to determine if the firearm is loaded. If the firearm is determined to be loaded, it must be unloaded.
- 11.1.6. 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. However, if it is necessary to permanently render a firearm inoperable in order to unload it, the client 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, Technical Leader (if a different individual), or designee.
- 11.1.7. 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 11.1.6 of this section for further details.



- 11.1.8. Firearms that have been unloaded and/or rendered safe are returned to the submitting agency.
- 11.1.9. A report is issued summarizing the actions taken to unload and/or render a firearm safe.



12. 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 a particular examination. These, of course, need very special handling (see the **Error! Reference source not found.** Section of this SOP). All firearms must be treated as though they are loaded. This rule cannot be over stressed and must be followed at all times. 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, Technical Leader (if a different individual), or designee immediately.

12.1. Procedure

- 12.1.1. The muzzle of the firearm must always be pointed in a safe direction (i.e. down at the floor, up at the ceiling, at the shooting backstop, into the water tank, into the barrel bullet trap, or at the wall in the function testing area).
- 12.1.2. 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.
- 12.1.3. Before handing a firearm to someone, verify that the firearm is unloaded by checking the chamber.
- 12.1.4. 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.
- 12.1.5. Follow the examination worksheet when function testing. Do not attempt to perform more than one task at a time.
- 12.1.6. Use dummy rounds when checking magazine capacity, whenever possible.
- 12.1.7. When dummy rounds are not available, follow the steps below for checking magazine capacity:
 - 12.1.7.1. Firearms having a detachable magazine:
 - Place the firearm in the shooting room.
 - Next, load the magazine to capacity with live cartridges in the function testing area, 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 on the examination documentation.
 - After you have verified that the magazine is empty, load the magazine with the desired number of cartridges for test firing purposes.
 - 12.1.7.2. Firearms having an integrated magazine:
 - Load the magazine to capacity in the shooting room with the firearm pointed in a safe direction, preferably into the water tank or at the shooting backstop.



- 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 on the examination documentation.
 - Verify that the magazine is empty. Immediately prior to test firing, load the magazine with the desired number of cartridges while in the shooting room.
- 12.1.8. 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.
- 12.1.9. The last thing to be done is loading the magazine with live cartridges.
- 12.1.10. Do not insert the magazine into the firearm until you are ready to fire the firearm. Always point the firearm into the water tank or at the shooting backstop when loading a magazine into a firearm. Always be prepared for the possibility of a slam fire.
- 12.1.11. Keep your finger away from the trigger until you are ready to fire the firearm.
- 12.1.12. 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 semi-autos and bolt action firearms. Open the cylinder on revolvers.
- 12.1.13. If you need assistance with a firearm during examination and/or test firing, seek assistance from a trained examiner and/or the Section Manager.
- 12.1.14. If you desire to handle a firearm that another examiner/technician is analyzing, you will not handle the firearm until test firing is completed and the shooter has verified that the firearm is unloaded. The ONLY reason that a firearm should be handled by more than one person prior to test firing is for assistance or training (see above).
- 12.1.15. If you observe an examiner/technician handling a firearm in an unsafe manner, bring it to their attention immediately. If the examiner/technician does not cease their unsafe practice, notify the Section Manager or laboratory safety officer immediately.
- 12.1.16. A firearm should not be placed in the evidence vault in a loaded condition. If a firearm cannot be unloaded before it must be secured (i.e. overnight), it must be placed in a safe location within the vault clearly marked as LOADED FIREARM. A loaded firearm should be rendered safe as soon as possible. A firearm shall never be released to an individual in a loaded condition.

12.2. Literature/Supporting Documentation

- 12.2.1. "A Guide to Firearms Safety", A Safety and Educational Publication of the National Rifle Association, May 1994.



13. Pre-Firing Safety Examination

It is the responsibility of the examiner/technician 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 examiner/technician must be mindful that individual case situations may require a more extensive function test process than that which is listed here.

13.1. Procedure

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

13.1.2. 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.

13.1.3. 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 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 the Technical Leader, if a different individual) before proceeding. The HFSC Quality Manual provides direction on how to proceed with obtaining a written court order and notification to defense counsel prior to consumption.

13.1.4. 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.

13.2. Interpretation

13.2.1. 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 (or Technical Leader, if a different individual) for guidance.



14. Trigger Pull Determination

14.1. Scope

- 14.1.1. One of the routine tests conducted in a firearm evaluation is determining its trigger pull(s).
- 14.1.2. 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.
- 14.1.3. The trigger pull of a firearm can be obtained utilizing standard trigger weights that make contact with the trigger at a point where the trigger finger would normally rest. The trigger pull test may be conducted using a trigger pull gauge or trigger pull weights.
- 14.1.4. Typically, trigger pulls are categorized as "Single Action" or "Double Action"; however, firearms may have additional or differently categorized trigger pulls. Examiners/technicians follow one or more of the following procedures to measure and record all trigger pulls a firearm is determined to have.

14.2. Procedure - Standard Trigger Weights

14.2.1. Single Action Trigger Pull

- Ensure that the firearm is unloaded.
- Cock the firearm.
- Hold the firearm with the muzzle vertical.
- Rest the trigger hook of the standard trigger weight hanger on the trigger where an individual's finger would normally rest making sure it is not touching any other part of the firearm. The weights should hang parallel to the barrel of the firearm.
- Add the weights until the firearm dry fires.
- Repeat at least three times, resetting the sear connection after each attempt. For revolvers, it may be necessary to perform this on all cylinder positions. Record the range of trigger pulls, from the lightest weight necessary for the sear to release to the heaviest, recording a range of at least ¼ pound.
- It should be noted that measuring the trigger pull of a rim fire firearm should not be performed on an empty chamber. A "dummy" cartridge should be used. The examiner/technician must also take into consideration the potential for damage to a center fire firearm and may wish to use a "dummy" cartridge in this instance as well.



- The single action trigger pull may be less than the minimum standard weight available. If this is the case, then the spring gauge will have to be used to determine the single action trigger pull.

14.2.2. Double Action Trigger Pull

- Ensure that the firearm is unloaded.
- Hold the firearm with the muzzle vertical.
- Rest the trigger hook of the standard trigger weight hanger on the trigger where the individual's finger would normally rest, making sure it is not touching any other part of the firearm. The weights should hang parallel to the barrel of the firearm.
- Add weights until the weights pull the trigger through the double action sequence and the sear releases.
- Repeat at least three times. For revolvers it may be necessary to perform this on all cylinder positions. Record the range of trigger pulls, from the lightest weight necessary for the sear to release to the heaviest, recording a range of at least ¼ pound.
- It should be noted that measuring the trigger pull of a rim fire firearm should not be performed on an empty chamber. A "dummy" cartridge should be used. The examiner/technician 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.
- The single action may be lighter than the smallest standard weight. Also, the double action trigger pull may be greater than the total standard weights available. If either one of these is the case, then the spring gauge will have to be used to determine the double action trigger pull.

14.3. Procedure – Spring Gauge

14.3.1. Ensure that the firearm is unloaded.

14.3.2. Mount the firearm in the vise making sure that there is no source of interference from the vise. The muzzle of the firearm should be as close to horizontal as possible.

14.3.3. Single Action Trigger Pull

- Cock the firearm.
- The position of the trigger hook attachment of the spring gauge should be as close to parallel with the barrel of the firearm as possible.
- Ensure the spring gauge indicator is "zeroed".



- Rest the trigger hook of the spring gauge on the trigger where an individual's finger would normally rest. Make sure it is not touching any other part of the firearm.
- Apply pressure to the spring gauge until the sear releases.
- Repeat at least three times, resetting the sear connection after each attempt.
- Record the range of trigger pulls from the lightest weight necessary for sear release to the heaviest, recording a range of at least ¼ pound. Record the trigger pull gauge used.
- With revolvers, it may be necessary to perform this on all cylinder positions. Note any revolver cylinder chamber that significantly alters the trigger pull.
- It should be noted that measuring the trigger pull of a rim fire firearm should not be performed on an empty chamber. A "dummy" cartridge should be used. The examiner/technician 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.

14.3.4. Double Action Trigger Pull

- Decock the firearm action, if necessary.
- The position of the trigger hook attachment of the spring gauge should be as close to parallel with the barrel of the firearm as possible.
- Ensure the spring gauge indicator is "zeroed".
- Rest the trigger hook of the spring gauge on the trigger where an individual's finger would normally rest. Make sure it is not touching any other part of the firearm.
- Apply pressure to the spring gauge until the sear releases.
- Repeat at least three times, resetting the sear connection after each attempt.
- Record the range of trigger pulls from the lightest weight necessary for sear release to the heaviest, recording a range of at least ¼ pound. Record the trigger pull gauge used.
- With revolvers, it may be necessary to perform this on all cylinder positions. Note any revolver cylinder chamber that significantly alters the trigger pull.
- It should be noted that measuring the trigger pull of a rim fire firearm should not be performed on an empty chamber. A "dummy" cartridge should be used. The examiner/technician 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.

14.4. Interpretation



14.4.1. Measurements obtained should be considered approximations given the accuracy limitations of most measuring devices. The trigger pull is normally recorded in a range of at least $\frac{1}{4}$ of a pound weight increment.

14.5. Literature/Supporting Documentation

14.5.1. Gamboe, Tom, "MAFS Firearms Workshop: Trigger Pull Methods," AFTE Journal, Vol. 18, No. 3, p. 77.

14.5.2. Rios, Ferdinand and Thorton, John, "Static vs. Dynamic Determination of Trigger Pull," AFTE Journal, Vol. 16, No. 3, p. 84.



15. Barrel & Overall Length Measurement of a Firearm

15.1. Scope

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

15.1.2. 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.

15.1.3. 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.

15.1.4. 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.

15.1.5. Long guns belonging to law enforcement personnel are considered an exception to this requirement unless specifically requested from a client.

15.2. Procedure

15.2.1. 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.

15.2.2. 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.

15.2.3. Overall Length

- Measure the distance from the butt to the muzzle.



- Measurement is made parallel to the bore and recorded in inches.

15.2.4. In the event that 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.

15.3. Interpretation

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

15.3.2. The uncertainty of measurement when using a NIST traceable measuring device is $\pm 1/8$ of an inch.

15.4. Literature/Supporting Documentation

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



16. Rusty Firearm Examination

16.1. Scope

- 16.1.1. Rusty firearms or those found in water, etc. may be submitted for examination.
- 16.1.2. 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.
- 16.1.3. 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.
- 16.1.4. It should be noted that the firearm may be too rusted to be functional.

16.2. Procedure

- 16.2.1. 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 or not 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 in order to unload it, the client 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, Technical Leader (if a different individual), or designee.
- 16.2.2. The client should be consulted to determine to what extent restoring the firearm is necessary (i.e., for test firing, for recovering manufacturer information, serial number, etc.). Soak the firearm in penetrating oil, de-rusting solvents, or similar material. Additionally, a solution of 15% acetic acid followed by a water rinse may be used to remove corrosion.
- 16.2.3. Periodically check the firearm until the firearm functions or the desired information is recovered.
- 16.2.4. 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.
- 16.2.5. Once the firearm is restored to the extent necessary, it should be treated with appropriate lubricants, etc. to prevent further corrosion.
- 16.2.6. See the Reporting Guidelines Section of this SOP for details on reporting the examination of firearms.

16.3. Literature/Supporting Documentation



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



17. Malfunctioning Firearm Examination

17.1. Scope

- 17.1.1. 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: "Will the firearm fire without pulling the trigger?"
- 17.1.2. 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.
- 17.1.3. 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.
- 17.1.4. 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.
- 17.1.5. Additionally, consult the Section Manager (or Technical Leader, if a different individual) prior to testing.

17.2. 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.

17.2.1. 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.

17.2.2. 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

17.2.3. 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.

17.2.4. Condition and Functionality of Safeties

Note the condition and functionality of all safeties.

17.2.5. 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.

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

17.2.7. Test Fire Firearm

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

17.3. 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.

17.3.1. Condition of the Action (Internal)

17.3.1.1. Hammer notch(s)



- Worn
- Burrs
- Dirt, etc.

17.3.1.2. Sear

- Worn
- Broken
- Burrs, etc.

17.3.1.3. Safeties (relationships to other firearm parts)

- Springs
- Weak
- Broken
- Altered, etc.

17.3.1.4. Signs of any tampering or faulty assembly.

17.4. Interpretation

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

17.5. Literature/Supporting Documentation

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



18. Bore & Chamber Casting

18.1. Scope

18.1.1. 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.

18.1.2. Bore and/or chamber casting may also be used for other forensic or training purposes.

18.2. Procedure

Casts can be made using various casting materials such as low melting point metals and silicone rubber compounds.

18.2.1. Ensure that the firearm is unloaded.

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

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

18.2.4. 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.

18.2.5. 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.

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

18.2.7. 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.

18.2.8. 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.

18.2.9. 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.

18.2.10. 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.

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

18.3. Interpretation



- 18.3.1. 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.
- 18.3.2. Class, subclass, and/or individual characteristics may be observable on casts and may assist Firearms Examiners in drawing conclusions.

18.4. Literature/Supporting Documentation

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



19. Firearms Reference Library

19.1. Scope

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

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

19.2. Procedure

- 19.2.1. A record of the firearms in the firearms reference library is maintained in a database.
- 19.2.2. Record the chain of custody transactions in the LIMS asset manager.
- 19.2.3. 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.

19.3. Literature/Supporting Documentation

- 19.3.1. AFTE Glossary, current edition.



20. Standard Ammunition File

20.1. Scope

20.1.1. The Standard Ammunition File is a collection or cataloging of both cartridges and their components used for various scientific reasons including the ability to:

- Identify the manufacturer's cartridge designation and source of evidence ammunition or component parts;
- Provide an exemplar resource for training new forensic scientists/evidence technicians;
- Provide a resource for the identification of ammunition components recovered at crime scenes or autopsies.

20.1.2. A commercially available ammunition reference database may also be employed to assist in these matters.

20.2. Procedure

The nature of each laboratory's ammunition reference collection is dictated or limited by the space, storage containers, and computer equipment available. However, the following should be considered:

20.2.1. Using architect blueprint cabinets or similar style cabinets for storage of the collection;

20.2.2. Using clear plastic tubes or boxes for storage of each ammunition entry. The entry consisting of at least one whole cartridge and one cartridge broken down into its component parts (bullet or other projectile, cartridge case with primer, powder);

20.2.3. Recording cartridge information such as:

- Manufacturer
- Bullet weight
- Bullet style or configuration
- Manufacturer's Index
- Headstamp
- Number of cannelures
- Other pertinent information

20.2.4. Cataloguing in a storage cabinet by caliber, bullet style and/or manufacturer's data as appropriate.

20.3. Literature/Supporting Documentation

20.3.1. AFTE Glossary, current edition.



21. Test Firing And Recovery Methods

21.1. Scope

- 21.1.1. 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.
- 21.1.2. 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.
- 21.1.3. 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.
- 21.1.4. Recovery methods include the water tank, bullet trap, and the cotton waste recovery box. The type of firearm and ammunition tested will usually dictate the type of recovery method used.
- 21.1.5. 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.
- 21.1.6. 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.
- 21.1.7. 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.
 - Caliber
 - Date of test fire
 - Ammunition used
 - Date the firearm was collected
 - Date of offense
 - Offense
 - NCIC code for the firearm
 - Manufacturer
 - Model
 - Serial number
 - Examiner/Technician's initials



- Item identifier
- IBIS Unit (if imaged)

21.2. Procedure

21.2.1. Safety Considerations Before Test Firing:

- Ensure that the exhaust fans are turned on and that the outside and inner doors to the shooting room are closed.
- Proper hearing and eye protection must be worn in addition to the “Man-Down” pendant.
- The examiner/technician 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: lab coat, face shield, bullet proof vest, and/or full body shield.

21.2.2. Safety Notifications and Announcements for Test Firing:

Typically, test firing is only done when more than one person is present in the Firearms Section. 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.

21.2.2.1. If one or more additional individuals is in the Firearms Section, 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.)

- This announcement serves as a notification that test firing is about to commence.
- When test firing is completed, opening the door to the shooting room and/or the gun work up room signals that test firing is complete.
- **A two-sided sign on the outer door to the gun work up room also provides an indication that test firing is in progress. One side indicates that it is safe to enter the room, and the other side indicates that test firing is in progress. The sign is flipped back and forth by firearms personnel as needed.**
- Firearms personnel present in the Firearms Section 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.



21.2.2.2. If no other individuals are physically present in the Firearms Section, the individual test firing calls HFSC personnel present in another area (but at the same physical address, typically CSU personnel). If no HFSC personnel on-site can be reached, the individual test firing contacts an off-site Supervisor or the Section Manager. Henceforth, the other HFSC personnel contacted will be referred to as a "Safety Contact".

- The individual test firing notifies the Safety Contact of how many test fires to expect and how long this will be expected to take. If a firearm is expected to be tested in full automatic or 3 round burst mode, this information is also relayed to the Safety Contact. The individual test firing notifies the Safety Contact that test firing is complete
- The Safety Contact remains on the line while the individual test fires and until all test firing is complete. The individual test firing is not expected to physically maintain control of the phone while test firing. If multiple test fires are to occur with long breaks in between, multiple phone calls may be necessary.
- If there an indication of a problem or distress and the individual test firing does not respond on the phone call, the Safety Contact calls appropriate emergency personnel (911). Additionally, an on-site Safety Contact uses the emergency access card to gain entry to the Firearms Section in order to evaluate the situation and provide appropriate assistance. An off-site Safety Contact makes contact with an individual on site and requests they utilize the emergency access card to gain entry to the Firearms Section to evaluate the situation and provide appropriate assistance. Any use of the emergency access card is reported and recorded in compliance with the HFSC Security Manual.

21.2.3. 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.
- 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. Load the magazine with



two (2) cartridges for test firing such a firearm. After testing the operability of the full automatic mode using two (2) cartridges, fire a third cartridge, if necessary.

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

21.2.4. Cotton Waste Recovery Box

The cotton waste recovery box is usually used to recover bullets from handguns, rifles, and slugs fired from shotguns. The box is packed with alternating rows of phone books, packed cotton or other suitable material, and file folder/paper partitions. The placement of paper partitions and phone books at various points in the box is to enable tracking of the test shot, as well as ensuring that the cotton is packed down so as not to retain previous bullet paths.

- Prior to test firing, ensure that the lid of the box is closed and properly secured.
- Fire the firearm. 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. Load the magazine with two (2) cartridges for test firing such a firearm.
- Every attempt must be made to recover and retain fired cartridge cases and projectiles. Projectiles and other shotshell components should be recovered by searching through cotton, using partitions as guides. Once the fired components have been recovered, remove any overly damaged phone books and replace them with new ones and repack the box.
- Document in the case record if a component could not be recovered.

21.2.5. Bullet Trap/Back Stop

The bullet trap 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.

- Fire the firearm. 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. Load the magazine with two (2) cartridges for test firing such a firearm.

- Retain any cartridge components that do not go into the trap. Fired projectiles and other components that go into the trap should NOT be recovered.

21.3. Literature/Supporting Documentation

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

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

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

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



22. Remote Firing

22.1. Scope

22.1.1. During the course of examining a firearm, it may be determined that it is unsafe to fire the firearm by holding it as designed. An examiner/technician may decide to test fire a firearm using the Smart Shot Firing Device®.

22.2. Procedure

22.2.1. Set up the remote firing device as follows:

- Place it in front of the appropriate recovery system.
- Clamp the front feet of the device to the tabletop to keep the device from moving.
- Secure the firearm in the device using the vise(s) on the firing device. Ensure that the action of the firearm is not inhibited.
- Attach the firing string to the trigger, if necessary.

22.2.2. It is recommended that the examiner/technician first dry-fire the firearm in the remote firing device before using live ammunition.

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

22.2.4. Retain test fires.

22.2.5. Restore bullet recovery system to a useable condition, if necessary.

22.2.6. Document the use of the Smart Shot Firing Device® in the case record.

22.3. Literature/Supporting Documentation

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



23. Primed Cartridge Case/Shotshell

23.1. Scope

23.1.1. 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 (i.e. reloaded, damaged, etc.).
- 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 2/3 of the weight of the gunpowder present in each cartridge.
- 24.2.6. Replace only 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 (i.e. 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 1/3 reduction in gunpowder does not result in the desired outcome, consider repeating the procedure and remove up to ½ 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. Caliber/Caliber Family Determination

25.1. Scope

25.1.1. 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.

25.2. 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.

25.2.1. Compare the evidence bullet directly with known reference bullets.

25.2.2. 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.

25.2.3. 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.

25.2.4. 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.

25.3. Interpretation

25.3.1. Caliber/caliber family is written as a numerical term and may be depicted with or without the decimal point.

25.3.2. 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.

25.3.3. In some instances, the examiner may not be able to determine a caliber/caliber family.

25.4. Literature/Supporting Documentation

25.4.1. Mathews, J. Howard, Firearms Identification Vol. I, 1973.

25.4.2. Barnes, Frank C., Cartridges of the World, 7th Edition, 1993.

25.4.3. AFTE Glossary, current edition.

25.4.4. Lutz, Monty C. and Ward, John G., "Determination of Bullet Caliber from an X-ray," AFTE Journal, Vol. 21, No. 2, p. 168.



26. Air Gap

26.1. Scope

26.1.1. 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.

26.2. Procedure

26.2.1. 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:



26.2.2. 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.

26.2.3. 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.

26.2.4. Repeat the above utilizing the groove impression.

26.3. Interpretation

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



26.4. Limitations

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

26.5. Literature/Supporting Documentation

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

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

26.5.3. AFTE Newsletter, No. 4, December 1969, p. 28.



27. General Rifling Characteristics Utilization

27.1. Scope

- 27.1.1. 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.
- 27.1.2. Disclaimer: 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.

27.2. Procedure

- 27.2.1. The General Rifling Characteristics (GRC) database can be accessed using the GRC computerized database in Microsoft Access.
- 27.2.2. 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.
- 27.2.3. When conducting a search of the GRC database, the **appropriate administrative information is completed (agency case number, forensic case number, item numbers, etc.)**.
- 27.2.4. 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.
- 27.2.5. 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 narrow-narrow search is the most restrictive and may be used when the land and groove impressions are well defined.
 - 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.
 - 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.
- 27.2.6. 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 particular search option (i.e. narrow-narrow, narrow, broad).

- 27.2.7. 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) may be performed.
- 27.2.8. Results of the computerized search maintained in the case record. The examiner reviews the results and **may**, if appropriate, add to or eliminate entries from the list based on the examiner's knowledge and experience. The examiner records justification for any addition or deletion 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.
- 27.2.9. 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.
- 27.2.10. 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 specific caliber field in the database may be left blank while other known fields are completed. In this instance, the narrow-narrow search is utilized. The examiner shall review the list to ensure the results returned correspond to determined class characteristics, and a statement to that effect should be noted on the results sheet.
- 27.2.11. 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:
 - 27.2.11.1. 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 (i.e. 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).
 - 27.2.11.2. 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 (i.e. bullets loaded in a 40 S&W or 10mm Auto cartridge may be so similar that they cannot be distinguished).

27.3. Interpretation



27.3.1. 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.

27.4. Limitations

27.4.1. All firearms may not be found in database.

27.5. Literature/Supporting Documentation

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

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

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



28. Wadding Determination

28.1. Scope

28.1.1. 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.

28.2. Procedure

28.2.1. 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.

28.2.2. 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.

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

28.2.4. 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.

28.2.5. Record all information on the appropriate worksheet(s).

28.3. Interpretation

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

28.4. Limitations

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

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



29. Shot Determination

29.1. Scope

29.1.1. 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.

29.2. Procedure

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

29.2.1. 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 on the appropriate worksheet(s).

29.2.2. 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 worksheet(s).
- 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.

29.2.3. 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 on the appropriate worksheet(s).

29.3. Limitations

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

29.4. Literature/Supporting Documentation

- 29.4.1. AFTE Glossary, current edition.



30. Physical Examination & Classification of Fired Bullets

30.1. Scope

30.1.1. 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.

30.2. Procedure

30.2.1. 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; *
- 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

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

30.3. Interpretation

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

30.4. Literature/Supporting Documentation

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

30.4.2. AFTE Glossary, current edition.



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

31.1. Scope

31.1.1. 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.

31.2. Procedure

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

31.2.1. If any trace material is present

31.2.2. Caliber*

31.2.3. The possible manufacturer/marketer of the item

31.2.4. Ignition System (such as center fire, rim fire, or other)

31.2.5. Description of cartridge case and primer

31.2.6. Head stamp information*

31.2.7. Description of Firing Pin Impression *

31.2.8. 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)

31.2.9. Other Marks Present

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

31.3. Interpretation

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

31.4. Literature/Supporting Documentation



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



32. Microscopic Comparison

32.1. Scope

32.1.1. In order 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.

32.1.2. Comparisons between cartridge cases or between bullets of different caliber families will not be performed unless there is a specific request from a client, obvious distortions to the evidence are observed, or there is another forensic reason to do so.

32.2. Procedure

32.2.1. 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 hand stage and unknown fired evidence is placed on the left hand 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 – i.e. two or more cartridge cases) are marked in such a



way as to differentiate which particular component was used in which comparisons.

- Comparison of all available identifying marks should be considered.

32.2.2. 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

32.2.3. 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. 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.

32.2.4. 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.

32.2.5. 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.

32.3. Interpretation

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

- 32.3.1. Identification*: A sufficient correspondence of individual characteristics will lead the examiner to the conclusion that both items (evidence and tests) originated from the same source.
- 32.3.2. Inconclusive: An insufficient correspondence of individual and/or class characteristics will lead the examiner to the conclusion that no identification or elimination could be made with respect to the items examined.
- 32.3.3. Elimination: A disagreement of class characteristics 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.
- 32.3.4. Unsuitable: A lack of suitable microscopic characteristics will lead the examiner to the conclusion that the items are unsuitable for identification.
- 32.3.5. Insufficient: An item that has discernible class characteristics but no individual characteristics will lead the examiner to the conclusion that the item is insufficient for identification. Alternatively, 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 will lead the examiner to the conclusion that the item is insufficient for identification.



32.3.6. * 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.

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.

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



33. Trace Material

33.1. Scope

33.1.1. 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. Removal/collection of trace material for testing purposes is conducted by the Forensic Biology section or the Trace Evidence Section.

33.2. Procedure

33.2.1. If there is a request to have the trace material removed/collected, contact the Forensic Biology section or the Trace Evidence Section.

33.2.2. Examine the firearms related evidence visually and microscopically for any trace material and record in notes.

33.2.3. If the trace material is not going to be retained for further examination, proceed with the following steps:

- For evidence containing blood, tissues, or other biohazards, see the **Error! Reference source not found.** section of this SOP.
- Remove loose material by rinsing the fired evidence with acetone or water.
- Remove plaster by rinsing the fired evidence in a 15% acetic acid solution.
- Remove paint by soaking the fired evidence in alcohol or acetone.
- Document the steps that were performed.

33.3. Literature/Supporting Documentation

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

33.3.2. AFTE Glossary, current edition.

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

33.3.4. 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.



34. National Integrated Ballistic Information Network – NIBIN

34.1. Scope

- 34.1.1. 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.
- 34.1.2. 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.
- 34.1.3. 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.

34.2. Procedure

- 34.2.1. The NIBIN Standard Image Capture Protocols are followed when making entries into the system.
- 34.2.2. 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.
- 34.2.3. If an item or items are unsuitable for NIBIN, or if an item or items are imaged into NIBIN, it is recorded on the appropriate worksheet(s).
- 34.2.4. Any information about the consistency in class characteristics of evidence cartridge cases to each other and the selection of certain specimens for entry into NIBIN must be documented within the case record.

34.3. Interpretation



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

34.4. Limitations

34.4.1. Mutilated or deformed evidence

34.4.2. Sufficient markings for inclusion in database

34.4.3. Database search may not include all viable possible matches



35. NIBIN Processing

35.1. Scope

- 35.1.1. Firearms evidence is routinely processed through the section's NIBIN program. Semi-automatic firearms, fully automatic firearms, shotshells, and cartridge cases not fired in a revolver or derringer are eligible for entry into NIBIN. Firearms belonging to law enforcement personnel are not eligible for entry.
- 35.1.2. 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, the Section Manager, or Technical Leader (if a different individual). Once identified, the ineligible NIBIN entries are deleted by the person making the entries or by a Section Manager-approved designee.

35.2. Procedure

If the evidence is being processed as part of a NIBIN-only request, create the request in LIMS and select the affected item(s). Evidence is processed for NIBIN following the workflows detailed in Sections 35.2.1(Firearms) and 35.2.2 (Cartridge Cases/Shotshells) below.

35.2.1. Firearms:

Follow the applicable SOPs for examining and test firing firearms. Complete the appropriate fields in the assignment in LIMS. Because test fires are considered evidence, they are stored according to appropriate SOPs. Microscopically evaluate the test fired cartridge cases to determine which item(s), if any, is/are suitable for imaging.

35.2.1.1. Obtain the evidence and check the offense date to ensure that any waiting period has passed.

35.2.1.2. Follow the procedure outlined in Section 7.1.2 of this SOP if any evidence is noted to pose a potential biohazard.

35.2.1.3. If writing on the package states that the evidence is to be printed, but there is no Latent Print request in LIMS, notify the designated Firearms supervisor and place the evidence in the designated location in the vault.

35.2.1.4. Perform a "buddy check" of the evidence by finding another examiner/NIBIN Technician to complete the three-step check of the evidence for pending requests for testing in other disciplines. In the event the primary analyst does not open the packaging and begin work on the evidence the same day the buddy check is performed, then it is repeated on the day that the primary analyst performs the work prior to the work being performed.

35.2.1.4.1. The additional examiner or technician takes items into his/her custody.



- 35.2.1.4.2. The additional examiner or technician checks the chain of custody in LIMS during transfer and the Case Jacket and assignment tab in LIMS in each case.
- 35.2.1.4.3. If a pending request for testing exists, then the affected evidence is placed in the appropriate location in the vault.
- 35.2.1.4.4. Once all items are deemed to be clear for evaluation by the additional examiner or tech, all items are transferred back to the primary analyst.
- 35.2.1.5. The primary analyst repeats steps 35.2.1.4.1- 35.2.1.4.3. Once all items are deemed to be clear for evaluation, work may proceed.
- 35.2.1.6. Self-assign the request, if not already done.
- 35.2.1.7. Check all seals on the outer packaging for initials and proper seal. Open the package and inventory the items. Treat any discrepancies per lab policy. Follow the procedure outlined in Section 7.1.2 of this SOP if any evidence is noted to pose a potential biohazard.
- 35.2.1.8. 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.
- 35.2.1.9. Repackage and seal the evidence (not test fires) and place in the transfer bin.
- 35.2.1.10. For each firearm that did not function (or was not test fired), complete the appropriate fields in LIMS and proceed to step 35.2.1.16.
- 35.2.1.11. Organize test fires in such a way that you are aware of what items need to be evaluated and imaged into IBIS.
- 35.2.1.12. Because test fires are considered evidence, store them per applicable SOPs.
- 35.2.1.13. 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 35.2.1.16.
- 35.2.1.14. Enter the evidence into NIBIN.
- 35.2.1.15. Complete the fields regarding NIBIN entry in the appropriate fields in LIMS.
- 35.2.1.16. Create worksheet(s).
- 35.2.1.17. Generate and sign report in LIMS.
- 35.2.1.18. Collect worksheets and compare worksheets to test fire packages and to your pending IBIS assignments for the day. Make sure to account for worksheets that were already generated because a firearm did not function or because test fires were unsuitable. To check the pending assignments, run the "Pending by Analyst" report in LIMS.



35.2.1.19. Transfer the evidence to the appropriate location and place worksheets in the designated area.

35.2.2. 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 assignment 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.

35.2.2.1. Obtain the evidence and check the offense date to ensure that any waiting period has passed.

35.2.2.2. Follow the procedure outlined in Section 7.1.2 of this SOP if any evidence is noted to pose a potential biohazard.

35.2.2.3. If writing on the package states that the evidence is to be printed, but there is no Latent Print request in LIMS, notify the designated Firearms supervisor and place the evidence in the designated location in the vault.

35.2.2.4. Perform a "buddy check" of the evidence by finding another examiner/NIBIN Technician to complete the three-step check of the evidence for pending requests for testing in other disciplines. In the event the primary analyst does not open the packaging and begin work on the evidence the same day the buddy check is performed, then it is repeated on the day that the primary analyst performs the work prior to the work being performed.

35.2.2.4.1. The additional examiner or tech takes items into his/her custody.

35.2.2.4.2. The additional examiner or tech checks the chain of custody in LIMS during transfer and the Case Jacket and assignment tab in LIMS in each case.

35.2.2.4.3. If a pending request for testing exists, then the affected evidence is placed in the appropriate location in the vault.

35.2.2.4.4. Once all items are deemed to be clear for evaluation by the additional examiner or tech all items are transferred back to the primary analyst.

35.2.2.5. The primary analyst repeats steps 35.2.1.4.1- 35.2.1.4.3. Once all items are deemed to be clear for evaluation, work may proceed.

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

35.2.2.7. Check all seals on the outer packaging for initials and proper seal. Open the package and inventory the items. Treat any discrepancies per lab policy. Follow the procedure outlined in Section 7.1.2 of this SOP if any evidence is noted to pose a potential biohazard.

35.2.2.8. Sub-item the evidence in LIMS, if needed.

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



- 35.2.2.10. Create and label new lab bags, if needed.
 - 35.2.2.11. Complete the appropriate matrix panels in the assignment in LIMS.
 - 35.2.2.12. Enter the evidence into NIBIN.
 - 35.2.2.13. Complete the fields regarding NIBIN entry in the appropriate fields in LIMS.
 - 35.2.2.14. Create worksheet(s).
 - 35.2.2.15. Generate and sign report in LIMS.
 - 35.2.2.16. Collect worksheets and compare worksheets to evidence packages and to your pending IBIS assignments for the day. To check the pending assignments, run the "Pending by Analyst" report in LIMS. This is done to verify that worksheets were created for each assignment.
 - 35.2.2.17. Transfer the evidence to the appropriate location and place worksheets in the designated area.
- 35.2.3. Authorized personnel review the resulting correlation, noting potential matches in the NIBIN system.
- 35.2.4. See the Reporting Guidelines Section of this SOP for details on how to report potential and confirmed NIBIN hits.



36. Serial Number Restoration – Polishing

36.1. Scope

- 36.1.1. 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.
- 36.1.2. 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.

36.2. Procedure

- 36.2.1. 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.
- 36.2.2. Note and record any visible characters or partial characters prior to polishing on the appropriate worksheet.
- 36.2.3. Polish the area of the obliteration using either a rotary tool with a sanding/polishing disc or fine grit sand paper.
- 36.2.4. 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.

36.3. Interpretation

- 36.3.1. Note and record any characters that become visible. A second qualified examiner must verify any reported characters.
- 36.3.2. If characters do not become visible, proceed to the appropriate chemical or magnetic restoration procedure.

36.4. Literature/Supporting Documentation

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



37. Serial Number Restoration – Magnetic Technique

37.1. Scope

37.1.1. 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.

37.1.2. 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.

37.2. Equipment, Materials, and Reagents

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

37.3. Procedure

37.3.1. 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.

37.3.2. Polish the area of obliteration in accordance with the Serial Number Restoration - Polishing section of this SOP.

37.3.3. Place the magnet with the poles on either side of the area of obliteration.

37.3.4. Apply Prepared Bath to the area of obliteration with a plastic disposable pipette.

37.3.5. Adjust the placement of the magnet, as needed, to maximize the visibility of the obliterated numbers/characters.

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

37.4. Interpretation

37.4.1. Note and record any characters that become visible. A second qualified examiner must verify any reported characters.

37.4.2. If characters do not become visible, the examiner may consider a chemical technique.



37.5. Literature/Supporting Documentation

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



38. Serial Number Restoration – Chemical Restoration

38.1. Scope

38.1.1. 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.

38.1.2. 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.

38.2. Equipment, Materials, and Reagents

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

38.2.1. Fry’s Reagent

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

38.2.2. 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)

38.2.3. Davis Reagent

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

38.2.4. 25% Nitric Acid

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

38.2.5. Acidic Ferric Chloride

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

38.2.6. Ferric Chloride

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



38.2.7. 10% Sodium Hydroxide (NaOH)

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

38.2.8. Phosphoric/Nitric Acid

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

38.3. Standards and Controls

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

38.3.1. For Fry's, Turner's, and Davis reagent:

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

38.3.2. 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.

38.3.3. 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.

38.3.4. The reactions observed from the tests above are recorded on the Serial Number Restoration Reagent Reactivity Test form. A copy of this form completed on an appropriate date is included in each case record in which these reagents are used.

38.3.5. In the event that the expected reaction cannot be confirmed, discard the etchant, prepare a new batch, and repeat the test.

38.4. Procedure

38.4.1. 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.

38.4.2. Utilize the Polishing Procedure as necessary.

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

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

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



38.4.6. 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.

38.5. Interpretation

38.5.1. Note and record any characters that become visible.

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

38.6. Limitations

38.6.1. 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.

38.7. Literature/Supporting Documentation

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

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



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